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## VOLUME 1

P.S. Short & I.D. Cowie (eds)



**BIXACEAE**

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# BIXACEAE

R.A. Kerrigan & D.J. Dixon

*Trees*, shrubs or suffruticose herbs, often with coloured sap; indumentum of simple or peltate hairs or absent. *Leaves* simple, alternate, palmately nerved, lobed or entire; stipules present. *Inflorescences* terminal or axillary, panicles, thryses or racemes. *Flowers* bisexual, actinomorphic or zygomorphic. *Calyx* of 4 or 5 sepals, free, caducous. *Petals* 5, sometimes 4–7, free, white to pink or yellow. *Stamens* numerous, free; anthers straight or horseshoe-shaped, tetrasporangiate and dithecal, opening by pores or short slits. *Disc* present between stamens and ovary. *Gynoecium* of 2–5 carpels united to form a superior, unilocular ovary; style 1, stigma 1. *Fruit* a loculicidal capsule. *Seeds* numerous, glabrous or cottony hairy.

A pantropical family with, following Heald (2004), *c.* 18 species distributed among four genera: *Amoreuxia*, *Bixa*, *Cochlospermum* and *Diegodendron*. In Australia represented by *Cochlospermum* and, in Qld, the naturalised species *B. orellana*.

*Amoreuxia* and *Cochlospermum* are sometimes placed in their own family, the Cochlospermaceae, while the Madagascan endemic, *Diegodendron*, is also usually excluded.

Species of *Bixa* and *Cochlospermum* are variously used as ornamentals, for the manufacture of dyes, therapeutic applications, fuel and cordage.

Taxonomic references: Cronquist (1981); George (1982); Wheeler (1992); Mabberley (2008); Poppendieck (2003); Heald (2004).

## COCHLOSPERMUM Kunth

Small *trees*, shrubs or suffruticose herbs; glabrous or with indumentum of simple hairs. *Leaves* unlobed or palmatisect, 5–9-lobed, deciduous, often with inconspicuous domatia-like recess forming at junction of veins at base of lamina. *Inflorescence* terminal, paniculate. *Flowers* actinomorphic, bract caducous. *Sepals* 5, in 2 whorls, the outer 2 shorter than the inner 3, asymmetric. *Petals* obovate, emarginate; yellow. *Stamens* numerous, free; anthers curved, dehiscing by 1 apical pore and 2 basal pores. *Ovary* glabrous; ovules many; style thin and elongate; stigma inconspicuous. *Fruit* a smooth, loculicidal, woody to chartaceous capsule, 3–5 valves. *Seeds* brown, reniform, cottony.

Pantropical genus of *c.* 12 species, with five in northern Australia. All four species found in the N.T. are treated here, but only *C. fraseri* and *C. gillivrayi* are in the D.R.

Taxonomic references: Croft (1981); George (1982); Wheeler (1992); Poppendieck (1980, 2003).

- |    |  |                           |
|----|--|---------------------------|
| 1  | Lobes of leaves free to base or fused for 1–2 mm .....   | <b>C. gregorii</b>        |
| 1: | Lamina of leaves divided for $\frac{1}{2}$ – $\frac{3}{4}$ their length or entire .....                                      | 2                         |
| 2  | Lobes of leaves with obtuse to rounded apices; staminal filaments yellow .....   | <b>C. fraseri</b>         |
| 2: | Lobes of leaves with acute to acuminate apices or leaves entire; staminal filaments red .....                                | 3                         |
| 3  | Leaves entire or lamina divided for <i>c.</i> $\frac{1}{2}$ – $\frac{2}{3}$ its length, the resultant lobes triangular ..... | <b>C. sp. Arnhem Land</b> |
| 3: | Leaves never entire, lamina divided for at least $\frac{2}{3}$ its length, the resultant lobes lanceolate .....              | <b>C. gillivrayi</b>      |

**C. fraseri** Planch.

Small *tree* or shrub to 7 m tall; stems and leaves glabrous or puberulous-pilose to velvety; inflorescences puberulous-pilose to velvety. *Petiole* to 155 mm long. *Lamina* orbicular to widely depressed-ovate in outline, 22–190 mm long, 25–210 mm wide, palmatifid, shallowly lobed or divided up to half its length; base cordate, margins crenate, lobe apex obtuse or rarely acute. *Inflorescence* up to 30 cm long; bracts caducous, widely ovate to triangular, 1.5–8 mm long, apex acuminate to obtuse. *Pedice*l to 26 mm long. *Outer* sepals ovate to lanceolate, 7–12 mm long, 3–7 mm wide, puberulous, red-streaked; inner sepals ovate to obovate, 10–18 mm long, 6–15 mm wide, puberulous, red-streaked. *Petals* 19–38 mm long, 10–26 mm wide, red-streaked, glabrous.

