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# MANGROVES OF THE NORTHERN TERRITORY, AUSTRALIA:

## *IDENTIFICATION and TRADITIONAL USE*

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**EXTRACT: *Bruguiera* (pp. 57–65)**

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**Bruguiera****RHIZOPHORACEAE**

**DERIVATION:** In honour of French explorer J. G. Bruguieres, 1750–1799.

A genus of six species confined to the Indo-Pacific region, five occur in Australia, four species are found in NT tidal forests.

**DESCRIPTION:** Large shrubs or trees; viviparous; base often buttressed or flanged, pneumatophores knee-like. Leaves decussate, simple, entire, glabrous, elliptic to broadly lanceolate, black dotted beneath; stipules lanceolate, 2–4 cm long. Inflorescences axillary, 1–10 flowered cymes; bracteoles absent. Sepals 8–16, free, persistent. Petals 8–16, each embracing a pair of stamens, 2 lobed with hairs and bristles, caducous. Stamens twice number of petals, paired, epipetalous; filaments filiform; anthers linear to oblong. Ovary inferior, 2–4-locular, ovules 2 per locule; style filiform; stigma obscurely lobed. Fruit baccate, indehiscent, 1 seeded. Hypocotyl terete or slightly ridged, blunt, falling with fruit.

**KEY TO SPECIES:**

1. Inflorescence 2–10-flowered; bristle in sinus of petal lobes far exceeds lobes ..... *B. parviflora*
1. Inflorescence 1-flowered; bristle in sinus of petal lobes not exceeding lobes ..... 2
2. Pedicel red; hypanthium red, indistinctly ribbed ..... *B. gymnorhiza*
2. Pedicel green; hypanthium green, distinctly ribbed ..... 3
3. Bristle in sinus of petal lobes distinct; apex of petal lobes glabrous ..... *B. sexangula*
3. Bristle in sinus of petal lobes inconspicuous or absent; apex of petals somewhat hirsute ..... *B. exaristata*

***Bruguiera exaristata* Ding Hou****Rib-fruited Mangrove**

**DERIVATION:** The Latin 'exaristatus' means awnless, and refers to the absent or inconspicuous bristle between the petal lobes.

**DESCRIPTION:** Shrub or tree to 8 m; bark dark grey, tessellate; stem base flanged, pneumatophores knee-like, copious. Leaf lamina obovate, 5.5–11.5 x 2.4–4.5 cm, margins often involute, base attenuate, apex acute; petiole 1.8–2.6 cm long; stipules lanceolate, 2.1–3.5 cm long. Mature bud 2.2–2.7 cm long; pedicel 6–12 mm, pendulous; hypanthium ridged, green. Sepals 8–9 (–10), linear-lanceolate, 12–16 mm long, persistent, green. Petals orange, 8–9 (–10), 10–13 mm long, caducous, bilobed, lobes 5 mm long, margins and base villous, bristle in sinus absent or minute. Staminal filaments 8–9 mm long; anthers apiculate, 5 mm long. Style 14 mm long; stigma shortly 3-lobed. Fruit turbinate,

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1.3–1.6 cm long. Hypocotyl cylindrical, slightly ridged, 5–7.2 x 0.6–0.9 cm, apex blunt.

**HABITAT:** *Bruguiera exaristata* is commonly found fringing tidal waterways or toward the rear of coastal tidal forests. Associates include *Rhizophora stylosa*, *Avicennia marina*, *Camptostemon schultzei* and *Ceriops tagal*. Occasionally monospecific stands are formed. Suitable substrates include clay-loams, sands and gravels, and salinities up to 72 ppt are tolerated (Wells 1982).

**DISTRIBUTION:** Common and widespread around the entire NT coastline, *B. exaristata* also occurs in Western Australia and Queensland. Extra-Australian records include Timor and New Guinea.

**DISTINCTIVE FEATURES:** Shrub or small tree to 8 m; leaf margins generally slightly inrolled; bristle in sinus of petal lobes absent or small.

