A taxonomic revision of *Cynometra* L. (Fabaceae) in Australia with a new species from the Wet Tropics of Queensland and a range extension to the mainland

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Summary

Cooper, W.E. (2015). A taxonomic revision of *Cynometra* L. (Fabaceae) in Australia with a new species from the Wet Tropics of Queensland and a range extension to the mainland. ***Austrobaileya* 9(3): 393–403**. *Cynometra* comprises three species in Australia. In addition to *C. iripa* Kostel., the new species *C. roseiflora* W.E.Cooper is described, illustrated and distinguished from related species. *C. ramiflora* L. is newly recorded as occurring on the Australian mainland in north Queensland. All species are described with notes provided on typification, distribution and habitat. An identification key to the species of *Cynometra* in Australia is presented.

Key Words: Fabaceae, Leguminosae, *Cynometra*, *Cynometra iripa*, *Cynometra ramiflora*, *Cynometra roseiflora*, new species, taxonomy, Australia flora, Queensland flora, identification key

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Introduction

Cynometra L. has been classified in the leguminous tribe *Detarieae* (within the Caesalpiniaceae) that broadly corresponds to the 'Detarieae clade' recovered from multiple genetic sequence data (Bruneau *et al*. 2008). There appears to be a close relationship with *Maniltoa* based on the available genetic evidence; however, taxon sampling has been limited to date (Bruneau *et al*. 2008), hence the traditional circumscription of *Cynometra* based on floral morphology (Knapp-van Meeuwen 1970; Ding Hou 1996) is followed in the current paper.

Cynometra comprises approximately 88 species when so defined (The Plant List 2013) with a pantropical distribution from the African continent, Indian subcontinent (including Indian Ocean Islands, India, Sri Lanka), SE Asia, Malesia, Pacific Islands, Australia to Central America (Mexico), the West Indies and South America (Brazil, Argentina and Chile), occurring in forests from sea level to altitudes of 1300 m. The genus has its greatest diversity on the African continent (Cowan & Polhill 1981: 124) and is present only in small species numbers in Australia and the western Pacific.

Historically, within Australia and in Asia, specimens of *Cynometra iripa* Kostel. (in the sense applied in this paper) have been previously determined as *C. ramiflora* var. *bijuga* (Bentham 1864; Bailey 1900; Knaap-van Meeuwen 1970). Recent consensus has been that true *C. ramiflora* did not occur on mainland Australia (Knapp-van Meeuwen 1970; Tomlinson 1986; Ding Hou 1996); although it has been subsequently recorded from the Australian territory of Christmas Island in the Indian Ocean (Du Puy 1993; Claussen 2005). Despite these published statements, *Cynometra ramiflora* does indeed occur on mainland Australia and was first collected at the Jardine River on Cape York Peninsula in 1978 (*Stirling AIM462* BRI), although this specimen was possibly overlooked by the second and third groups of authors mentioned above. *Cynometra ramiflora* was again collected in 1991 (*Sankowsky 1223* [BRI], this specimen resulting in the phrase name *Cynometra* sp. (Paira Homestead Rd., G. Sankowsky +1223) at BRI) and again at Jardine River in October 2014 (*Cooper, Jensen, Kemp & Zdenek 2265*, *2267*, *2268* [CNS]).

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In 1992, Garry Sankowsky collected a sterile specimen of *Cynometra* at Mossman River. This specimen and further collections were later determined at QRS (now CNS) to be *C. ramiflora,* and as *C. iripa* by the Queensland Herbarium (BRI). Habitat as well as leaf, flower and fruit morphology indicated that these collections were distinct from *C. ramiflora* and *C. iripa* and required investigation.

This morphological and ecological study confirms that three species of *Cynometra* occur in Australia: *C. iripa*, *C.ramiflora* and the newly described *C. roseiflora* known only from the Mossman River. Knaap-Van Meeuwen (1970: 13) stated that all Indo-Pacific species of *Cynometra* grow under ever-wet conditions; however, the three species that occur in Australia grow in tropical climates with a distinct dry season. *C. iripa* and *C. ramiflora* do occur in back mangal (*sensu* Tomlinson 1986) areas, but *C. roseiflora* occurs in rainforest with a distinct dry season on porous granitic soil.

Materials and methods

The study is based upon the examination of selected herbarium material from CNS, BRI, CANB and NSW (herbarium acronyms as per Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff 2015), combined with field observations of all species. All specimens cited have been seen by the author.

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

Taxonomy

Cynometra L., *Sp. Pl.* 1: 382 (1753) & *Gen. Pl.*, 5th edn. 466 (1754). **Type species:** *C. cauliflora* L.

