
MANGROVES OF THE NORTHERN TERRITORY, AUSTRALIA:

IDENTIFICATION and TRADITIONAL USE

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EXTRACT: *Rhizophora* (pp. 123–128)

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DARWIN 2006

Rhizophora

RHIZOPHORACEAE

DERIVATION: The Greek 'rhiza' means root, and 'phora' means bearing in reference to the characteristic stilt roots of the genus.

A pantropical genus of eight or nine species, four species occur in Australia, three of these in the NT. One taxon, *R. × lamarckii*, is considered to be of hybrid origin.

DESCRIPTION: Trees, viviparous; conspicuous arching stilt-roots. Leaves decussate, simple, entire, glabrous, elliptic to ovate, midrib extending to caducous point; stipules lanceolate. Inflorescence axillary, cymose; bracts and bracteoles at flower base and inflorescence dichotomies. Sepals 4, persistent, reflexed in fruit. Petals 4, entire. Stamens 4–12; anthers almost sessile, triangular. Ovary semi-inferior, united with hypanthium, locules 2, ovules 2 per locule. Fruit obpyriform. Fertile seeds one per fruit. Hypocotyl cylindrical, up to 40 cm long.

KEY TO SPECIES:

1. Inflorescence with 3 dichotomies; style more than 5 mm long; underside of leaf evenly dotted..... *R. stylosa*
1. Inflorescence with 1 or 2 dichotomies; style less than 3 mm long; underside of leaf not evenly dotted..... 2
2. Inflorescence with 1 dichotomy; peduncle less than 14 mm long..... *R. apiculata*
2. Inflorescence with 2 dichotomies; peduncle more than 18 mm long..... *R. × lamarckii*

***Rhizophora apiculata* Blume**

Tall Stilt-root Mangrove

DERIVATION: The Latin 'apiculata' means to end abruptly and is a reference to the apex of the leaf.

DESCRIPTION: Tree, columnar to 15 m; bark dark grey, tessellate; stilt roots extending to 3 m up stem. Leaves narrowly elliptic, 9.3–19.0 x 3.7–8.0 cm, lamina dark green with distinct light green zone along midrib; apex mucronate, base attenuate; petiole 17–35 mm long; stipules 4.0–7.1 cm long. Inflorescence 2 flowered. Peduncle to 14 mm long, straight. Buds broadly ellipsoidal, finely fissured, subtended by 2 fused cup-shaped, fissured, bulbous bracteoles. Calyx lobes concave, ovate, 11–15 x 5–6 mm, acute. Corolla lobes oblong-lanceolate, 9–10 mm long, membranous. Stamens 11–12; anther 8–10 mm long, sessile. Upper ovary bluntly conical, 2 mm high; style 0.8 mm long, 2-lobed. Fruit 3.0–3.5 x 1.5–2.1 cm, rough. Hypocotyl cylindrical, club-shaped, 18–37 x 1.2–1.9 cm.

HABITAT: *Rhizophora apiculata* grows in mud and sand substrates; tidal waterways with some freshwater input on a perennial basis are preferred. Associates include *Bruguiera gymnorhiza*, *Lumnitzera littorea*, *Rhizophora stylosa* and *R. × lamarckii*.

DISTRIBUTION: *Rhizophora apiculata* is sparsely distributed across the northern coast of the NT, it is common in certain areas, for example, Melville Island, Cobourg Peninsula and north-east Arnhem Land. Due to its ability to occur as isolated trees or as small stands it is likely to be found in more localities. *Rhizophora apiculata* also occurs in Queensland, extra-Australian range is from India and Sri Lanka to the Pacific Islands.

DISTINCTIVE FEATURES: Large tree with conspicuous stilt roots, dark green leaves, two buds per inflorescence.

ETHNOBOTANY: Rirratjingu people obtain edible mangrove worms (*Bactronophorus thoracites*) from the trunk and dead branches, and mud crabs (*Scylla serrata*) are found in holes under the stems and roots and are highly valued as a food source (Yunupingu et al. 1995).

Tiwi people use the outer bark of the aerial roots to form ceremonial armbands called pamajyini. The hypocotyl, tudapulima or karampalinga, can be boiled in water and the liquid used as a wash to treat skin sores. It is also a good source of the health promoting and tasty mangrove worm, yuwurli (Puruntatameri et al. 2001).

Iwaidja speakers use two linked fruit and hypocotyls, yurrumbina, as toy dolls. The long slender hypocotyls are placed over the shoulders in the same fashion as a child's legs when being carried on the shoulders. The fruit joined to the hypocotyl may also be used as a toy spear and woomera. The hypocotyl is flicked forward in the same way as a woomera and the fruit is discharged in a similar way to a spear (Blake et al. 1998).