**ETHNOBOTANY:** Tiwi people recognise this species as containing edible mangrove worms (*Bactronophorus thoracites*) and as indicating a good place to hunt for these worms. 'Witchetty grubs' may also be found in this tree, while possums and black-footed tree-rats eat the flowers (Puruntatameri et al. 2001). Kunwinjku people also recognise this tree as being a good source of edible mangrove worms (Altman 1981).

**Recorded Aboriginal language names**

Nurninga (Tiwi)

Yirikal (Kunwinjku)

Na-mururr (Yanyuwa)

Bardi people of the Kimberley use the wood of *B. exaristata* for fishing boomerangs (Smith & Kalotas 1985). New Guineans manufacture an astringent cure for diarrhoea and dysentery from the fruit (Percival & Womersley 1975). The timber is used for building houses in Sumba, Indonesia (Astuti et al. 2001).

**NOTES:** *Bruguiera sexangula* has been confused with this species in the past, see notes under that species.

*Bruguiera exaristata* produces flowers and fruit throughout the year, hypocotyls are relatively small and easily dispersed by tide or flood. Seedlings appear to perish in low light intensities. The red-headed honeyeater, *Myzomela erthrocephala*, has been observed visiting flowers of this species and is a likely pollinator (pers. obs.).

***Bruguiera gymnorhiza* (L.) Savigny**

**Large-leaved Mangrove**

**DERIVATION:** From the Greek 'gymnos' meaning naked, and 'rhiza' meaning root, in reference to the conspicuous exposed, knee-roots possessed by this species.

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**DESCRIPTION:** Columnar tree to 20 m; bark dark grey to brown, tessellate to smooth, lenticelled; stem base buttressed, knee roots copious. Leaf lamina elliptic to elliptic-lanceolate, 4.5–7.1 x 9.5–18.5 cm, coriaceous, apex acute, base attenuate; petiole 2.8–5.0 cm long; stipule 3.5–4.5 cm long, reddish. Mature bud 3.2–3.9 cm long; pedicel 10 mm long, pendulous, red; hypanthium distinctly reddish, terete or slightly ridged. Sepals 10–14(–16), linear, acute, 15–21 mm long, pink to red. Petals orange, 10–14(–16), 13–16 mm long, lobes 5–6 mm long with 2–3 bristles 3 mm long on apex, 1 conspicuous bristle in sinus, margins and base villous. Staminal filaments 9–11 mm long; anthers linear, mucronate, 4 mm long. Style 15–20 mm long; stigma 3-lobed. Fruit turbinate, terete, 2–2.5 cm long. Hypocotyl 12–20 x 1.5–2 cm, terete or slightly ridged, straight, blunt.

**HABITAT:** *Bruguiera gymnorhiza* is frequently found in areas of low salinity at the rear of tidal forests and along tidal waterways that are brackish. Associates include many mangrove species. Substrates include mud, sand and sometimes black soils. Occasionally *B. gymnorhiza* is found growing at elevations above the tidal influence in riparian, freshwater situations, especially in the north-east coastal areas.

**DISTRIBUTION:** *Bruguiera gymnorhiza* is common on the northern and north-eastern coasts of the NT, and one population has been recorded from the Sir Edward Pellew Group of islands in the Gulf of Carpentaria. However, it is not known to occur west of Fogg Bay. This species also occurs in Queensland and New South Wales and is widespread throughout the Indo-West Pacific region.

**DISTINCTIVE FEATURES:** Columnar tree to 20 m; large, glossy, opposite leaves; calyx orange to red; hypocotyl 'cigar-like' to 20 cm long, thick and blunt.

**ETHNOBOTANY:** Macassan fishermen used the bark of this species to produce a red dye, which was used to treat trepang on Groote Eylandt (Levitt 1981).

Tiwi people use the timber to make throwing sticks for hunting magpie geese, the long hypocotyl is called karampalinga. Possums and black-footed tree rats eat the flowers (Puruntatameri et al. 2001).

Emi and Batjamal people use the timber to make spear tips (Smith & Wightman 1990).

Rirratjingu and Kunwinjku people recognise this species as a good source of edible mangrove worms, *Bactronophorus thoracites* (Yunupingu et al. 1995, Altman 1981).

