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Dichapetalum Thouars (Dichapetalaceae) in Australia

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Abstract

All *Dichapetalum* known in Australia are described and illustrated including two new species: *Dichapetalum auranticarpum* W.E.Cooper and *Dichapetalum cremeum* W.E.Cooper. *Dichapetalum australianum* C.T.White is reinstated, and *Dichapetalum timoriense* DC. is confirmed for the Northern Territory. Notes on habitat and distribution are provided, as well as a key to the Australian species.

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Introduction

Dichapetalaceae consists of three genera: *Dichapetalum* Thouars (133 species), *Stephanopodium* Poepp. & Edl. (13 species, Central and South America) and *Tapura* Aubl. (28 species, Africa and the Americas) (Mabberley 2017). *Dichapetalum*, the only genus to occur in Australia, is known from Central and South America, Africa, Madagascar, India, China and Southeast Asia to New Guinea, Solomon Islands and Australia with most diversity found in Africa (Prance 1972). The genus grows predominantly in lowland to montane rainforest, rarely in woodland, savannah or semi-arid regions (Breteler 1973:4).

Dichapetalum species are relatively uniform in their morphology (Hauman 1955:340). Leenhouts (1956, 1957) observed that the most reliable characters for distinguishing species are found in the size and shape of the inflorescence and in the fruit structure, vegetative characters are variable, venation is characteristic in several species, and, in most cases, flowers yield valuable features. Metcalf & Chalk (1950) described unicellular hairs for the genus, which are found in all Australian species except *D. auranticarpum* W.E.Cooper sp. nov. (named here) in which the fruit epicarp is clothed in stellate trichomes.

Leenhouts in his revision (1956) and Flora Malesiana treatment (1957:305-306, 309) broadly circumscribed two widespread and variable taxa, *D. papuanum* (Becc.) Boerl. and *D. timoriense* (DC.) Boerl. while acknowledging the difficulty of species delimitation with inadequate collections of flowering material of dioecious species and a paucity of good fruiting collections. Following the collection of more material in Australia and the examination of specimens and specimen images from New Guinea and elsewhere in Malesia, additional diagnostic features have been identified that enable the effective delimitation of taxa. Based on examination of these collec-

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tions and plants in the field, we conclude *Dichapetalum* comprises four species in Australia, including two new species described herein: *D. auranticarpum* and *D. cremeum* W.E.Cooper. *Dichapetalum australianum* C.T.White is reinstated, and *D. timoriense* is confirmed for the Northern Territory.

Methods

The study is based upon the examination of herbarium material including scans from BRI, CANB, CNS, JSTOR and L as well as field observations. All specimens cited have been seen by the author.

Measurements of the floral parts and fruits are based on material preserved in 70% ethanol as well as fresh material from the field.

The Kew Plant Glossary (Beentje 2010) was used for terminology.

Results

,*Dichapetalum papuanum* occurs in New Guinea, Indonesia and Malaysia, and has previously been recognised as occurring in Australia (Leenhouts 1956; 1957) but we conclude this is a misapplication, likely due to the paucity of herbarium material including the lack of fruiting specimens. The isotype of *D. papuanum* (L- L0016523) has been annotated as being from Papua New Guinea, however, notes on that specimen indicate it was collected at Ramoi, near Sorong in West Papua, Indonesia. This specimen was collected by Odoardo Beccari PP 307 (L- L0016523) in 1872. Beccari travelled to West Papua from 1871–76 but not Papua New Guinea (Dowe 2016). *Dichapetalum australianum* from north Queensland, previously treated as a synonym of *D. papuanum*, is morphologically distinct from that species and is reinstated here. *D. papuanum* is therefore now not considered to occur in Australia.

Leenhouts (1956; 1957) noted *Dichapetalum timoriense* to be extremely variable and circumscribed the species broadly, including many names previously applied throughout Southeast Asia. Specimens from Cape York Peninsula, Queensland, previously determined as *D. timoriense* are named as a new species, *Dichapetalum cremeum*, while specimens from the Northern Territory are confirmed as *Dichapetalum timoriense*. More complete flowering and fruiting collections may also enable the delimitation of more species in Southeast Asia and Malesia that are presently included in *D. timoriense*.

Hewson (1984: 218, 219) reviewed *Dichapetalum* in Australia, confirming the presence of *D. papuanum* and noting that *Dichapetalum* collections from the Claudie River may represent another taxon.

The markedly distinct *Dichapetalum auranticarpum* has only recently been collected with fruit for the first time and is confirmed as a third *Dichapetalum* species from Cape York Peninsula, Queensland.

This study has revealed that Australian species possess distinct leaf features that enables identification of sterile specimens, e.g. the shape and length of the taper of the petiole onto the abaxial midrib, a useful morphological character not previously discussed in the literature. The taper remains consistent within each species and is especially evident on fresh collections, however it may sometimes be fugitive on herbarium specimens of some species.

This study has demonstrated the importance of fruiting material for delimitation of species. Fruit of Australian species are unlike those of species with similar leaves throughout Malesia and Southeast Asia.

Taxonomy

Key to *Dichapetalum* in Australia:

1	Petioles with an acuminate taper onto abaxial midrib; fruit sparsely and minutely hairy **2**
1	Petioles with a short and truncated taper onto abaxial midrib; fruit warty and/or conspicuously hairy **3**
2	Leaf base usually distinctly asymmetrical, subcordate or narrowly rounded, rarely cuneate; taper onto abaxial midrib 2.5–8 mm long; calyx hemispherical at base ***D. cremeum***
2	Leaf base often slightly asymmetrical, attenuate or rarely cuneate; taper onto abaxial midrib up to 2.5 mm long; calyx tubular at base ***D. australianum***
3	Leaf apex emarginate, rarely acute, narrowly obtuse or with an apiculum; hermaphrodite inflorescence a solitary flower or a 4-flowered cyme; fruit warty, stellate-hairy becoming glabrous, bright reddish-orange; occurs in north Queensland ***D. auranticarpum***
3	Leaf apex acute and usually with an apiculum; hermaphrodite inflorescence a many-flowered cyme or panicle; fruit densely clothed in velvety hairs, green; occurs in the Northern Territory ***D. timoriense***

Dichapetalum Thouars

Genera Nova Madagascariensia: 23 (1806).

Type: *Dichapetalum madagascariense* Poir. (*fide* Poiret 1812: 470).

***Dichapetalum* in Australia:** Monoecious or dioecious scrambling *shrubs* or *vines*, sometimes with back-arching stems that aid climbing; indumentum simple trichomes (or stellate on the fruit of *D. auranticarpum*); stipules present, often caducous; petioles sub-peltate, thickened and tapering onto abaxial midrib. *Leaves* simple, alternate; margin often repand; base often asymmetrical; orbicular glands may be present on either or both abaxial and adaxial surfaces, presumably they are nectiferous given that they are frequently eaten by