Iwaidja speakers also find mud crab burrows under the prop roots of this plant, though the mud crabs may also be found in other areas of the mangroves and beaches. Mangrove worms, yurrgbili, are found in the wood of fallen trees and are chopped out and then eaten (Blake et al. 1998).

Recorded Aboriginal language names

Walmu (Rirratjingu)

Wirrilu (Iwaidja)

Pukulijupa, Pamparingini, Purirringa (Tiwi)

In Thailand the wood is used to produce charcoal, firewood, poles, timber for housing construction and is distilled and then fractionated into acetic acid, methanol and wood tar (Aksornkoe 1987). In the Philippines this species is used for timber and tannin (Jara 1987). In Vietnam this species is preferred for firewood (Hong & San 1993). The timber is used for building houses and the bark to make a red dye in Sumba, Indonesia (Astuti et al. 2001).

***Rhizophora* × *lamarckii* Montrouz. Hybrid Stilt-root Mangrove**

DERIVATION: In honour of Jean Baptiste Antoine Pierre de Monnet de Lamarck (1744–1829), French biologist, famed for his theory of organic evolution that acquired characteristics may be inherited.

DESCRIPTION: Tree, rambling, multi-trunked, robust to 25 m; bark from grey, finely tessellated to dark grey, coarsely friable; stilt roots gregarious to 6 m up trunk. Leaves elliptic, 9.1–13.6 x 3.9–6.3 cm, apex with distinct apicle to 3 mm long, base broadly cuneate; petiole 1.5–2.5 cm long; stipule lanceolate, 5–7 cm long. Inflorescence with 2 dichotomous branches, each dichotomy subtended by 2 opposite, fused bracteoles. Peduncle 1.8–2.1 cm long, flattened; pedicel stout to 4 mm long. Bud narrowly ovate 1.0–1.2 cm long, subtended by opposite fused bracteoles. Calyx lobes deltoid to broadly lanceolate, 9–14 x 6–8 mm, apex acute. Corolla lobes lanceolate, 10 x 3 mm, margins tomentose, apex acute. Stamen number variable; anthers almost sessile, 8 mm long. Ovary shallowly conical; style 2 mm long, terete, 2–4-lobed. Fruit have not been observed in NT populations.

HABITAT: *Rhizophora* × *lamarckii* is restricted to mangal areas with a perennial source of freshwater input, substrates of sand and mud may be colonised. Associates include *Bruguiera gymnorhiza*, *Lumnitzera littorea*, *Ceriops decandra* and less commonly *Nypa fruticans* and *Xylocarpus granatum*. Obligatory associates in the NT are *R. apiculata* and *R. stylosa*.

DISTRIBUTION: *Rhizophora* × *lamarckii* is distributed across the northern coast of the NT, and is likely to occur as individuals where both putative parent species occur. Also found in north-east Queensland; extra-Australian records include Malaysia, Indonesia, New Guinea, the Solomon Islands and New Caledonia.

DISTINCTIVE FEATURES: Large tree with conspicuous stilt roots, up to four buds per inflorescence.

***Rhizophora stylosa* Griff. Stilt-root Mangrove**

DERIVATION: The Latin ‘stylosus’ refers to the large style of this species.

DESCRIPTION: Tree, multi-trunked or columnar, to 8 m; bark smooth, grey to fissured, black; stilt roots to 2 m, aerial roots copious from lower branches. Leaf blade broadly elliptic, 6.5–12.0 x 3.3–7.4 cm, under-surface regularly spotted, apicle prominent to 4 mm long, base broadly cuneate; petiole 1.2–3.1 cm long. Stipule lanceolate, 3.9–5.8 cm long. Inflorescence with 3–5 dichotomies, up to 32 flowered; each dichotomy subtended by a 4-lobed bract. Calyx lobes broadly lanceolate, 9–13 x 3–4 mm, apex acute. Corolla lobes lanceolate 9–11 mm long, margins woolly, hairs 3–4 mm long. Stamens 4–8; anthers 8–9 mm long, almost sessile. Ovary depressed-conical, 1.5 mm high; style 6 mm long, terete-filiform,

apex bilobed. Fruit 2.6–3.2 x 1.7–2.0 cm, neck distinctly contracted. Hypocotyl cylindrical, 20–35 x 1.1–2.0 cm.

HABITAT: *Rhizophora stylosa* grows in a variety of tidal habitats, preferring banks of tidal rivers, but also as a pioneering species in coastal situations or as a landward zone at the rear of tidal forests. *Rhizophora stylosa* may be found in association with many species that occur in tidal areas. Substrates include muds, sands, coarse grits and rock.