**Recorded Aboriginal language names**

Anuma (Anindilyakwa)

Gathul (Rirratjingu)

Rdugurdugu (Nunggubuyu)

Mirrwu (Iwaidja)

Na-mururr (Yanyuwa)

Benmerr (Batjamal)

Kunyme (Emi)

Timinipulika / Murrunga (Tiwi)

Yirikal (Kunwinjku)

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Hypocotyls of *B. gymnorhiza* have been used by Aboriginal people in north Queensland as a source of food, although preparation is required. In Maluku province, eastern Indonesia, the treated hypocotyls are considered poor food, whilst in central Indonesia a sweet meat of sugar and inner hypocotyl flesh is sold in markets. The hard, red timber is valued for firewood and ash production. Watson (1928) reported Malaysians using the fruit of this species as medicine for sore eyes, the pneumatophores as a source of scent and the bark as a condiment. In the Philippines the timber is widely used for construction and firewood (Jara 1987). In Fiji the wood is used as firewood for cooking and smoking fish, during cremation and to produce charcoal; the timber is also used to make scaffolding, boats, coconut husking stakes, fish traps and fence posts; it also produces a dye for tapa making (Pillai 1987). In Vietnam the young hypocotyls are eaten in times of hardship (Hong & San 1993).

**NOTES:** Mangrove species have been recorded growing above the influence of the tide in New Guinea (van Steenis 1984), the Christmas Islands (Woodroffe 1988) and Western Australia (Beard 1967). In the Northern Territory *B. gymnorhiza* exhibits similar habitat variability at Melville Island, north-east Arnhem Land and Groote Eylandt, where it may be observed growing in non-tidal, fresh water situations with typical riparian species (pers. obs.).

Wells (1982) observed that seedlings of *B. gymnorhiza* are capable of regenerating in areas of infrequent inundation. Occasional cyclonic surges that occur in coastal areas of the NT would allow propagules to be dispersed above normal tidal limits. *B. gymnorhiza* is found in waters with salinity of up to 37 ppt.

Flowers and fruit are produced throughout the year. The relatively large flowers are pendulous, to allow easy bird pollination, and the reddish calyx attracts the attention of pollinators. Propagules are suited to dispersal by tide and flood.

The specific epithet, *gymnorhiza*, is often spelt with a double 'rr' as *gymnorrhiza*, as it was spelt in the earlier edition of this publication. However, a decision was made in 2005 by the 'consensus census', a working group of senior plant taxonomists from all major Australian herbaria, to follow the original spelling used by Linnaeus and use one 'r' (Tony Orchard, pers. comm. Oct. 2005).

***Bruguiera parviflora* (Roxb.) Wight & Arn. ex Griff.**

### **Slender-fruited Mangrove**

**DERIVATION:** The Latin 'parvi' means small, and 'flora' means flower, a reference to the small flowers of this species in comparison to other members of the genus.

**DESCRIPTION:** Slender shrub or tree to 5(–8) m; bark grey, fissured; stem base slightly flanged, knee roots slender, up to 30 cm high. Lamina elliptic, 5.5–10.5 x 1.8–3.9 cm, apex acute, base attenuate, margins often scalloped due to insect attack; petiole 10–20 mm long, stipules 21–40 mm long, lanceolate. Inflorescence 3–10-flowered; peduncle 5–10 mm long; pedicel 2–7 mm long;

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mature bud 6–10 mm long. Hypanthium green, 4–6 mm long, slightly ridged. Sepals 8, 2 mm long, narrowly triangular, apex acute with minute hook. Petals 8, 1.5–2 mm long, oblong, 3 bristles on each lobe, 1 bristle in sinus. Staminal filaments 1.5 mm long; anthers triangular, 0.5 mm long. Style 1.5 mm long; stigma 2–3-lobed. Fruit narrowly turbinate, 2 cm long. Hypocotyl cylindrical, smooth, curved, 8–15 x 0.4–0.6 cm.