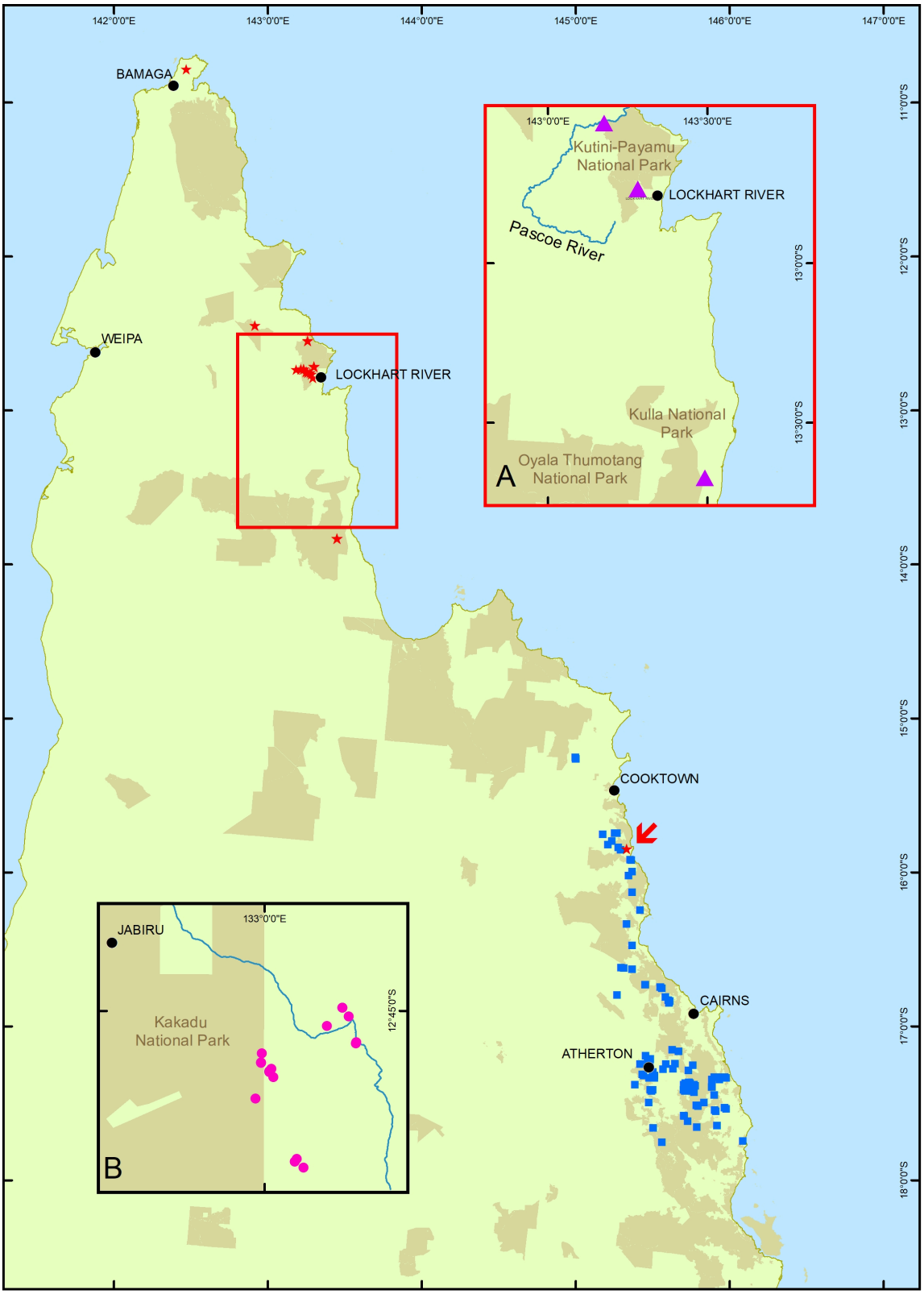

Figure 1. Map of *Dichapetalum* species in mainland Australia. ▪ *D. australianum*; ★ *D. cremeum*; Inset **A**: ▲ *D. auranticarpum*; Inset **B** (Northern Territory): ● *D. timoriense.* Shaded areas on the map respresent protected areas.

insects. *Inflorescences* are axillary or terminal, mostly dichotomously branched or glomerulous, bracteate; pedicels articulated. *Flowers* actinomorphic, monoecious or dioecious; *calyx* lobes connate at base, *sepals* 5, imbricate; *petals* 5, free, bilobed and emarginate; *stamens* 5, adnate to base of petal lobes, episepalous and inserted between disk lobes; anther introrse; 5 non-nectar producing staminodes surround the ovary (sometimes referred to as a hypogynous glands, disk glands, nectiferous glands or disk-lobes [Breteler 1973: 26–27]); ovary 2- or 3-locular; style connate; stigma 2- or 3-lobed. *Fruit* a capsule or a drupe; sepals, petals and stamens persist at base; seeds 1–3.

Etymology: *Dichapetalum* from *dicho* (paired) and *petalon* (petal), referring to the often bilobed petals.

Dichapetalum auranticarpum W.E.Cooper, *sp. nov*.

Type: Australia: Queensland. Cook District: Wattle Hills, Cape York Peninsula, 14 October 2022, *W.Cooper 2888, R.Jensen & F.Zich* (holo: CNS 154153 [2 sheets + spirit]), iso: 6 sheets to be distributed to BRI, CANB, DNA, L, LAE, MO).

Monoecious scandent *shrub* or *vine* to *c.* 5 m; stem diameter to *c.* 50 mm; bark grey with vertical creases and horizontal lenticels; some branches back-arching; twigs lenticellate, tomentose on new growth becoming thinly appressed, denser at nodes; indumentum white or cream-coloured; stipules caducous, subulate, densely pubescent, *c.* 2.25 mm long; petioles sub-peltate, thickened, 4–8 mm long not including the taper, taper along abaxial midrib extending for 1.5–2.5 mm, truncated at base of primary vein, taper on adaxial midrib truncate or acute, thinly sericeous, becoming glabrous, dark brown. *Leaves* oblong-elliptic, oblong-obovate or oblong, 70–130 mm long and 22–53 mm wide, coriaceous; new growth sericeous, denser on primary veins and margins abaxially and adaxially, a tuft of hairs persists at apex of abaxial primary vein but eventually glabrous, glabrescent; glands 3–10 near base abaxially and absent or sparsely scattered over the remainder of the blade; glands on adaxial surface few and scattered; discolorous; base symmetrical and sometimes slightly asymmetrical, cuneate or attenuate, rarely narrowly rounded or subcordate; apex narrowly emarginate, rarely acute or narrowly obtuse and mucronate; margin entire; venation camptodromous proximally and brochidodromous distally; primary vein slightly depressed adaxially and raised abaxially; secondary veins 6 or 7 pairs, raised on both sides, angle to primary vein 40–50º; tertiary venation reticulate, densely pitted within each reticulation on abaxial surface. *Hermaphrodite inflorescence* an axillary or terminal solitary flower or 2–4-flowered cyme; bracts at base of peduncles lanceolate, 1–2.5 mm long, tomentose; peduncles 1.25–2 mm long, densely pubescent; pedicels articulate, 0.5–1 mm long, densely pubescent; bracts at base caducous, subulate, *c.* 2 mm long, pubescent; *flower* fragrance not detected, diameter 3.2–4.5 mm and *c.* 3.5 mm long; *calyx* hemispherical at base; sepals ovate, 2.75–4.2 mm long, abaxially and adaxially tomentose; yellowish-green; *petals* spathulate, folded longitudinally, bilobed and cucullate, apex emarginate to 0.5 mm, 2.75–4.5 mm long, *c.* 1 mm wide, abaxially with sparse appressed white hairs in lower half, adaxially with sparse hairs along central fold line and margin or almost glabrous, white; *stamens* 5, glabrous, filaments narrowly triangular and flattened, 1.5–2 mm long, anthers introrse; *staminodes* bilobed-globose, *c.* 0.3 mm long, glabrous; *ovary* globular, 2- or 3-locular, 1.2 x 1.2 mm, tomentose; stigma sessile, *c.* 0.5 mm long, diameter *c.* 0.5 mm, 3-lobed, lobes triangular, glabrous. *Staminate inflorescence* axillary or terminal, 5–24-flowered, glomeruliferous; bracts at base of peduncles and calyces *c.* 0.5 mm long; peduncles *c.* 1.75 mm long, tomentose; pedicels absent or up to 1 mm long; *Flower* fragrance not detected, diameter *c.* 2.5 mm, *c.* 2.5 mm long; *sepals* ovate, 3.2–3.5 mm long, tomentose, yellowish-green; *petals* 5, free, spathulate, folded, emarginate and cucullate, 3.5–4 mm long, glabrous or a few sparse minute hairs abaxially and adaxially, white; *stamens* 2.8–3.2 mm long; filaments strap-shaped, *c.* 2 mm long, glabrous; anthers introrse; *staminodes* oblate, *c.* 0.2 mm long, glabrous; *pistillode* ovoid, diameter 0.5–1.2 mm, tomentose. *Fruit* peduncle *c.* 1.3 mm long; thinly sericeous; pedicel absent or minute; drupe 2- or 3-lobed, indehiscent, oblate, diameter 19.5–26.5 mm and 19–22 mm long, immature fruit clothed in arachnoid stellate hairs, mature fruit becoming hairless with cystoliths persisting where the stellate hairs were previously attached, bright reddish-orange, sutures absent; *seeds* 1–3, sculptured with a distinct rib along the centre abaxially, *c.* 18.5 x 13 x 9 mm. Figs. 1 & 2.