***Cynometra* in Australia:** Monoecious shrubs or trees to 15 m tall, can be multistemmed or buttressed. **Bark** finely fissured, lenticels linear or round; stipules caducous and leaving no visible scar; bracts enclosing new leaves and inflorescences similar to the stipules, several overlap to create a cone-like structure, broadly reniform, semi-circular, broadly ovate, somewhat cupular or oblong-obovate, 0.8–2.5 mm long, rust coloured, minute hairs on dorsal surface, margin ciliate, caducous. **Leaves** coriaceous, alternate, 1–2-jugate, discolorous, new leaves green, pink or bright red; petiole + rachis chanelled on the upperside; petiolules thickened, wrinkled, mostly enclosed by leaflet base; leaflets opposite, asymmetrical, basal pair (if present) are smaller than terminal pair; base oblique; margin entire; venation brochidodromous. **Inflorescences** axillary, terminal or ramiflorous, racemes on a swelling; bracteoles 1 or 2 towards pedicel base, filiform or strap-shaped, 1.5–3.5 mm long, caducous. **Flowers** bisexual; hypanthium inverted cone-shaped; sepals 4, imbricate, unequal in width, margin ciliate at apex, somewhat ragged or entire, acute; petals 5, free, white or pink, margin entire or barely fimbriate at apex, caducous; disk absent; stamens 10; anthers orbicular-cordate, cleft at base, bilocular, introrse, medi-dorsifixed, dehiscing longitudinally; ovary asymmetrically elliptical, stipe short and inserted excentrically; ovules 1 (rarely 2 or 3); style slender, almost directly in line with dorsal margin of ovary or excentric to varying degrees and becoming more excentric post anthesis; stigma capitate. **Fruit** an indehiscent woody nut, asymmetrical with a beak at apex of dorsal suture, rugose, scurfy; seeds 1 (rarely 2 or 3). Germination epigeal.

Key to *Cynometra* species in Australia

1 Petals bright pink, about half as long as sepals; ovary inner wall glabrous but for a tuft of hairs at base; new leaves bright red . . . . . **3. C. roseiflora**

1. Petals white or very pale pink, about same length as sepals; ovary inner wall glabrous to generally hairy (not tufted at base); new leaves green or pink **2**

2 Leaf rachis and petiolules minutely hairy; sepal apices ciliate; ovary inner walls pubescent; fruit laterally compressed and distinctly beaked partway along dorsal side; new leaves green . . . . . **1. C. iripa**

2. Leaf rachis and petiolules glabrous on mainland Australia (minutely hairy or glabrescent on Christmas Island); sepal apices entire or few-toothed; ovary inner walls glabrous or with a few sparse hairs; fruit globose and with a small beak near apex of dorsal side; new leaves pink . . . . . **2. C. ramiflora**

1. Cynometra iripa Kostel., *Allg. Med.-Pharm. Fl.* 4: 1341 (1835). **Type:** Rheede, *Hort. Malab.* 4: t. 31 (1683).

Cynometra ramiflora var. *bijuga auct. non* (Span. ex Miq.) Benth. as to type; Bentham (1864: 296).

Cynometra ramiflora auct. non. L.; Bailey (1900: 469).

***Illustrations*:** Parkinson A (1768–71) as *C. ramiflora*; Lear & Turner (1977: 31) as *C. ramiflora*; Wightman (1989: 63); Ross (1998: 168); Tomlinson (1986: 253); Cooper & Cooper (2004: 102); Duke (2006: 136, 137 [upper image], (2013).

In Australia: Shrub or tree to 6 m, sometimes multistemmed. **Bark** finely fissured, lenticels linear or round, pale; new flush foliage green; stipules not seen. **Leaves** 1–2-jugate; petioles 1–4 mm long, minutely pubescent; petiole + rachis 9–30 mm long, channelled on the upperside, puberulent, lenticels pale; petiolules up to 3 mm long, wrinkled, mostly enclosed by leaflet base, puberulent on underside, glabrescent on upperside; leaflets discolorous, asymmetrical, obliquely-elliptical, obliquely-oblong, obliquely-obovate or obliquely-ovate; basal pair 8.5–50 × 5–30 mm; terminal pair 23–85 × 11–50 mm; coriaceous, glabrous; base oblique, cuneate, attenuate or obtuse; apex obtuse and emarginate; margin entire; venation brochidodromous, primary vein raised (more so on under-side); secondary veins 6–10 pairs, slightly raised on both sides of dried specimens but ± flush on fresh leaves, angle of divergence from primary vein 50–70º, forming loops 2–5 mm from margin; tertiary venation reticulate. **Inflorescences** axillary, terminal or ramiflorous, solitary racemes or a fascicle of racemes on a swelling, racemes 3–9-flowered; bracteoles 1 or 2 towards pedicel base, filiform, 1.5–3 mm long, sparsely hairy, caducous. **Flowers** fragrant, erect, 6.5–8.5 × 5.5–8 mm wide; receptacle inverted cone-shaped, *c.* 1.5 × 1.5 mm; sepals 4, unequal in width, lanceolate or oblong-ovate, becoming reflexed and often incurved at apex, 2.5–3 × 0.5–1.7 mm, white or very pale pink; margin at apex ciliate, from mid position to base entire or sparsely ciliate; glabrous or with few sparse hairs on abaxial surface; petals 5, white or very pale pink, lanceolate, 2–3 × 0.5–0.7 mm, glabrous, caducous; stamens 10; filaments terete, 4–7 mm long, straight or curved, glabrous; anthers *c.* 1 × 1 mm, brown; ovary inserted excentrically on a short stipe, *c.* 2.25 × 1.25 mm, pink, white pubescent externally, appressed-pubescent internally; ovules 1 (rarely 2); style slender, almost directly in line with dorsal margin of ovary or excentric to varying degrees, becoming more excentric post anthesis, 2–4 mm long, sparsely hairy from median section to base; stigma capitate. **Fruit** on a 6–10 mm long pedicel, an asymmetrical nut with a distinct beak at apex of dorsal suture and partway along dorsal side, suborbicular, laterally compressed, 30–40 × 30–34 × 17.5–20 mm, deeply rugose, glabrescent, scurfy, brown; seeds 1 (rarely 2), 25–29 × 17–20 mm. *wrinklepod mangrove*. **Figs. 1A, 2A–C**.