**HABITAT:** *Bruguiera parviflora* typically forms monospecific stands in areas that are infrequently inundated, or occurs as isolated individuals in vegetation along tidal waterways. Associates include *B. exaristata*, *Rhizophora stylosa*, *Ceriops decandra*, *Camptostemon schultzii* and *Avicennia marina*. Suitable substrates include consolidated muds, sands and calcareous sands, brackish and hypersaline areas may be colonised.

**DISTRIBUTION:** Common on the northern coast of the NT but not collected from the east coast of the NT; this species also occurs in Western Australia and Queensland. Extra-Australian records from Bangladesh to Vanuatu are reported.

**DISTINCTIVE FEATURES:** Slender tree to 5 m; leaf margins generally with scalloped edge from insect predation; flowers small, green; hypocotyls slender to 6 mm wide.

**ETHNOBOTANY:** This species is considered a good source for edible mangrove worms (*Bactronophorus thoracites*) through much of coastal Arnhem Land (Wightman & Smith 1989, Galpagalpa et al. 1984). The wood is used to make canoe paddles (Specht 1958) and spears (Galpagalpa et al. 1984).

Tiwi people also obtain edible mangrove worms from the wood of dead trees, and the presence of this species indicates to Tiwi a good place to hunt for worms (Puruntatameri et al. 2001). Tiwi also use the stems to make spear shafts, while possums and black-footed tree-rats eat the flowers.

#### **Recorded Aboriginal language names**

Godu (Djambarrpuyngu)

Yiny'tji (Djambarrpuyngu)

Yiny'tji (Yolngu Matha)

Nurninga (Tiwi)

North Queensland Aboriginals produce paddles from the timber of *B. parviflora* (Roth 1901), while Malaysians use the timber for firewood. In Thailand any part of the plant is boiled in water and the liquid used to relieve constipation (Aksornkoae 1987). In the Philippines the timber is used to make charcoal and for construction, tannin is extracted from the wood and bark (Jara 1987). In Vietnam this species is preferred for firewood (Hong & San 1993), and is used extensively to make charcoal. The timber is used for building houses in Sumba, Indonesia (Astuti et al. 2001).

**NOTES:** The yellow-green flowers are produced from June to September, fruit appear from September to December. The light hypocotyls are easily dispersed in water, and prefer to establish in areas receiving high to moderate light (Wells 1982). The small flowers of this species are pollinated by day flying insects such

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as butterflies, and unlike other members of this genus found in the NT the flowers are held erect.

The leaf margins of *B. parviflora* are often characteristically scalloped due to insect predation.

***Bruguiera sexangula*** (Lour.) Poir.

### Northern Large-leaved Mangrove

**DERIVATION:** The Latin 'sexangula' means six-angled, and refers to the six-sided hypocotyl of this species.

**DESCRIPTION:** Tree to 12 m; bark light brown to grey; stem base often flanged, knee roots present. Leaf lamina narrowly elliptic to elliptic, 9.5–11.5 x 3.0–4.1 cm, base attenuate, apex mucronate; petiole 6–12 mm long; stipule 4.0–4.2 cm long, lanceolate. Mature bud 2.7–3.1 cm long; pedicel 6–12 mm long; hypanthium ribbed. Sepals 10–11, lanceolate, 15–18 mm long, apex slightly recurved. Petals 10–11, 15 mm long, lobes 0.7 cm long, apex obtuse with 1 or 2 short bristles or glabrous, 1 bristle in sinus, margins and base pubescent. Staminal filaments 4–5 mm long; anthers linear, 4–5 mm long. Style 15–22 mm; stigma lobes 3, 0.5 mm long. Fruit turbinate, ridged. Hypocotyl 6–12 x 1.5–2 cm, angular, narrowed at both ends.

**HABITAT:** *Bruguiera sexangula* occurs fringing tidal waterways that receive significant perennial freshwater input, on a variety of substrate types. Salinities from brackish to freshwater are tolerated; Wells (1982) did not record it in salinities greater than 33 ppt. Associates include *Rhizophora stylosa*, *Avicennia marina*, *Camptostemon schultzei* and *Bruguiera parviflora*.