Specimens examined. **Queensland**. Cook District: Chester River scrub, eastern fall of McIlwraith Range, Silver Plains Station, June 1992, *Forster PIF10443 & Tucker* (BRI); Cassowary Creek, Iron Range National Park, April 1993, *Fell DGF144A & Butcher* (BRI); Wattle Hills, Cape York Peninsula, Oct 2021, *Cooper 2798 & Hawkes* (CNS); Wattle Hills, Cape York Peninsula, November 2021, *Cooper 2821, Addicott & Zich* (CNS); Wattle Hills, Cape York Peninsula, November 2021, *Cooper 2820, Addicott & Zich* (CNS); Wattle Hills, Cape York Peninsula, 15 November 2021, *Cooper 2819, Addicott & Zich* (CNS); Wattle Hills, Cape York Peninsula, 14 October 2022, *Cooper 2887, Jensen & Zich* (CNS)); Wattle Hills, Cape York Peninsula, August 2023, *Cooper 3050A & Zich* (CNS).

Diagnostic features. Dichapetalum auranticarpum is similar to *D. sessiliflorum* Leenh. (from New Guinea to Malaysia) but differs from the latter species by the indumentum white or cream (v. rusty); stipules 2.25 mm long (v. 3 mm long); leaf margin entire (v. minutely crenulate); leaf secondary veins 6 or 7 pairs (v. 7–10 pairs); inflorescence pedunculate (v. sessile); hermaphrodite flower diameter 3.2–3.7 mm (v. 2 mm); petals with sparse

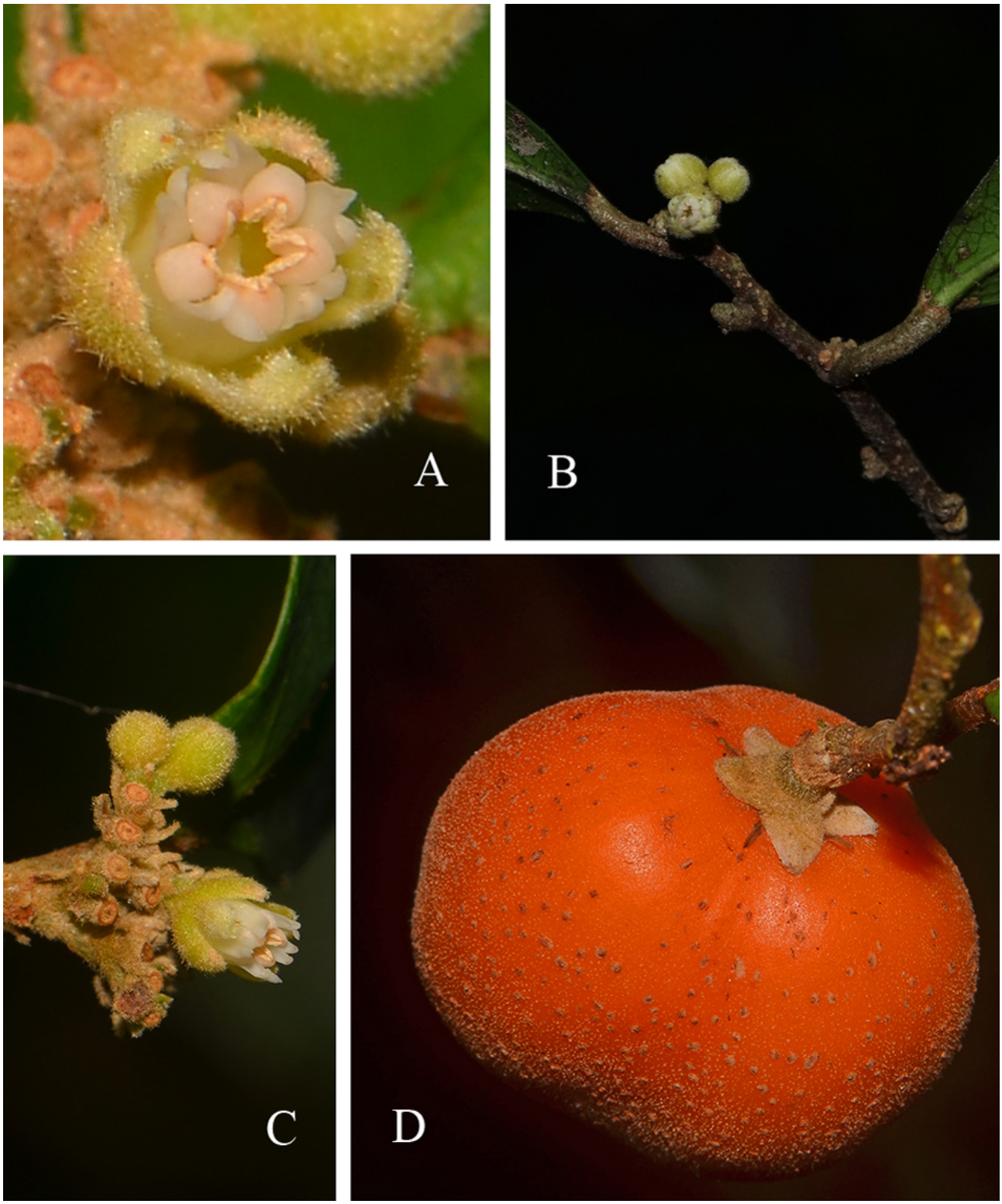

Figure 2. ***Dichapetalum auranticarpum***: **A**. Hermaphrodite flower showing apical view of sepals, emarginate petals and anthers; **B**. Hermaphrodite inflorescence and petioles showing abrupt petiole taper onto abaxial midrib; **C**. Hermaphrodite inflorescence showing bracts, lateral view of flower buds, scars from dehisced pedicels, sepals and emarginate petals (*Cooper 2888, Jensen & Zich* [CNS]). **D**. Fruit showing persistent sepals and petals at base, indumentum and cystoliths (*Cooper 2888, Jensen & Zich* [CNS]). **Photos: A, C** & **D**. F. Zich; **B**. R. Jensen

minute hairs (v. long-pilose); staminodes present (v. absent); fruit epicarp clothed in whitish arachnoid stellate hairs becoming glabrescent (v. densely ferruginous-tomentose); habitat of lowland rainforest below 50 m (v. montane rainforest 1200–1500 m in New Guinea and Malaysia).

Phenology. Flowers have been recorded in April, June, August, October and November and ripe fruit in October and November.

Distribution & habitat. Dichapetalum auranticarpum occurs in mesophyll evergreen rainforest from the Chester River to Wattle Hills on the Pascoe River, including Kutini-Payamu (Iron Range) National Park. The known distribution is in areas of up to 150 m altitude which are inundated by flood waters during the wet season. *D. auranticarpum* co-occurs with *Aglaia euryanthera* Harms, *Aleurites moluccanus* (L.) Wild., *Archontophoenix tuckeri* Dowe, *Argyrodendron polyandrum* L.S.Sm., *Buchanania arborescens* (Blume) Blume, *Calophyllum australianum* F.Muell. ex Vesque, *Castanospermum australe* A.Cunn. & Fraser ex Hook., *Corymbia tesselaris* Benth., *Cryptocarya hypospodia* F.Muell., *Decaisnina hollrungii* (K.Schum.) Barlow, *Dissiliaria laxinervis* Airy Shaw, *Donella lanceolata* (Blume) Aubrév., *Endiandra longipedicellata* C.T.White & W.D.Francis, *Garcinia dulcis* Kurz, *Ficus albipila* (Miq.) King, *Myristica insipida* R.Br., *Planchonella chartacea* (F.Muell. ex Benth.) H.J.Lam, *Pongamia pinnata* var. *minor* (Benth.) Domin, *Premna hylandiana* Munir, *Ptychosperma macarthurii* (H.Wendl. ex Veitch) H.Wendl. ex Hook.f., *Rinorea bengalensis* (Wall.) Kuntze, *Syzygium bamagense* B.Hyland, *Syzygium mackinonnianum* (B.Hyland) Craven & Biffin and *Tetrameles nudiflora* R.Br.