***Additional selected specimens* (*from 60 examined*): Australia: Northern Territory.** Ingliss Island, Dec 1987, *Dunlop 7510* (CANB); Arnhem Bay, Probable Island, Oct 2009, *Westaway 3190* (NSW). **Queensland.** Cook District: *c.* 6 km NE of Mapoon community, Sep 2006, *Wharton s.n.* (BRI [AQ783524]); Cape York Peninsula, E of Bramwell Homestead on Olive River, Dec 1987, *Kanis 2047* (CANB); Weipa Concession, Marmoss Creek, Sep 1974, *Dockrill 853* (CNS); near Taylors Landing, Claudie River, Jul 2014, *Cooper 2239, Jensen & Venables* (CNS); Nesbit River, Jun 1995, *Forster PIF17083* (CNS); Annie River, Dec 1978, *Duke AIM877* (BRI); Endeavour River Estuary, May 1991, *Le Cussan 25* (CNS); Cooktown, Keatings Lagoon

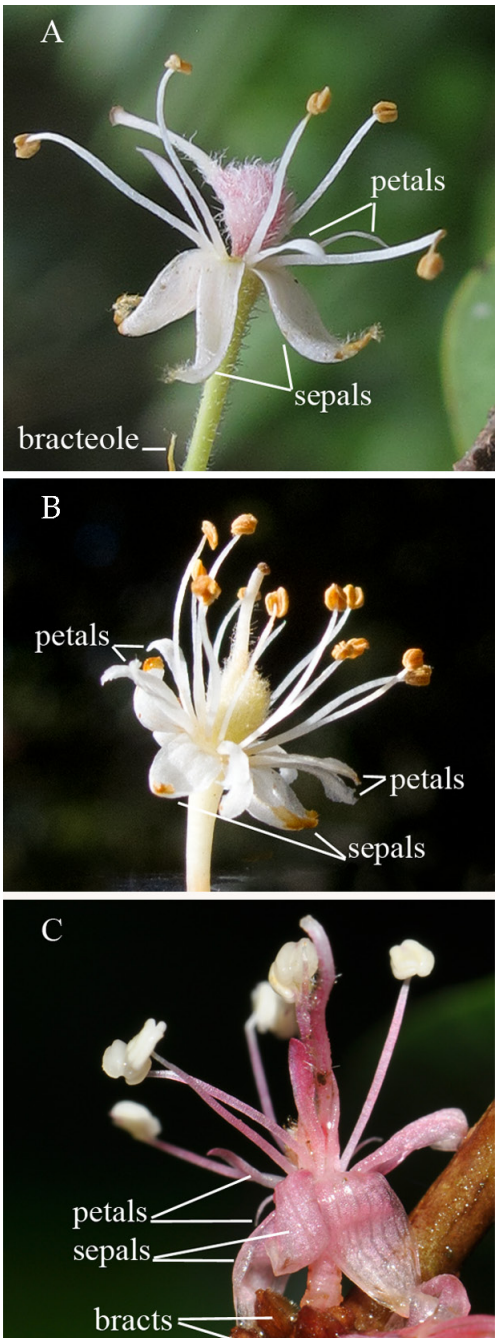

Fig. 1. ***Cynometra*** flowers: A. ***Cynometra iripa*** (*Cooper 2238 et al.* [CNS]), B. ***C. ramiflora*** (*Cooper 2245 et al.* [CNS]), C. ***C. roseiflora*** (*Cooper 2215 et al.* [CNS]). Photos: A & B, W. Cooper; C, T. Hawkes.

Conservation Park, Dec 2008, *Booth 5243 & Lynch* (BRI); 100 m N of Daintree River ferry crossing, Jul 1995, *Gray 6247* (CNS); North bank of Mossman River mouth, Sep 1948, *Smith 3997* (CANB); Redden Island, Machans Beach, Apr 2014, *Cooper 2235, Venables & Cooper* (CNS); Holloways Beach, Jan 2015, *Cooper 2273* (CNS); Holloways Beach, Jul 2014, *Cooper 2238 & Venables* (CNS); Russell River Road, Jul 2004, *Gray 8933* (CNS); Mouth of Maria Creek near Kurramine Beach, Jul 1994, *Waterhouse 3356* (BRI); Deluge Inlet, Hinchinbrook Island, Aug 1976, *Abel AS144* (BRI). North Kennedy District: Hayman Island, Jun 1934, *White 10120* (BRI). South Kennedy District: Mackay, Sep 1968, *Jones s.n.* (BRI [AQ19340]).