**DISTRIBUTION:** *Bruguiera sexangula* is rare in the NT, and is only known to occur in north-east Arnhem Land and on Groote Eylandt. Generally, it occurs as scattered individuals but on the Cato River, and to a lesser extent the Peter John, it forms significant stands. A population at Yanbakwa outstation on south-west Groote Eylandt is also quite large (Ian Cowie pers. comm. 2005). *Bruguiera sexangula* also occurs on the north Queensland coast; extra-Australian records from India through south east Asia to New Guinea are reported.

**DISTINCTIVE FEATURES:** Tree to 12 m; leaves large, opposite, glossy; petals with distinct bristle in sinus of lobes, apex of petal lobes glabrous; most easily confused with *Bruguiera gymnorhiza* and *B. exaristata*.

#### ETHNOBOTANY:

##### Recorded Aboriginal language names

Yulumuru (Yolngu Matha)

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In the Philippines the timber is used, a lotion from the fruit is used to treat sore eyes, the roots are used as incense wood and the leaves contain alkaloids that are tumor inhibitors (Jara 1987).

**NOTES:** This species is similar to *B. exaristata* and *B. gymnorhiza* and has been confused with both in the past. The safest means of correct identification is via the petals, as outlined in the key to *Bruguiera* species. Herbarium specimens lacking petals have been the reason for most incorrect identifications.

The restricted nature of this species in the NT has not been recognised previously, due to specimens of *B. exaristata* and *B. gymnorhiza* being mistakenly identified as *B. sexangula*.

Fertile collections of this species have been made in March, June and September. The large, downward pointing flowers are probably bird pollinated. The hypocotyls are suited to dispersal by water.

***Bruguiera* × *rhynchopetala* (W.C. Ko) X.-J. Ge & N.C. Duke**  
**Hybrid *Bruguiera***

A single tree, which appears to represent a hybrid between *B. gymnorhiza* and *B. sexangula*, was recorded from north-east Arnhem Land on the Gove Peninsula near Nhulunbuy (G. Wightman 4152, 4469, 4511, DNA). The tree was located in a rear mangal situation receiving fresh water run off well into the dry season. It died in the early 1990s.

The hybrid status of this individual was supported by: 1, intermediate and shared morphological characters of the putative parents; 2, reduced fertility (a single semi-mature fruit has been observed); 3, confused floral phenology and morphology; 4, luxuriant foliage growth; 5, low number of individuals; and 6, the presence of the putative parents in the general area.

Although, the floral morphology of this individual was somewhat variable, the petal shape and bristles closely matched material from Queensland (Duke 2006). However, the tree appeared to be relatively young and did not have the characteristic columnar stems exhibited in Queensland specimens (Duke 2006).

It is likely that hybrids also occur in other areas where both *Bruguiera gymnorhiza* and *B. sexangula* occur, e.g., Groote Eylandt, the rivers leading into Arnhem Bay, and the Cape Arnhem area.

*Bruguiera* × *rhynchopetala* is also recorded from the east coast of Queensland and Hainan Island in China. It was recently formally described as a species (Duke 2006), prior to that it was regarded as a variety of *Bruguiera sexangula*.

Due to the restricted occurrence of this taxon in the NT, it has not been included in the identification keys or floristic diversity sections of this publication. However,

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it should be noted that *B. × rhynchopetala* occurs in the most floristically diverse mangrove area in the NT, in north-east Arnhem Land.

References: Ding Hou 1958, McCusker 1984, Duke 2006.