Conservation status. Based on known localities, the Extent of Occurrence (EOO) of *Dichapetalum auranticarpium* is estimated to be 546 km^2 with an Area of Occupancy (AOO) of 12 km^2 (calculated with GeoCat; Bachman et al. 2011). Sufficient information is not available to make good estimates of population size. The species is known from three locations and is represented in conservation reserves (Kutini-Payamu (Iron Range) National Park).

Based on its EOO and AOO and a severely fragmented distribution or small number (estimated between 5 and 10) of localities (with the threat of severe wildfire as the most serious plausible threat) it meets the thresholds for Criteria B1a + B2a (IUCN 2012).

Recent 'megafires' on the Australian continent have demonstrated the risk to mesic ecosystems posed by the combination of changing climate and fire regimes (Jones & Ricketts 2023). Increasing 'drying' has seen habitats previously considered not likely to be threatened by fire become susceptible to larger, more intense fires in certain seasons. Given this global phenomenon, it is plausible that an inferred or projected decline in habitat area, extent or quality could be reasonably expected into the future (Sub-criterion b(iii)). Given the most likely preferred habitat for this species is rainforest, it would also not be unreasonable to expect a corresponding projected decline in the number of mature individuals at known locations (Sub-criterion b(v)). Consequently, *D. auranticarpum* preliminarily satisfies the requirements for listing as VU B1a,b(iii) + B2(a,b(iii) under the IUCN criteria (IUCN 2012) at the National/ regional scales.

Etymology. The epithet *auranticarpum* is derived from the Latin *aurantiacus* (orange) and *carpus* (a fruit), in reference to the bright orange fruit.

Notes. Dichapetalum auranticarpum is notable for its glomeruliferous staminate inflorescences and unusual stellate indumentum on the fruit epicarp.

Dichapetalum australianum C.T.White

Contributions to the Queensland Flora, No. 7. *Proceedings of the Royal Society of Queensland* 53: 211-212 (1942).

Type citation: "Cook District. – Slopes of Mt. Fraser, alt. 2,000 ft., in rain-forest gully, *L.J. Brass*, *No. 2510* (fruits), 16th April, 1932..." **Type**: Australia. Cook District. Slopes of Mt Fraser, alt. 2000 ft, rain forest gully, 16 Apr 1942, *L.J.Brass 2510* (hlo: BRI AQ0419158).

[Dichapetalum papuanum auct. non (Becc.) Boerl.: Hewson (1984: 218); Hyland *et al.* (1994: 303; 1999; 2003); Cooper & Cooper (2004)]

Illustrations: (all as *D. papuanum*) Hewson (1984: 216); Cooper & Cooper (1994: 91); Cooper & Cooper (2004: 150); Zich *et al.* (2020).

Dioecious, slender and sapling-like to *c.* 4 m then becoming a *vine* to the canopy; stem diameter to 30 mm; bark reddish-brown with numerous circular or horizontal lenticels; some branches back-arching; twigs lenticellate, sparsely sericeous on new growth becoming glabrous; indumentum white; stipules caducous, triangular, sericeous, *c*. 3 mm long; petioles thickened, arched and sub-peltate (not always distinct on dried specimens), 3–7 mm long not including taper; taper along midrib extending for 2–3 mm and acuminate at junction with primary vein, wrinkled, sparsely sericeous becoming glabrous, dark brown. *Leaves* elliptic, obovate or rarely lanceolate, 40–170 mm long and 15–66 mm wide, coriaceous; new growth sericeous; abaxial surface glossy, with sparse appressed hairs at base and along midrib becoming sparser, glands 0–6 (rarely 8) near base and sometimes a few scattered in mid to distal sections; adaxially sparsely sericeous on midrib and a few solitary white hairs along margin especially at indentations, becoming glabrous, glands scattered; coriaceous; discolorous; base often slightly asymmetrical, attenuate or rarely cuneate; apex shortly acuminate and the ultimate tip narrowly rounded, caudate or acute; margin shallowly repand; venation camptodromous proximally and brochidodromous distally; primary vein distinctly raised on both surfaces or flush and raised within a groove; secondary veins 4–8 pairs, proximal veins at *c*. 40° to the midrib and distal veins at 10–30° to the midrib, slightly raised on both surfaces; tertiary venation reticulate, densely pitted within each reticulation on abaxial surface. *Gynoecious inflorescence* an axillary

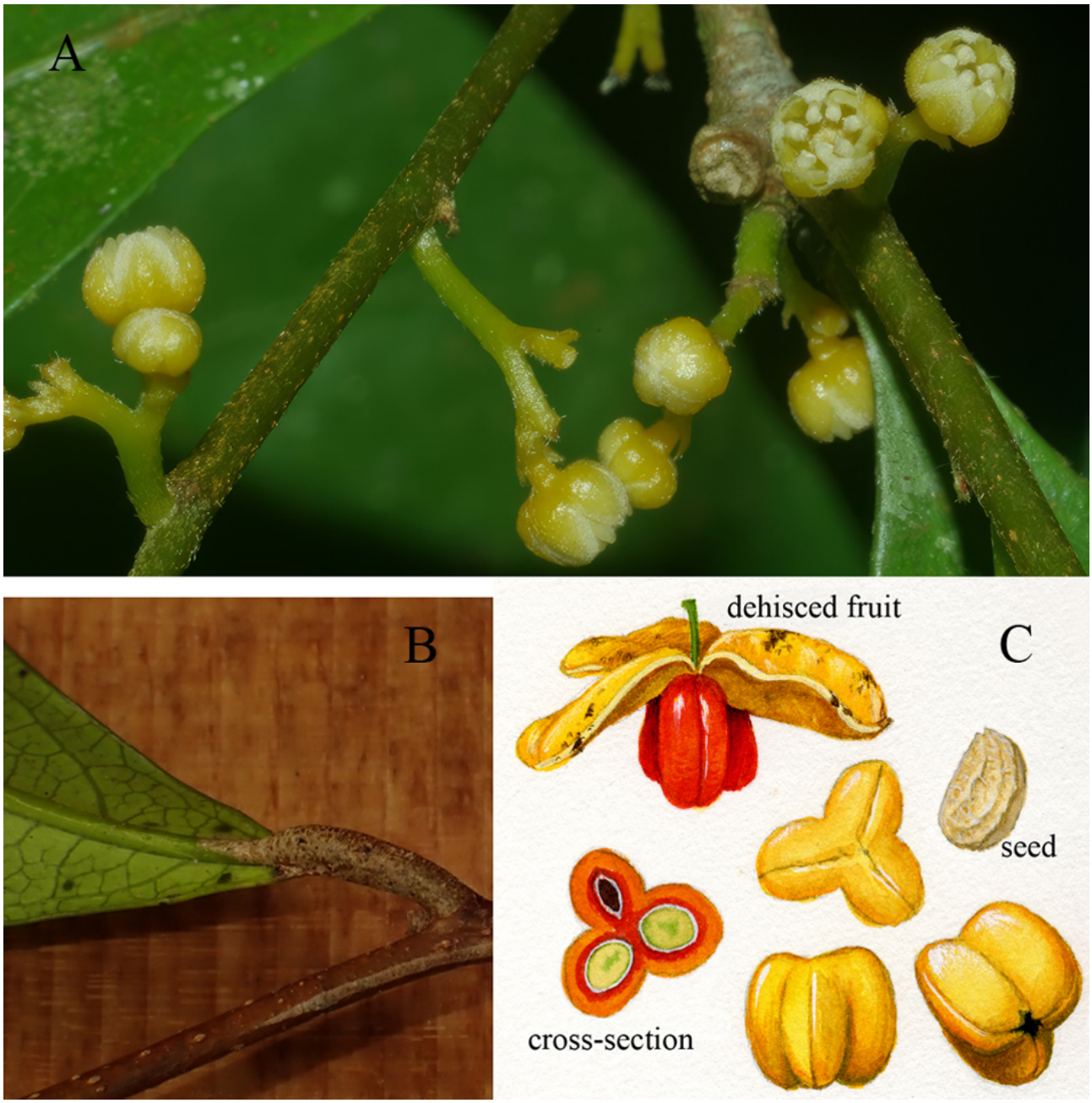

Figure 3. ***Dichapetalum australianum***: **A**. 3- and 4-flowered female inflorescences (not vouchered) **B**. Petiole showing short taper onto abaxial primary vein as well as glands on leaf blade (*Cooper 2934* [CNS]; **C**. Ripe fruit dehisced and indehisced, as well as cross-section, arillate seeds and a naked seed (*Cooper 123* [CNS]). **Photos: A**. G. Sankowsky; **B**. W.E. Cooper; **C**. Artwork W.T.Cooper.