***Distribution and habitat*:** *Cynometra iripa* is distributed throughout tropical southern and south-eastern Asia (including India, Bangladesh, Myanmar, Cambodia, Vietnam and Thailand), Malesia (Malaysia, Indonesia, Singapore, the Philippines and New Guinea), Micronesia, Melanesia (Solomon Islands, New Caledonia) and Australia, at altitudes reportedly to 500 m (Ding Hou 1996). Within Australia, *C. iripa* has been recorded in Queensland on the mainland and off shore islands from Cape York to the Mackay area, as well as west to East Arnhem Land in the Northern Territory (**Map 1**); altitude near sea-level to 20 m.

In Australia, *Cynometra iripa* is a plant of back mangal areas, rarely of upstream wetlands (Keatings Lagoon near Cooktown [*Booth 5243 & Lynch*]) or adjoining monsoon forest (Arnhem Land [*Westaway 3190*]). In Queensland it commonly co-occurs with *Acacia polystachya* A.Cunn. ex Benth., *Acrostichum speciosum* Willd., *Aegiceras corniculatum* (L.) Blanco, *Arytera bifoliolata* S.T.Reynolds, *Avicennia marina* (Forssk.) Vierh., *Brownlowia argentata* Kurz, *Bruguiera gymnorhiza* (L.) Savigny, *Clerodendrum inerme* (L.) Gaertn., *Cryptocarya exfoliata* C.K.Allen, *Dalbergia candenatensis* (Dennst.) Prain, *Derris trifoliata* Lour., *Dillenia alata* (R.Br. ex DC.) Martelli, *Dysoxylum acutangulum* subsp. *foveolatum* (Radlk.) Mabb., *Excoecaria agallocha* L., *Ganophyllum falcatum* Blume, *Heritiera littoralis* Dryand., *Lumnitzera littorea* (Jack) F.Voigt, *Melaleuca leucadendra* (L.) L., *Thespesia populneoides* (Roxb.) Kostel., *Terminalia sericocarpa* F.Muell and *Xylocarpus* spp. In the Northern Territory it is

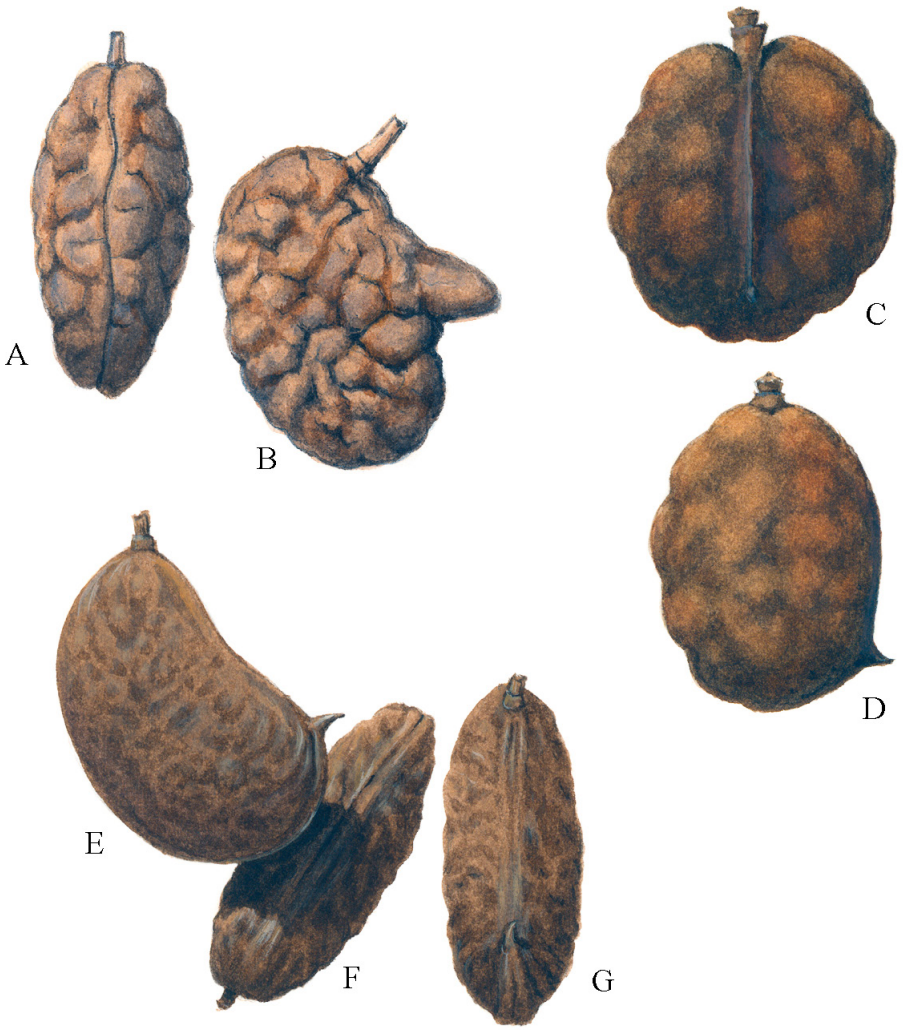

Fig. 2. ***Cynometra*** fruit all natural size: ***C. iripa*** (*Cooper 2273* [CNS]), A. ventral view, B. lateral view showing beak on dorsal side; ***C. ramiflora*** (*Cooper 2265 et al.* [CNS]), C. dorsal view, D. lateral view; ***C. roseiflora*** (*Cooper 2271 et al.* [CNS]), E. lateral view, F. ventral view, G. dorsal view. Del. W.T. Cooper.

known to occur in back mangal communities co-occurring with *Aegiceras corniculatum* (L.) Blanco, *Lumnitzera racemosa* Willd. and *Flacourtia territorialis* Airy Shaw, and in adjoining monsoon forest dominated by *Peltophorum pterocarpum* (DC.) Backer ex K. Heyne.