*Stamens* numerous, filaments yellow, glabrous; anthers 2.5–3.2 mm long. *Style* c. 11 mm long. *Capsule* obovoid, 55–90 mm long, 35–48 mm diam., brown, glabrous. *Seeds* c. 5–8 mm long, 3.5–5 mm wide. *Flowering*. Apr.–Oct. *Fruiting*. Jun.–Mar. **Kapok Bush, Yellow Kapok.**

Fig. 1 (Cowie 10272; Leach 3351); Pl. 1–2 (unvouchered); Pl. 3 (Smith 1153).

Australia (W.A., N.T., Qld). In the N.T., distributed across the Top End. Found in open eucalypt woodland on a variety of substrates, including rocky hills with gravelly soil, sand, laterite, dolomite and heavy clay soils.

Two subspecies, which occur throughout the species range, are recognised. The subsp. *fraseri*, predominantly found from Katherine north to

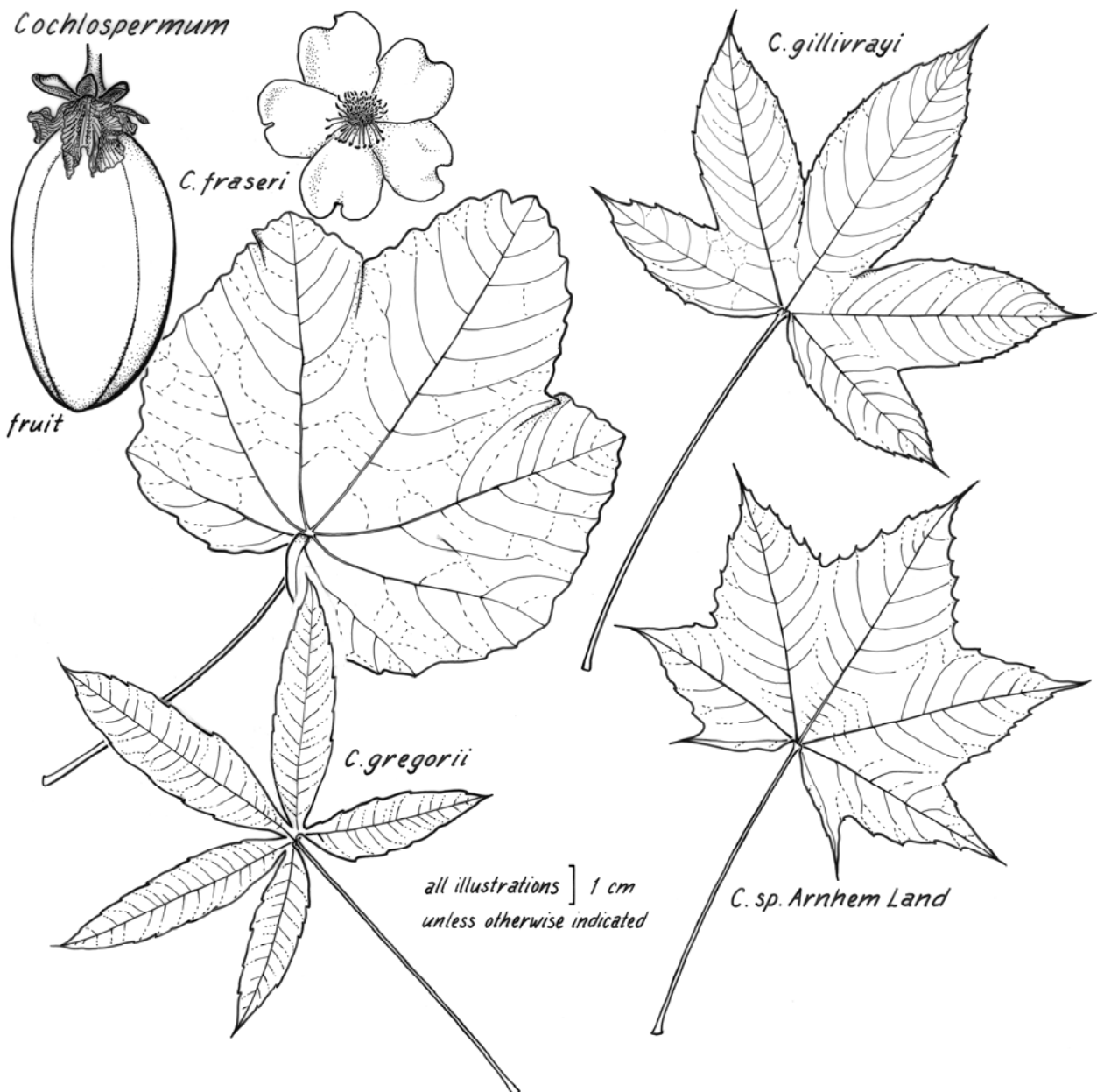


Fig. 1

Melville Island and extending to western Arnhem Land, has usually glabrous leaves and bracts which are about 2 mm long. The subsp. *heteronemum* (F. Muell.) Poppendieck, mostly found between Katherine and the Ord River (W.A.), usually has pubescent leaves and bracts 40–58 mm long. Poppendieck (1980) indicated a third subspecies may be recognised, this being based on a few specimens from W.A. characterised by deeply incised leaves and lanceolate floral bracts.

A very useful species for Aboriginal people across the Top End (e.g. Puruntatameri *et al.* 2001; Wijnjorrotj *et al.* 2005; White *et al.* 2009). For example, the bark is used to make rope and the taproot of young plants, petals and young fruit are all eaten. It is also a calendar plant, with fruit ripeness indicating the availability of eggs of crocodiles and freshwater turtles.