raceme or shortly peduncled fascicle, 1–3 (4)-flowered; bracts at base of peduncle ovate, *c*. 0.3 mm long, sparsely sericeous; peduncles 3.5–6 mm long, sparsely sericeous; pedicels articulate, 0.6–0.8 mm long, thinly pilose; bracts 1 or 2 along pedicel, triangular, *c*. 1 mm long, sericeous; *flower* fragrance not detected, diameter *c*. 3.5 mm, *c*. 3 mm long; *calyx* tubular at base, *c*. 3.2 mm long; *sepals* 5, ovate, *c*. 1.8 mm long; abaxially sparsely sericeous, outer pair more densely pubescent especially along margins, adaxially pubescent, orange; *petals* 5, ovate, slightly longer than *sepals*, *c*. 2 mm long, glabrous or a few sparse hairs abaxially, adaxially glabrous or with 1 or a few hairs, white or lemon, apex emarginate to *c*. 0.25 mm; *stamens* 5; filaments narrowly triangular, *c*. 1 mm long; anthers introrse; *staminodes* 5, bilobed-globose, *c*. 0.25 long and 0.5 wide, glabrous, orange; *ovary* ovoid, 2- or 3-locular, *c*. 1 x 1 mm, pubescent; stigma sessile, 3-lobed, diameter *c*. 0.3 mm. *Staminate inflorescence* axillary or ramiflorous, 6–10-flowered, repeatedly dichotomously branched cyme, often in pairs; bracts clustered at base, ovate, *c*. 1 mm long, sparsely sericeous; peduncle 3.5–7 mm long, sparsely sericeous; pedicel 0.8–1.5 mm long, sparsely sericeous, bracts absent; *flower* fragrance not detected, diameter *c*. 2.5 mm and *c*. 2.5 mm long; *calyx* tubular at base; sepals 5, ovate, 1–1.25 mm long, abaxially sparsely sericeous

through mid-section and tomentose near margins, adaxially tomentose, orange at base and lemon towards apex; *petals* 5, obovate or elliptical, cucullate, minutely emarginate, *c*. 1 mm long and 0.5 mm wide, glabrous or with a few crisped hairs on lower abaxial surface, lemon or whitish; *stamens* 5, filaments slender-triangular with a few pale hairs below the centre, *c.* 1.5 mm long, anthers introrse; staminodes 5, laterally compressed and oblate, glabrous; *pistillode* pubescent. *Fruit* pedicel 1–2 mm long, sparsely sericeous; capsule 1–3-lobed, oblate, 7–20 x 10–24 mm, surface slightly dimpled with a few sparse appressed white hairs visible with a lens mostly towards base, orange; *seeds* 1–3, reniform, straw-coloured, *c*. 12 mm long and 7 mm wide, with red arils completely enclosing the seeds. Fig. 1 & 3

Specimens examined: **Queensland**. Cook District: Vine Creek area, off Tully Falls Road, March 2006, *Ford 4796* (CNS); Djallon Creek Scenic Drive, Palmerston National Park, Nov 2008, *Forster PIF17935 & Spokes* (CNS); Pugh Creek, Mirriwinni, Jan 1988, *Jago 663* (CNS); Weinert Creek, Babinda, Nov 2013, *RL Jago 556* (CNS); Westcott Road, Topaz, Jan 1992, *Cooper & Cooper 123* (CNS); Westcott Road, Topaz, Oct 2022, *Cooper 2934* (CNS); Timber Reserve 1230, Boonjee Logging Area, Nov 1976, *Hyland 9164* (CNS); Wooroonooran National Park, Bartle Frere track before Bobbin Falls, Oct 1997, *Forster PIF21755, Jensen & Booth* (BRI); Lake Barrine, Nov 2013, *Gray 9619* (CNS); SFR 191, Parish of Barron, Oct 1991, *Hyland 14253* (CNS); SF 191 Wongabel, Feb 1996, *Forster PIF 18628* (CNS); Scenic Reserve 440, Lake Euramoo, Dec 1971, *Hyland 5738* (CNS); Tolga Scrub, Nov 1999, *Gray 7701* (CNS); Haren Creek, 3.5 km SW of Kuranda, March 1998, *Wannan BSW687 & RL Jago* (BRI & NSW); 4.5 km from Whyanbeel Road on track to Stewart Creek 13.7 km NW of Mossman, Nov 1988, *Jessup, Guymer & McDonald GJM425* (BRI); Coral Sea Drive southwest of Mossman, Dec 2002, *Jago 6353* (BRI); Baileys Creek, N of Daintree River, Jan 1962, *Webb & Tracey 6508* (BRI); Near Wetherby Homestead in NW foothills of Mt Danbullan Range, 6 km NW of Mt Molloy, June 1984, *Moriarty 2921* (CNS); Hunter Creek, Brooklyn, Dec 2011, *Sankowsky 4178A & Sankowsky* (BRI); Isabella McIvor Road, 3 km, June 1992, *Le Cussan 111* (CNS).

Diagnostic features. Dichapetalum australianum is distinct by being dioecious; petiole taper along midrib extending for 2–3 mm and acuminate at junction with primary vein; hermaphrodite inflorescence 1–3(4)-flowered, sparsely sericeous; staminodes gabrous; fruit an oblate orange capsule, usually with 3 seeds enclosed by copious red aril. *D. australianum* differs from *D. papuanum* by flower length (2.5–3 mm v. 1–2 mm); disk lobes (glabrous v. tomentose); fruit (oblate and dehiscent v. obovate and indehiscent).

Phenology. Flowers have been recorded from September to February and fruit from December to June.

Distribution & habitat. *Dichapetalum australianum* is restricted to complex notophyll and mesophyll vine forest as well as riparian forest almost entirely within the Wet Tropics Bioregion from the Tully River area north, and extending to Isabella Falls near Cooktown in the Cape York Bioregion, at altitudes between sea level and 1130 m. It co-occurs with *Aglaia australiensis* Pannell, *Aglaia meridionalis* Pannell, *Aglaia monticola* W.E.Cooper & P.I.Forst. *Argyrodendron peralatum* (F.M.Bailey) Edlin ex Boas, *Beilschmiedia recurva* B.Hyland, *Beilschmiedia tooram* (F.M.Bailey) B.Hyland, *Castanospora alphandii* (F.Muell.) F.Muell., *Cnesmocarpon dasyantha* (Radlk.) Adema, *Cryptocarya mackinnoniana* F.Muell., *Cryptocarya onoprienkoana* B.Hyland, *Doryphora aromatica* (F.M.Bailey) L.S.Sm., *Elaeocarpus grandis* F.Muell., *Endiandra monothyra* B.Hyland, *Firmiana papuana* Mildbr., *Flindersia brayleyana* F.Muell., *Franciscodendron laurifolium* (F.Muell.) B.Hyland & Steenis, *Myristica globosa* subsp. *muelleri* (Warb.) W.J.de Wilde, *Prunus turneriana* (F.M.Bailey) Kalkman, *Syzygium endophloium* B.Hyland, *Syzygium gustavioides* (F.M.Bailey) B.Hyland, *Syzygium papyraceum* B.Hyland and *Toechima monticola* S.T.Reynolds.