***Phenology*:** Flowers have been recorded from March to October; fruits have been recorded from January to March, June to September and in November.

***Typification*:** *Cynometra iripa* Kostel. is solely based on Rheede's plate in *Hortus Malabaricus* (Kosteletzky 1835; Knaap-van Meeuwen 1970). This plate was also one of the two elements cited by Linnaeus (1753) in his description of *C. ramiflora* L.; however, this element has now been excluded from

typification of that name (Kosteletzky 1835; Knaap-van Meeuwen 1970). Kosteletzky (1835) quite clearly indicated the single typifying elements for both his name and that of Linnaeus (1753) and provided accounts of both species. Although this does not equate to a formal lectotypification in the modern sense, subsequent authors have followed this citation (e.g. Knaap-van Meeuwen 1970; Ding Hou 1996: 606; Ross 1998: 169). Jarvis (2007) goes so far as to state "Lectotype (Knaap-van Meeuwen in *Blumea* 18: 23 (1970): [icon] "*Cynomorium Silvestre*" in Rumphius, Herb. Amboin. 1: 167, t. 63. 1741", although Kosteletzky (1835) rather than Knaap-van Meeuwen (1970) should probably be regarded as making this decision: neither state "lectotypify" as such.

***Notes*:** *Cynometra iripa* has been described as having a style not in line with the dorsal suture of the ovary (Knaap-van Meeuwen 1970), but Australian material has styles that are often directly in line with the dorsal suture, although during and after anthesis they become excentric to varying degrees. All living specimens seen in the Cairns area, as well as along the Claudie and Olive Rivers, have pink ovaries with a dense covering of white hairs, thus differing from the rust-coloured pubescence described by Ross (1998). Fresh specimens from other areas were not seen for comparison.

Sepals have been described as being rather long-hairy (Knaap-van Meeuwen 1970: 23; Ding Hou *et al*. 1996: 603). Sepals of Australian specimens seen by the author of this revision do not have a hairy surface but do have a ciliate margin especially at the apex.

***Etymology*:** There has been confusion over the etymology of the specific epithet *iripa*. It is clear that Rheede's name for this plant, *Iripa*, was based on an indigenous Malayalam (native language of southern India) name (Rheede's opening statement is 'Iripa Malabarensibus'; Ram (2005) also indicates that Malayalam names were employed by Rheede). This is further confirmed by Nicolson *et al.* (1988), who reported that "Irippa (sic) is still used. It is found [in] mangrove swamps, increasingly scarce in Kerala". Hence the etymology for *iripa* is derived from Irippa, the Malayalam name for the plant.

2. Cynometra ramiflora L., *Sp. Pl*. 382 (1753). **Type:** based on *Cynomorium sylvestre* Rumph., *Herb. Amboin*. 1: 167, t. 63 (1741), *fide* Knaap-van Meeuwen (1970: 23 "excl. syn *Iripa* Rheede").

Cynometra sp. (Paira Homestead Rd G.Sankowsky+ 1223); Pedley (2007: 39, 2010: 34).

***Illustrations*:** Beddome (1869–1874); Pierre (1880–1907); Kirtikar & Basu (1918); Verdcourt (1979: 84); Whitmore (1983: 255); Du Puy (1993: 180 D & E); Corner (1997: 399); Claussen (2005: 21); Duke (2006: 137) as *C. iripa* (lower photo).

In Australia: Tree to 15 m, dbh to 60 cm, buttressed, blaze red. **Bark** with numerous lenticels, these round or elongated and often in vertical lines; twigs with scattered to dense round and linear lenticels; new flush foliage pink to cream; stipules filiform, *c*. 1.5 mm long; tuft of hairs at petiole apex *c*. 0.75 mm long, caducous. **Leaves** 1 (rarely 2)-jugate; petiole (+ rachis when present) 5–33 mm long, shallowly grooved on upper side, glabrous on mainland specimens and glabrescent on Christmas Island specimens; petiolules 2–6 mm long, thickened and mostly enclosed by leaflet base, glabrous on mainland specimens but minutely pubescent on Christmas Island specimens; leaflets discolorous, asymmetrical, obliquely-ovate, obliquely-oblong, obliquely-obovate or broadly elliptical; basal leaflets, if present, 17–82 × 9–46 mm; terminal leaflets 63–210 × 30–98 mm; coriaceous, shiny, glabrous; base oblique, rounded, truncate, attenuate or cuneate; apex acute, shortly acuminate, acuminate or emarginate; margin entire; venation brochidodromous, primary vein raised on upperside, secondary veins in 8–12 pairs (6 –7 pairs on basal leaflets if these present), angle of divergence from primary vein 40º–50º; tertiary venation reticulate. **Inflorescences** axillary, terminal or ramiflorous, solitary or paired (sometimes condensed) racemes, up to 20-flowered; rachis to 20 mm long, glabrous; pedicels 6.5–12.5