### **C. gillivrayi** Benth.

Small *tree* or shrub to 7 m tall; stems and leaves glabrous or with sparse white hairs, particularly on young shoots and inflorescences. *Petiole* to 150 mm long. *Lamina* widely depressed-obovate in outline, 40–150 mm long, 50–170 mm wide, palmatifid, divided for at least two-thirds its length; base shallowly to deeply cordate, margins serrate, apex acute, acuminate or rarely obtuse; lobes lanceolate, narrowly elliptic to elliptic. *Inflorescence* up to 12 cm long; bracts caducous, widely ovate, *c.* 2 mm long, apex obtuse. *Pedicele* to 30 mm long. *Outer* sepals ovate to widely ovate, 8–11 mm long, 4–7.5 mm wide, puberulous, red-streaked; inner sepals elliptic to obovate, 11–13 mm long, 7–12 mm wide, puberulous, red-streaked. *Petals* 29–40 mm long, 12–25 mm wide, red-streaked, glabrous. *Stamens* numerous, filaments red, glabrous; anthers 3–4 mm long. *Style* *c.* 12 mm long. *Capsule* obovoid, 60–95 mm long, *c.* 50 mm diam., brown, glabrous. *Seeds* *c.* 8 mm long, 3–4 mm wide. *Flowering* July–Sept. *Fruiting* *c.* Nov.

Fig. 1 (*Russell-Smith 2457*).

Australia (N.T., Qld). In the N.T. known from Cape Van Diemen (Melville Island), Kakadu N.P., north-east Arnhem Land, including offshore islands, and the Gulf country. Grows in eucalypt woodland and along creek banks on sand and sandstone. Two specimens, from Elsey N.P. (*Egan 2511*) and Mt Gilruth (*Wightman 1348*), are possibly intergrades with *C. fraseri*; the leaves have obtuse to acute lobes, are generally more hairy than in *C. gillivrayi*, and the lobes are more deeply divided than in *C. fraseri*.

Used to make implements and fibre by the Tiwi People (Puruntatameri *et al.* 2001), and is a recorded source of food for the Alawa (*Wightman et al.* 1991).