Conservation status. Based on known localities, the Extent of Occurrence (EOO) of *Dichapetalum australianum* is estimated to be 8,800 km^2 and Area of Occupancy (AOO) is 184 km^2 (calculated with GeoCat; Bachman et al. 2011). The species is represented in conservation reserves and there are no immediate threats evident. As such, *D. australianum* would be categorised as being of Least Concern.

Etymology. The species epithet is from the Latin *australis* meaning southern.

Notes. Dichapetalum australianum was first described in 1942 from a specimen collected at Mt Fraser, near Julatten, by L.J. Brass. Leenhouts (1956 and 1957) revised the genus *Dichapetalum* for Asia, Australia and Melanesia and included *D*. *australianum* within the concept of *D. papuanum*. He suggested that *D. papuanum* is best characterised by its obovate nearly glabrous fruit and that fruiting material is desirable to settle status. The fruit were described and illustrated as obovate and indehiscent which differs markedly from what is observed for *D. australianum*. The Type specimen for *D. papuanum* (*Beccari PP307* L) was collected from Ramoi (near Sorong in West Papua, Indonesia), although it has been incorrectly annotated as being from Papua New Guinea. *D. papuanum* subsp. *borneense* Leenh. occurs on Sabah (Malaysian Borneo) (*Haviland 2192* K).

Dichapetalum cremeum W.E.Cooper, *sp. nov.*

Type: Australia: Queensland. Cook District: Portland Roads Road, 14 April 2022, *W.Cooper 2849 & J.Pritchard* (holo: CNS 154152 [2 sheets + spirit]), iso: 7 sheets to be distributed to BRI, CANB, DNA, L, LAE, MO, S).

Dichapetalum sp. 1 (Claudie River; B.Hyland 7006); Briggs & Leigh (1996)

Dichapetalum sp. Claudie River (B.Hyland 7006); Thomas & McDonald (1989)

[Dichapetalum timoriense auct. non (DC.) Boerl.: Hyland *et al.* (1994: 303); Jessup in Henderson (2002); Cooper & Cooper (2004), *pro parte* (as to Qld. occurrence); Zich *et al.* (2020), *pro parte* (as to Qld. occurrence)]

Illustrations: (all as *D. timoriense*) Cooper & Cooper (2004:150); Zich *et al.* (2020)

Monoecious shrubby *scrambler* becoming a *vine* to canopy; stem diameter to *c*. 57 mm; bark with vertical shallow fissures, lenticellate, rusty-brown on younger stems becoming grey on older stems; some branches back-arching; indumentum appressed or erect, cream-coloured; stipules thread-like, *c*. 3.5 mm long, sericeous; petioles sub-peltate, 4–10 mm long not including taper; taper along abaxial midrib extending for 2.5–8 mm, long-acuminate at junction with primary vein, usually visible on adaxial and abaxial surfaces of fresh and dried specimens, thinly sericeous, dark brown. *Leaves* obovate, elliptical or oblong, 70–150 mm long and 25–68 mm wide, coriaceous; adaxial surface with appressed hairs becoming glabrous; abaxial surface with appressed hairs along primary and secondary veins, persisting on primary vein; glands on abaxial surface scattered with a few sometimes near base, glands on adaxial surface absent or 1–7 near base with up to 4 scattered elsewhere on blade, discolorous; base mostly asymmetrical, subcordate or narrowly rounded, rarely cuneate; apex acute, short-acuminate often with an apiculum or rarely narrowly rounded, entire; venation brochidodromous throughout or camptodromous proximally and brochidodromous distally; primary vein flush adaxially and raised abaxially, each with a tuft of hairs at apex on younger growth; secondary veins 6–7 pairs, raised on both sides, angle to primary vein 40–50°; tertiary venation reticulate, densely pitted within each reticulation on abaxial surface. *Hermaphrodite inflorescence* axillary (often in pairs), up to 30-flowered dichotomously branched panicle or cyme to 21 mm long; peduncle 3–13 mm long, tomentose; bracts at rachis base and mostly at junctions along rachis ovate, *c.* 0.35 mm long, tomentose; pedicels articulate, 1.5–2.5 mm long, sericeous. *Flowers* fragrant or fragrance not detected, diameter *c*. 2.75 mm and *c*. 2 mm long; *calyx* hemispherical at base; *sepals* ovate, 1.5– 2 mm long, abaxially tomentose, adaxially thinly tomentose, yellowish-green; petals broadly elliptical, deeply cucullate, 1.5–2 mm long, glabrous, white, apex emarginate to 0.2 mm; *stamens* 5, 1.5–2 mm long, filaments strap-shaped, glabrous, anthers introrse; *staminodes* flat, rhomboid, apex obovate or acute often with 2 uneven acute apices, 0.5–1 mm long, tomentose; *ovary* ovoid, *c*. 0.5 x 0.5 mm, densely tomentose; style *c*. 0.5 mm long, glabrous; stigma 2-lobed, diameter *c*. 0.25 mm. *Fruit* peduncle 6–7 mm long; pedicel 2–4.5 mm long; drupe usually 3-lobed and 3-sutured, indehiscent, oblate, diameter 22–45 mm, 15–30 mm long, papillate, clothed in minute erect velvety hairs not visible to naked eye, cream-coloured or yellow, mesocarp 5–8 mm thick; *seeds* usually 3, wedge-shaped, *c*. 15 mm long, sculptured, brown. Figs. 1 & 4

Specimens examined: **Australia**. **Queensland.** Cook District: Porn. [Portion] 195, Parish of Clerk, *Hyland 12907* (CNS); Near airstrip, Rocky River, Silver Plains, Aug 1997, *Cooper & Jensen 53* (CNS); Island Scrub 1, Iron Range Research Station, April 2017, *Fell IRRS147* (CNS); Gordon Creek, June 2003, *Hyland 14853* (CNS); Claudie River, Oct 2022, *Cooper 2883, Jensen & Zich* (CNS); Claudie River, Nov 1977, *Hyland 9539* (CNS); Claudie River, Oct 1980, *Hyland 21090V* (CNS); Claudie River, Oct 1974, *Hyland 7815*(CNS); Claudie River, Oct 1980, *Hyland 21095V* (CNS); Claudie River, April 1992, Fell DF2505 (BRI); 8 km NW of Lockhart River, Oct 1995, *Stanton JPS63* (BRI); Gordon Creek, Sept 2015, *Cooper 2298* (CNS); Portland Roads Road, April 2022, *Cooper 2849 & Pritchard* (CNS); Garraway Creek rockpiles, April 1988, *Forster PIF 4244 & Liddle* (BRI); Nelson Creek mouth to Pascoe River, Iron Range National Park, Oct 2022, *Cooper 2891, Jensen & Zich* (CNS); Hann Creek, July 2002, *Cooper & Cooper 1771* (CNS); Ex-Bamaga, cultivated at Tolga, June 2006, *Sankowsky 2719* (BRI, CNS); Mt Cornwallis, Dauan Island, Torres Strait, Feb 1989, *Gray 5023* (CNS).

Papua New Guinea. Central District: Rubulogo Creek *c*. 18 miles N of Port Moresby, April 1967, *Pullen 6629* (L); Nunumai, *c*. 12 km N of Amazon Bay, June 1969, *Pullen 7577* (L). Madang District: Nov 1969, *Vandenberg & Katik NGF 42367* (L). Morobe District: Burep River NE of Lae, *Hartley 10177* (L); Aluki Village, Sep 1982, *Katik LAE 74969 & Galore*(NSW);

Indonesia. Aru Archipelago: Pulau Baum, April 1993, *Nooteboom 5685* (L); Aru Islands, April 1993, Balgooy & Mamesah 6425 (L).