mm long, glabrous; bracteoles near pedicel bases boat-shaped and keeled, 3–3.5 × *c*. 1.5 mm, ciliate at apex, dorsal surface with hairs along keel line and some scattered minute hairs may be present, caducous. **Flowers** with an unpleasant odour, erect, 5–9 × *c*. 9 mm; receptacle inverted cone-shaped, *c*. 1.5 × 1.5–2.5 mm; sepals 4, oblong-ovate, *c*. 5 × 2.5 mm, white, apex acute and somewhat ragged or slightly fimbriate, otherwise margin entire, glabrous; petals 5, obovate-lanceolate, 5.5–6 × *c*. 1.5 mm, white, caducous, glabrous, apex acute or mucronate and somewhat ragged or slightly fimbriate, otherwise margin entire; stamens 10; filaments terete, straight or curved, 6–8 mm long, glabrous; anthers *c*. 1.25 mm long, cream to brown; ovary inserted slightly off centre on its stipe, *c*. 1 mm long, yellowish or pink, pubescent externally, internal walls glabrous (or with a few sparse hairs *Cooper 2245*); ovules 1–3; style in line with dorsal suture or frequently excentric, 3–3.5 mm long, sparse hairs towards base; stigma capitate. **Fruit** on a 3–10 mm long pedicel, an asymmetrical, somewhat globose nut, but flattened on the ventral side, 38–52 × 37–42 × 28.5–40 mm, rust brown coloured, woody, rugose, scurfy, minutely and sparsely pubescent, beak short, near apex of dorsal suture, seed solitary. *wrinklepod mangrove.* **Figs. 1B, 2C & D, 3**.

***Additional selected specimens* (*from 18 examined*): Malaysia.** Pahang, Kuantan Telok Chempedak Bay, Jul 1992, *Saw FRI37559* (CNS). **Papua New Guinea.** New Britain Province: Cape Roebuck, west of Fullerborn Harbour, May 1973, *Womersley NGF41214* (CNS). Western province: Morehead River, *c*. 8 miles inland, Aug 1967, *Pullen 7057* (CANB), *7074* (CANB); junction of Bensbach & Tarl Rivers, Bensbach sub-district, Aug 1967, *Ridsdale & Galore NGF 33711* (CANB). **Australia. Christmas Island**. SE Ross Hill, Mar 2002, *Holmes CI43 & Holmes* (CANB); Cultivated at National Park Headquarters, Dec 2014, *Cooper 2285* & *Maple* (CNS); Cultivated at 21 Central Rehab Field, Dec 2014, *Cooper 2286* & *Maple* (CNS). **Queensland.** Cook District: Paira Homestead, Sep 1991, *Sankowsky 1223* (CNS); Old Paira Homestead Road, Cape York, Feb 1992, *Sankowsky 1320* (CNS); Jardine River, Nov 1978, *Stirling AIM462* (BRI); Jardine River, Oct 2014, *Cooper 2267, Jensen, Kemp & Zdenek* (CNS); Jardine River, Oct 2014, *Cooper 2265, Jensen, Kemp & Zdenek* (CNS); Jardine River, Oct 2014, *Cooper 2268, Jensen, Kemp & Zdenek* (CNS); ex Mew River, Muddy Bay, Cape York (cultivated at Tolga), Oct 2005, *Sankowsky 2668 & Sankowsky* (BRI); *ditto loc*., (cult. by Sankowsky at Tolga), Oct 2014, *Cooper 2258, Cooper & Sankowsky* (CNS); Cairns Botanic Gardens (ex Mew River), May 2014, *Cooper 2275 & Venables* (CNS); Cairns Botanic Gardens (ex Mew River), Aug 2014, *Cooper 2245, Cooper & Roberts* (CNS).

Fig. 3. *Cynometra ramiflora* showing pink colouration on pendulous new leaves (*Sankowsky 2668 et al.* [CNS]). Photo: G. Sankowsky.

***Distribution and habitat*:** *Cynometra ramiflora* occurs in India, Sri Lanka, South-east Asia (including Thailand), Malesia (including Indonesia, Malaysia, the Philippines, New Guinea), Melanesia (Solomon Islands, New Caledonia) and Australia.

On mainland Australia, it has been recorded from two locations from north Queensland near Cape York (**Map 1**). One site is along the Jardine River in areas of back mangal on white sand and mangrove mud where it co-occurs with *Acrostichum speciosum* Willd., *Calophyllum inophyllum* L., *Cerbera manghas* L., *Crinum pedunculatum* R.Br., *Heritiera littoralis* Dryand., *Melaleuca quinquenervia* (Cav.) S.T.Blake, *Rhizophora* spp. and *Xylocarpus granatum* K.D.Koenig. The second is near the Mew River on the east coast adjacent to mangroves in swamp forest dominated by *Livistona benthamii* F.M.Bailey.