DISTRIBUTION: *Rhizophora stylosa* is widespread and common around the entire NT coastline, and also occurs in Western Australia, Queensland and New South Wales. Extra-Australian occurrences include Taiwan, Malaysia, the Philippines, Indonesia, New Guinea, Samoa and Micronesia.

DISTINCTIVE FEATURES: Tree with conspicuous stilt roots, up to 16 buds per inflorescence, leaf underside dotted.

ETHNOBOTANY: Djambarrpuyngu and Ngan'gikurunggurr people hunt for mud crabs (*Scylla serrata*) in the roots of this tree, they are a highly valued and much sought after food resource (Wightman & Smith 1990, Marrfurra et al. 1995). Ngan'gikurunggurr people also use the hard straight stems as points for bamboo shafted spears (Marrfurra et al. 1995).

In north-east Arnhem Land the inner bark is scraped into water and the infusion used to treat skin sores and ulcers (Scarlett et al. 1982), and the roots are used to make fighting sticks (Specht 1958).

Djambarrpuyngu people also seek the edible mangrove worm (*Bactronophorus thoracites*) from the trunks and branches of dead trees (Galpagalpa et al. 1984). The worms can be chopped out of live trees as well, but it is much easier to extract the worms from the rotting wood of dead trees.

Tiwi and Rirratjingu people use this species in the same way as *Rhizophora apiculata*, as do Iwaidja speakers (see notes under that species).

MalakMalak and Matngala people use the straight stems to make the sharp point of the small two piece hunting spear (Lindsay et al. 2001).

Recorded Aboriginal language names

Bandjurr (Djambarrpuyngu)	Arana (Nunggubuyu)
Gana (Djambarrpuyngu)	Unuma (Anindilyakwa)
Giyapara (Djambarrpuyngu)	Marrutj (Batjamal)
Ngulumung (Djambarrpuyngu)	Murrutj (Batjamal)
Gana (Yolngu matha)	Rungurr-rungurr (Emi)
Giyapara (Yolngu matha)	Yerrmasyi (Ngan'giwumirri)
Walmu (Yolngu matha)	Yerrmasyi (Ngan'gikurunggurr)
Walmu (Rirratjingu)	Pukulijupa, Pamparingini, Purirringa (Tiwi)
Wirrilu (Iwaidja)	Maparak (MalakMalak and Matngala)

Rhizophora stylosa is used by Dampier Land Aboriginals to make boomerangs, spears and ceremonial objects, the wood is also regarded as good firewood (Smith & Kalotas 1985). Specht (1958) also records clubs being made from the buttress roots (mistakenly as *R. mucronata*) in Arnhem Land.

The bark of *Rhizophora* spp. has also been used for tanning and dyes (Cribb & Cribb 1981), and in the past *Rhizophora* were a major source of tannins (Mastaller 1997). In Malaysia, Watson (1928) reports light wine and a decoction used to cure haematuria made from the fruit. The wood is widely used to make charcoal in Indonesia (Soegiarto & Soemodihardjo 1987), while the aerial roots are used in roof construction in traditional houses in Sumba, Indonesia (Astuti et al. 2001).

In Fiji this species is used as firewood for cooking and smoking fish, it is also a source of tannin (Pillai 1987). In Vietnam fishermen build houses on wooden platforms raised on the stilts of *Rhizophora* spp (Hong & San 1993). The timber is also used extensively to make charcoal and the bark is a source of tannin. In times of hardship the young fruit are eaten (Hong & San 1993).

GENUS NOTES: Some confusion has existed in the past over the number of species of *Rhizophora* that occur in the NT. Due to the misidentification of herbarium specimens some authors have listed *R. mucronata* as occurring in the NT (McCusker 1984, Lassak & McCarthy 1983). However, only *R. apiculata*, *R. stylosa* and *R. × lamarckii* have been reliably identified, and have supporting herbarium voucher specimens.

The hybrid origin of *Rhizophora × lamarckii* has been suggested in the past (Tomlinson 1978, Tomlinson & Womersley 1976) with sterility, intermediate floral morphology and aberrant stamen numbers have supporting the theory. Duke and Bunt (1979) were sceptical about the hybrid origin but a recent worldwide genetic investigation has confirmed the hybrid status of this taxon (Duke pers. comm. 2005).

All known populations of *R. × lamarckii* in the NT co-occur with *R. stylosa* and *R. apiculata*, no fruit have been seen on any individuals. Further *R. × lamarckii* is morphologically intermediate between the two putative parents, while aberrant stamen numbers are commonplace. The fact that individual trees are often very large and have luxuriant foliage also supports hybrid origin.

Rhizophora stylosa produces flowers and fruit throughout the year. *Rhizophora apiculata* has been recorded flowering from February to November, and fruiting from March to October. *Rhizophora × lamarckii* has been recorded with buds and flowers from March to September.