### **C. gregorii** F. Muell.

Small *tree* to 7 m tall; stems and leaves glabrous except for adaxial tuft of hairs at junction of veins with petiole; inflorescences puberulous. *Petiole* to 145 mm long. *Lamina* orbicular in outline, 50–160 mm long, 70–160 mm wide, palmatisect, lobes free to base or joined for 1–4 mm; margins serrate, apex acuminate; lobes lanceolate. *Inflorescence* up to 12 cm long; bracts caducous, widely ovate, *c.* 3 mm long, apex acuminate to caudate. *Pedicele* to 18 mm long. *Outer* sepals ovate, 6–11.5 mm long, 4.5–8 mm wide, puberulous, red-streaked; inner sepals ovate, 11–18 mm long, 8–10 mm wide, puberulous, red-streaked. *Petals* 30–40 mm long, 11–20 mm wide, red-streaked, glabrous. *Stamens* numerous, filaments red, glabrous; anthers 3–4 mm long. *Style* *c.* 12 mm long. *Capsule* obovoid, 55–90 mm long, 35–48 mm diam., brown, glabrous. *Seeds* *c.* 6–8 mm long, 3–4 mm wide. *Flowering* July–Aug. *Fruiting* Nov.–Dec.

Fig. 1 (*Thomson 3134*); Pl. 4 (unvouchered).

Australia (N.T., Qld). In the N.T. distributed across the eastern half of the Top End, from Mt Brockman (Kakadu N.P.) south to Daly Waters and east to Nicholson River in the Gulf country. Found in open woodland, *Triodia* grassland and bulwaddy (*Macropteranthes kekwickii*), on sandstone pavement and escarpment, rocky watercourses and quartzite ridges and grows in sand, sandy loam and clay loam.

### **C. sp. Arnhem Land (I.D. Cowie 5916)**

I.D. Cowie & C.P. Mangion

Small *tree* to 9 m tall; stems and leaves glabrous except for an adaxial tuft of hairs at the junction of the main veins and petiole; inflorescence puberulous. *Petiole* to 125 mm long. *Lamina* obovate to widely depressed-obovate in outline, 50–149 mm long, 73–178 mm wide, divided to around  $\frac{1}{2}$ – $\frac{2}{3}$  its length; base shallowly cordate, margins serrate, apex acute; lobes ovate, deltate to widely deltate. *Inflorescence* up to 14 cm long; bracts caducous, widely ovate, *c.* 2 mm long, apex obtuse. *Pedicele* to 21 mm long. *Outer* sepals ovate to widely ovate, 6.2–8.9 mm long, 3.7–7.7 mm wide, puberulous, red-streaked; inner sepals ovate to very widely ovate, 7–16 mm long, 6.3–11.2 mm

wide, puberulous, red-streaked. *Petals* 38–42 mm long, 23–27 mm wide, red-streaked, glabrous. *Stamens* numerous, filaments red, glabrous; anthers 3.3–3.7 mm long. *Style* to 11.7 mm long. *Capsule* obovoid, 64–89 mm long, 51–58 mm diam., brown, glabrous. *Seeds* 6.5–7 mm long, 5.5–6 mm wide. *Flowering* June–Sept. *Fruiting* Sept.–Dec.

Fig. 1 (Cowie 8028).

Australia (N.T.). Recorded from central Arnhem Land, around Maningrida, Arafura Swamp and south to the Annie Creek area. Grows in tall open

forest and eucalypt woodland, floodplain margins, coastal chenier ridges, and along creek banks on red sandy loam, brown silty soils with fine laterite gravel or sand.

A species with affinities to *C. gillivrayi*, it can be differentiated by the shape of the lamina lobes (triangular in this species, lanceolate to elliptic in *C. gillivrayi*) and the wider seeds (5.5–6 mm wide compared to 3–4 mm wide in *C. gillivrayi*). Flowering material can be difficult to identify as plants are usually leafless when in flower.

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Pl. 1 *Cochlospermum fraseri* (Photo: C.G. Wilson)



Pl. 2 *Cochlospermum fraseri* (Photo: C.R. Dunlop)



Pl. 3 *Cochlospermum fraseri* subsp. *heteronemum*  
(Photos: N.M. Smith)



Pl. 4 *Cochlospermum gregorii* (Photos: B.M. Stuckey)