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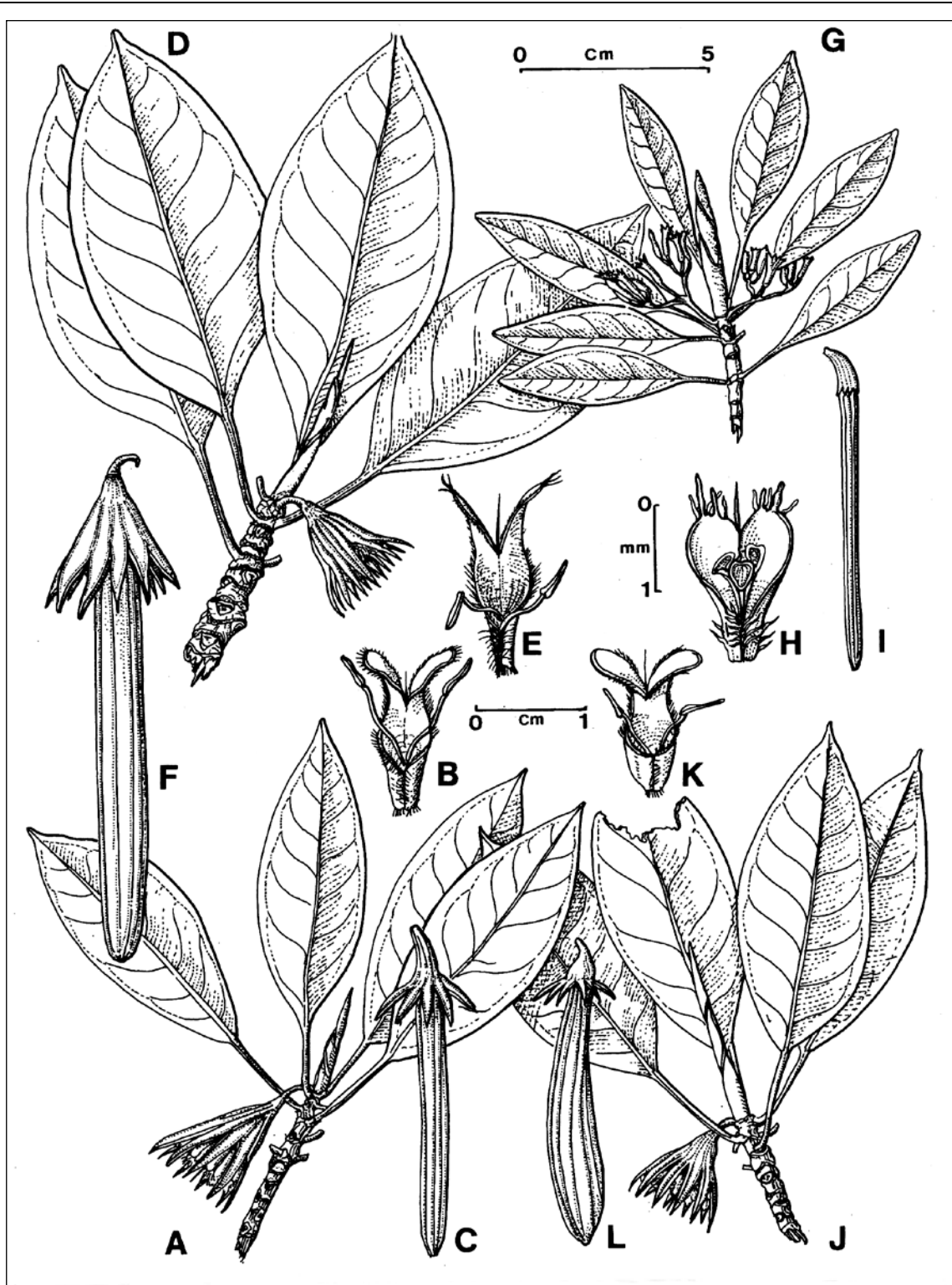


Figure 16. *Bruguiera*. A–C, *B. exaristata*. A, flowering branch; B, petal; C, fruit and hypocotyl (A–C, G. Wightman 291 & 3233, DNA). D–F, *B. gymnorhiza*. D, flowering branch; E, petal; F, fruit and hypocotyl (D–F, G. Wightman 440 & 617, DNA). G–I, *B. parviflora*. G, flowering branch; H, petal; I, fruit and hypocotyl (G–I, G. Wightman 501 & 519, DNA). J–L, *B. sexangula*. J, flowering branch; K, petal; L, fruit and hypocotyl (J–L, G. Wells s.n., DNA 15229).