Diagnostic features. *Dichapetalum cremeum* is similar to *D. timoriense* but differs from the latter species by the indumentum cream-coloured (v. white); stipules *c*. 3.5 mm long (v. 4–6 mm long); petiole taper 2.5–8 mm long (v. 1.8–2.5 mm long); leaf base usually asymmetrical, narrowly rounded and rarely cuneate (v. usually symmetrical, cuneate or slightly rounded); inflorescence to 18 mm long (v. to 35 mm long); bracts ovate and *c.* 0.35 mm long (v. linear, 2–3.5 mm long); flower diameter *c*. 2.75 and length *c*. 2 mm (v. diameter *c*. 5 mm and 2.5–4 mm long); sepals ovate and 1.5–2 mm long (v. elliptical and *c*. 2.5 mm long); petals incised to *c*. 0.2 mm (v. incised to *c*. 0.6 mm); staminodes flat, rhomboid, apex obovate or acute often with 2 uneven acute apices, 0.5–1 mm long (v. spathulate or strap-shaped, apex 2-lobed, lobes rounded or mostly acute; fruit pedicel 2–4.5 mm long (v. 0.5–2 mm long); mature fruit broadly oblate, 3-sutured, yellow, papillate and with sparse minute indumentum only visible with a lens (v. globular,

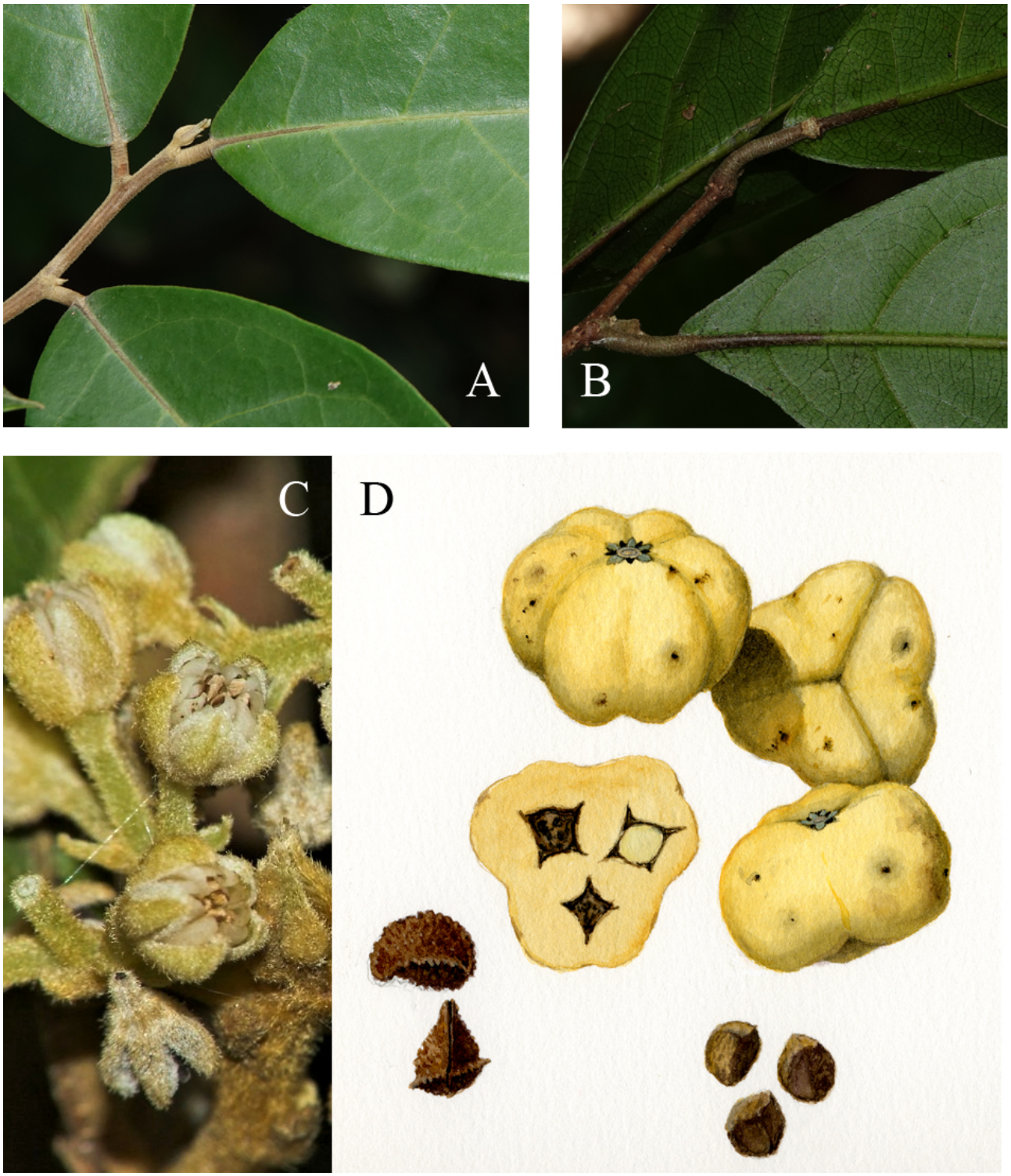

Figure 4. ***Dichapetalum cremeum***: **A**. Leaf adaxial surface showing petiole taper extending along primary vein (*Cooper 2880, Jensen & Zich* [CNS]); **B**. Leaf abaxial surface showing petiole taper extending along primary vein (*Cooper 2883, Jensen & Zich* [CNS]); **C**. Hermaphrodite flowers (*Sankowsky 2719 & Sankowsky* [BRI]); **D**. Fruit and seeds (*Cooper & Jensen 53* [CNS]). **Photos: A** & **B**. R. Jensen; **C**. G. Sankowsky; **D**. Artwork W.T. Cooper.

ovoid, pear-shaped or cordate, 4-sutured, densely rusty-hairy, hairs visible to naked eye, yellowish-green).

Phenology. Flowers have been recorded in February, April and June; fruit has been recorded in September and October.

Distribution & habitat. Dichapetalum cremeum occurs in evergreen and semi-deciduous notophyll and mesophyll vine forest on Cape York Peninsula north from the Cedar Bay area near Cooktown to Dauan Island in the Torres Strait, at altitudes below 80 m. It also occurs in Papua New Guinea and the Aru Islands of Indonesia. In Australia it co-occurs with: *Aglaia argentea* Blume, *Aleu-*

rites moluccanus (L.) Willd., *Alstonia scholaris* (L.) R.Br., *Alstonia spectabilis* R.Br., *Argyrodendron polyandrum* L.S.Sm., *Atalaya australiana* Leenh., *Blepharocarya involucrigera* F.Muell., *Brachychiton velutinosus* Kosterm., *Canarium australianum* F.Muell., *Celtis philippensis* Blanco var. *philippensis, Cordia dichotoma* G.Forst., *Diospyros fasciculosa* (F.Muell.) F.Muell., *Drypetes deplanchei* (Brongn. & Gris) Merr., *Lagerstroemia archeriana* F.M.Bailey subsp. *archeriana, Miliusa traceyi* Jessup, *Mimusops elengi* L., Semecarpus *australiensis* Engl., *Sloanea langii* F.Muell, *Strychnos psilosperma* F.Muell., *Tetrameles nudiflora* R.Br. and *Vitex helogiton* K.Schum.

Conservation status. Based on known localities, the Extent of Occurrence (EOO) of *Dichapetalum cremeum* is estimated to be 53,000 km^2 and Area of Occupancy (AOO) is 60 km^2 (calculated with GeoCat; Bachman et al. 2011). The species is represented in conservation reserves and there are no immediate threats evident. As such, *D. cremeum* would be categorised as being of Least Concern.

Etymology. The epithet *cremeum* is from the Latin *cremeus* (cream-coloured), in reference to the cream colour of the ripe fruit.

Notes. At Kutini-Payamu (Iron Range) National Park, vines shorter than 3m with copious quantities of female flowers did not set fruit. Fertilisation may only occur when the vine has reached the subcanopy.

Some specimens of *D*. *cremeum* from New Guinea and South East Asia have been determined as *D. timoriense*. Further studies might prove that *D. cremeum* occurs beyond the area listed above.

Sterile specimens of *D. cremeum* are indistinguishable from sterile *D. schlechteri* Krause, however the former differs by sepals adaxially thinly tomentose (v. glabrous); petals broadly ovate (v. spathulate); petal apices emarginate to 0.2 mm (v. divided to centre of petal); stamens same length as petals (v. stamens much longer); ovary ovoid and 0.5 x 0.5 (v. globose, diameter 1.2 mm); stigma 2-lobed (v. 3-lobed).