On Christmas Island, *C. ramiflora* occurs in isolated relict mangroves on an elevated

area at *c*. 300 m altitude where, at no time since the last interglacial has sea level been where mangroves are now found (Woodroffe 1988: 12). Christmas Island has been rapidly uplifted during the Cainozoic pushing tertiary limestone to 361 m above sea level (Woodroffe 1988: 12).

***Phenology*:** Flowers in cultivation have been recorded in August and October; fruit has been recorded from the Jardine River in October and in cultivation in May.

***Typification*:** See previous notes under *Cynometra iripa*.

***Notes*:** Previously *Cynometra ramiflora* was thought not to occur in Australia, but specimens from Cape York and Christmas Island are confirmed to be this species.

In the past, *C. ramiflora* has been distinguished from *C. iripa* by the glabrous inner wall of its ovaries (Knaap-Van Meeuwen 1970: 14; Tomlinson 1986: 253) (those of *C. iripa* are pubescent). However, one collection (*Cooper 2245*) has sparse but distinct pale hairs on the inner wall of some, but not all ovaries.

Sepals have been variously described as being completely hairy, with a few hairs near their tip or glabrous (Knaap-van Meeuwen 1970: 24, Ding Hou *et al*. 1996: 606). Australian material has glabrous sepals with an entire to slightly fimbriate apex margin.

With the exception of a small tuft of caducous hairs at the petiole apex, all specimens seen from the Australian mainland and New Guinea have glabrous petioles, rachises and petiolules (including on tender new growth), whereas material from Christmas Island and SE Asia have glabrescent petioles and rachises, and minutely pubescent petiolules.

***Etymology*:** The specific epithet, *ramiflora*, is derived from the Latin *rami-* (pertaining to branches) and *-florus* (flowered), referring to the ramiflorous inflorescences.

3. Cynometra roseiflora W.E.Cooper sp. nov. Similar to *Cynometra ramiflora* L. but differs in the colour of new flush foliage (red versus pink); petal length (about half as long as sepals versus of similar length); petal colour (bright pink versus white); internal ovary wall (glabrous but for a tuft of hairs at base versus glabrous or sparsely hairy but lacking a tuft of hairs at base); fruit shape (reniform and laterally compressed versus globose and ventrally flattened). **Typus:** Australia: Queensland. Cook District: Mossman Gorge section, Daintree National Park, north side of the river, 10 March 2013, *W. Cooper 2215*, *T. Hawkes*, *R. Jensen*, *J. Kemp & J. Leech* (holo: CNS [2 sheets + spirit]; iso: BRI, CANB, L, K, MO *distribuendi*).

Cynometra iripa (in part) (*sensu* Pedley 2007: 39).

Cynometra ramiflora (in part) (*sensu* Hyland *et al*. 2003, 2010).

Shrub or tree to 15 m. **Bark** with round or elongated lenticels or pustules; twigs zig-zag, with lenticels round and scattered; stipules not seen. **Leaves** 1-jugate; petioles 4–8 mm long, not channelled, mostly enclosed by leaflet base, glabrous; leaflets slightly discolorous, new growth bright red and pendulous; petiolules 1–2.5 mm long, wrinkled, glabrous; leaflets asymmetrically ovate, 70–175 × 20–62 mm, membranaceous-coriaceous, glabrous, upper-side shiny, under-side dull; base oblique, cuneate, attenuate or rounded; apex acuminate or drawn out with a bluntly rounded tip, rarely emarginate; margin entire; venation brochidodromous, primary vein raised on both surfaces; secondary veins 8–15 per leaflet, angle of divergence from primary vein 20–40º; tertiary veins reticulate. **Inflorescence** a ramiflorous, axillary or rarely pseudo-terminal, 1–7-flowered fascicle or pedunculate raceme on a swelling; pedicels 3–4 mm long, glabrous; bracteoles 2 on each pedicel, caducous, not seen but evidenced by scars. **Flowers** not fragrant, erect, *c*. 7 × 6 mm; receptacle shortly cone-shaped *c*. 0.5 mm long and wide; sepals 4, lanceolate or oblong-elliptic, reflexed and strongly incurved at apex, 3–4 × 1–2.5 mm, bright pink, some becoming whitish after anthesis, glabrous, margin at apex often sparsely and minutely ciliate; petals 5, lanceolate or strap-shaped, entire, 1–2 × 0.2–0.7 mm, bright pink,

caducous; stamens 9–10; filaments terete, *c.* 4.5 mm long; anthers *c.* 0.75 × 0.75 mm, white; ovary inserted slightly excentrically on a short stipe or sessile, *c.* 1.5 × 1 mm, pink, pubescent externally, glabrous internally except for a tuft of hairs at base; ovule 1; style slender, elongate, initially in line with dorsal suture, becoming excentric after anthesis, *c.* 4.5 mm long, sparsely hairy from base to apex, stigma minutely capitate. **Fruit** on a 2–5 mm long pedicel, a reniform or oblong and laterally compressed nut, with a small beak at apex of dorsal suture, 28–55 × 19.5–31.5 × 13.5–23.5 mm, rugose, scurfy, sparsely and minutely pubescent, rust brown coloured; seeds 1 per fruit, testa thin and adhering to mesocarp. Germination epigeal. **Figs. 1C, 2E–G, 4**.

***Additional selected specimens* (*from 8 examined*): Queensland.** Cook District: N bank of Mossman River, Mossman, Oct 1992, *Russell s.n.* (BRI [AQ548293]); Mossman Gorge NP, north side of the river, Jul 2013,

Fig. 4. *Cynometra roseiflora* showing red new leaves (*Cooper 2215 et al.* [CNS]). Photo: R. Jensen.

Cooper 2223, Jensen, Jago & Russell (CNS); NPR 133, Mossman Gorge, Jul 1995, *Hyland 25906 RFK & Gray* (CNS); NPR 133, Mossman Gorge, Dec 1995, *Hyland 25906 RFK & Gray* (CNS); Mossman River, Silky Oaks Resort, Jul 1992, *Sankowsky 1333* (CNS); Mossman Gorge, Silky Oaks Resort, May 1993, *Sankowsky 1417* (CNS); Cultivated by G & N Sankowsky at Tolga, Nov 2014, *Cooper 2271 & Sankowsky* (CNS).

***Distribution and habitat*:** *Cynometra roseiflora* is endemic to the Wet Tropics bioregion in north-eastern Queensland where it is currently known to occur within a very small area on the northern side of the Mossman River in the Mossman Gorge section of the Daintree National Park and on the neighbouring property of Silky Oaks Lodge (**Map 1**), altitude 20–125 m. It grows in wet lowland rainforests (mesophyll vine forest) on soils derived from granite. Plants that co-occur with *C. roseiflora* include *Alstonia scholaris* (L.) R.Br., *Archidendron ramiflorum* (F.Muell.) Kosterm., *Backhousia bancroftii* F.M.Bailey & F.Muell. ex F.M.Bailey, *B. hughesii* C.T.White, *Calamus australis* Mart., *Calamus moti* F.M.Bailey, *Cardwellia sublimis* F.Muell., *Citronella smythii* (F.Muell.) R.A.Howard, *Dysoxylum arborescens* (Blume) Miq., *D. papuanum* (Merr. & L.M.Perry) Mabb., *D. pumilum* Mabb.; *Lindsayomyrtus racemoides* (Greves) Craven, *Medinilla balls-headleyi* F.Muell., *Mesua larnachiana* (F.Muell.) Kosterm., *Myristica insipida* R.Br. var. *insipida* and *Palaquium galactoxylon* (F.Muell.) H.J.Lam.

***Phenology*:** Flowers have been recorded in March; fruits have been recorded in June–July.

***Etymology*:** The specific epithet, *roseiflora*, is derived from the Latin *roseus* (pink) and *-florus* (flowered).

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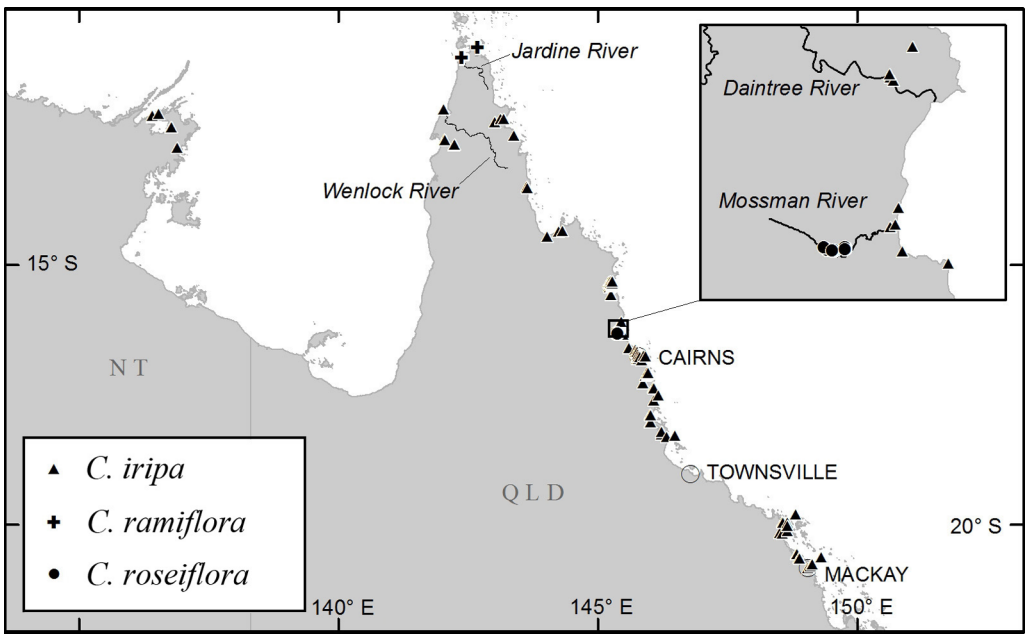

Map 1. Distribution of *Cynometra iripa* ▲(within Australia), *C. ramiflora* ✚ (within mainland Australia), and *C. roseiflora* ●.