Dichapetalum timoriense (DC.) Boerl.

Handleiding tot de Kennis der Flora van Nederlandsch Indie 1(1): 199 (1890).

Chailletia timoriensis DC., in Candolle, A.P. de (ed.), *Prodromus Systematis Naturalis Regni Vegetabilis* 2: 57 (1825). **Type citation**: "in ins. Timor. [insula Timoria]". **Type**: Indonesia or Timor-Leste, *s. dat., leg. ign. s.n.* Probable syntypes: Timor, *s. dat., leg. ign. s.n.* (P-P04764482, P-P04764483, P-P04764485, P-P04764491); Timor, *s. dat., Riedlé s.n.* (P-P04764486); Timor, Voyage de Baudin, *s. dat., leg. ign. s.n.* (P-P04764487); Is Timor, *s. dat., leg. ign. s.n.* (G-G00476613); Timor, *s. dat., leg. ign. s.n.* (K-K000657824, K000657825); Timor, *s. dat., leg. ign. s.n.* (L-L0931088); Timor, *s. dat., leg. ign. s.n.* (NY-NY00000904).

Dichapetalum timorense W.E.Cooper, in W.E. Cooper & W.T. Cooper, *Fruits of the Australian Tropical Rainforest*: 150 (2004), *orth. var.*

For a more complete synonymy refer to Leenhouts (1957).

Monoecious *shrub* or *scrambler* becoming a *vine*, climbing with the aid of some backward-arching branches; twigs grey or purplish, tomentose becoming glabrous, lenticellate; indumentum white; stipules linear or very narrowly triangular, 4–6 mm long, sericeous; petioles 3–9 mm long (not including taper); taper along abaxial midrib extending for 1.8–2.5 mm long, truncate at junction with primary vein, tomentose, grey-brown. *Leaves* mostly oblong or oblanceolate, rarely elliptical or obovate, 70–180 mm long and 15–55 mm wide; coriaceous; adaxial surface with appressed hairs on primary and secondary veins, becoming glabrous; abaxial surface with appressed hairs on midrib and margin, becoming sparse on secondary veins; both surfaces usually with up to 15 glands near base and up to 20 may be scattered across the blade, discolourous; base sometimes asymmetrical, cuneate or slightly rounded; apex acute, often with a short soft apiculum *c*. 0.25 mm long or rarely narrowly rounded; margin repand; venation camptodromous proximally and brochidodromous distally; primary vein slightly raised adaxially and distinctly raised abaxially; secondary veins 7–9 pairs at 50º to midrib, slightly raised; tertiary venation reticulate, densely pitted within each reticulation on abaxial surface. *Hermaphrodite inflorescence* an axillary or terminal repeatedly dichotomously branched panicle or cyme, (often in pairs or rarely 3 arising from the same axil) up to 35 mm long; peduncle 8–11 mm long, tomentose; pedicels 2.5–5 mm long, tomentose; bracts at each junction along the rachis, linear, 2–3.5 mm long and *c*. 0.5 mm wide, tomentose. *Flower* fragrance not noted, diameter *c*. 5 mm and 2.5–2.75 mm long; *calyx* hemispherical at base; *sepals* elliptical, *c*. 2.5 mm long and 1.25 mm wide, abaxially tomentose throughout, adaxially tomentose in upper 1/2 to 2/3, green, white or cream; *petals* rhomboid, *c*. 2 mm long and 1.4–1.6 mm wide, glabrous, white or cream, apex emarginate to *c*. 0.6 mm; *stamens* 5, *c*. 1.5 mm long; filaments strap-shaped, glabrous; anthers introrse; *staminodes* spathulate or strap-shaped, apex 2-lobed with lobes rounded or mostly acute, glabrous, *c*. 0.75 mm long; *ovary* globose, 5-lobed, densely tomentose, 2-celled, *c*. 1.5 x 1.5 mm; style sparsely minutely hairy, *c*. 1.5 mm long; stigma 2-forked, rays *c*. 0.3 mm long. *Fruit* peduncle *c*. 2.5 mm long, tomentose; pedicel 0.5–2 mm long, clothed in erect velvety hairs interspersed with some longer hairs, drupe oblate or globular, 2-celled (unless one is aborted), 4-sutured, 15.5–17.5 x 22 x 14.5 mm, velvet-tomentose, yellowish-green, mesocarp *c*. 2 mm thick; *seeds* 1 or 2. Figs. 1 & 5

Specimens examined: **Northern Territory**: Bowerbird Gorge, Magela Creek, Aug 2018, *Brennan 1373* (DNA); South Magela Gorge, April 2014, *Brennan* 10298 (DNA);

Figure 5. *Dichapetalum timoriense*: **A**. Hermaphrodite inflorescence (*Russell-Smith 10736 & Lucas* [DNA]); **B**. Ripe fruit (*Brennan 10298* [DNA]); **C**. Petiole showing short taper onto abaxial primary vein as well as glands on leaf blade (*Russell-Smith 10736 & Lucas* [DNA]). **Photos: A** & **C** J. Russell-Smith. **B**. K. Brennan

Berry Springs, Russell-Smith residence, cultivated, Nov 2017, *Cowie 14342 & Yee Wen Low* (DNA); Magela Creek, upper catchment, April 1995, Brennan 5650 & Cowie (DNA); Upper Magela Creek valley, Arnhem Land, May 1991, *Rusell-Smith 8471 & Brock* (DNA); Lightening [Lightning] Dreaming, Arnhem Land, Feb 1984, *Dunlop 6583 & Wightman* (CNS, DNA); Magela Creek Falls, Kakadu National Park, March 2022, *Dixon 1031 & Leach* (DNA).

Diagnostic features. Dichapetalum timoriense is distinct by twigs grey or purplish; stipules linear or narrowly triangular; leaves mostly oblong or oblanceolate; glands numerous; inflorescences long-peduncled and often in pairs, repeatedly dichotomously branched; disk lobes glabrous; ovary tomentose; fruit a drupe without sutures, 2-celled, velvet-tomentose.

Phenology. Flowers have been recorded in December and February, and fruit in April and May.

Distribution & habitat. Within Australia, *Dichapetalum timoriense* is restricted to the Northern Territory in protected sandstone gorges with *Allosyncarpia* dominated vine forest in Kakadu National Park and Arnhem Land,

especially the East Alligator River catchment, Lightening Dreaming and Magela Creek.

Conservation Status. Based on known localities, the Extent of Occurrence (EOO) of *Dichapetalum timoriense* is estimated to be between 113 km^2 (specimens) and 238 km^2 (observations) with an Area of Occupancy (AOO) of between 28 and 58 km^2 (calculated with GeoCat; Bachman et al. 2011). Sufficient information is not available to make good estimates of population size although it is likely that the NT population is <10 000 individuals. Regionally, the species is represented in conservation reserves (Kakadu National Park and Warddeken Indigenous Protected Area) although no targeted monitoring or management actions are known to have been undertaken for this species over the last decade.

Based on its EOO and AOO and a severely fragmented distribution or small number (estimated between 5 and 10) of localities (with severe wildfire as the most serious plausible threat) it continues to meet the thresholds for Criteria B1a + B2a (IUCN 2012).

The risk posed by recent megafires discussed under *D. aurantiacum* also applies to *D. timoriense*. Given this global phenomenon, it is plausible that an inferred or projected decline in habitat area, extent or quality could be reasonably expected into the future (Sub-criterion b(iii)). Given the most likely preferred habitat for this species is on monsoon forest margins, the area's most sensitive to changed fire behaviours, it would also not be unreasonable to expect a corresponding projected decline in the number of mature individuals at known locations (Sub-criterion b(v)). Consequently, *D. timoriense* preliminarily satisfies the requirements for listing as VU B1a,b(iii) + B2(a,b(iii) under the IUCN criteria (IUCN 2012) at the National/regional scales.

Etymology. The species epithet refers to the type locality, the island of Timor.

Disclosures

We have no conflicts of interest.

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