Tomlinson (1986) suggested all *Rhizophora* are wind pollinated, he cites high pollen/ovule ratios, short pollen presentation time, lack of nectar secretion and downward pointing flowers (so that foliage does not obstruct pollen dispersal) as evidence to support wind pollination.

References: Ding Hou 1958, Duke and Bunt 1979, McCusker 1984.

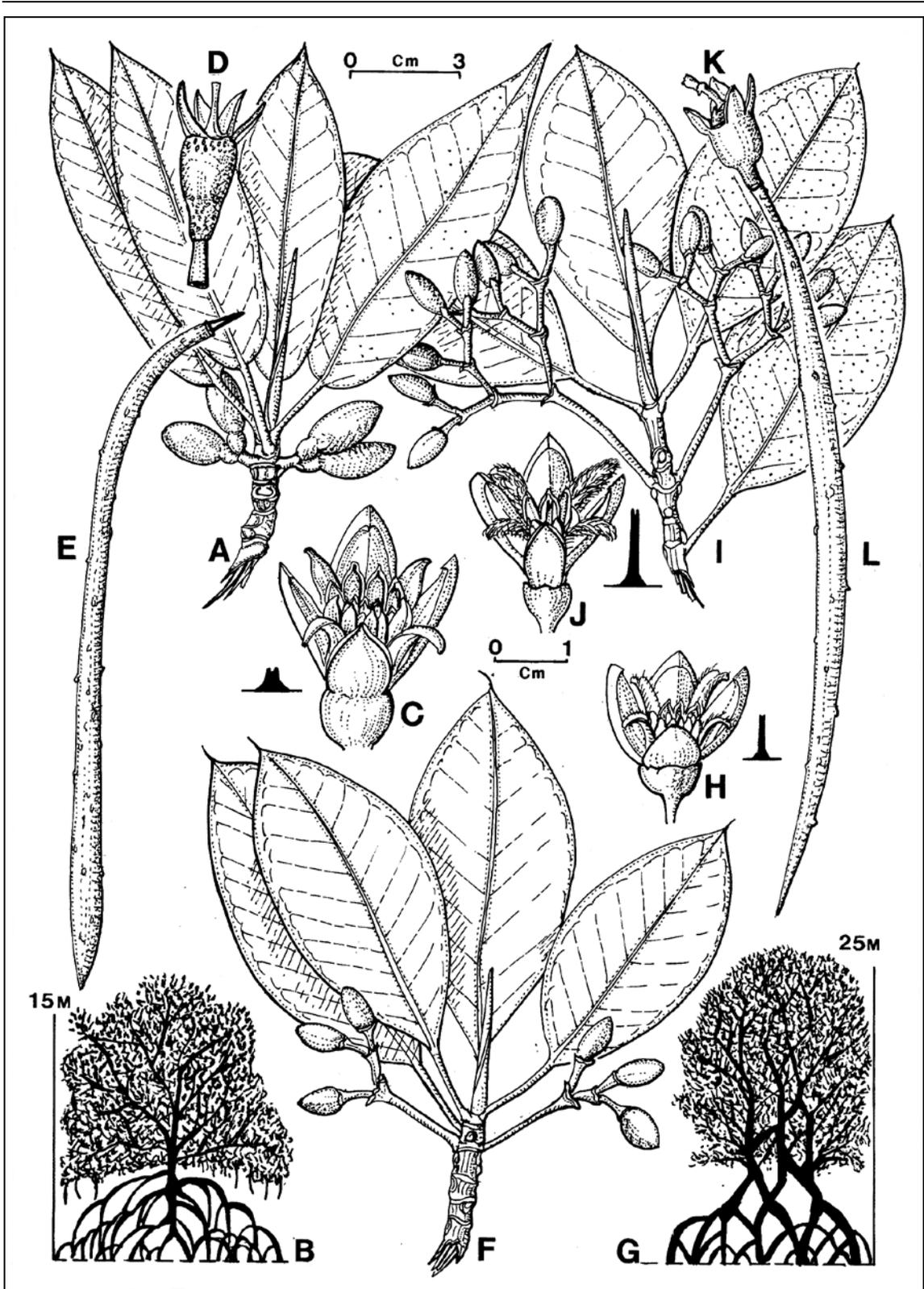


Figure 35. *Rhizophora*. A–E, *R. apiculata*. A, budding branch; B, habit; C, flower and style; D, fruit; E, hypocotyl (A–E, C. Dunlop 6840, DNA). F–H, *R. × lamarckii*. F, budding branch; G, habit; H, flower and style (F–H, G. Wightman 2101, DNA). I–L, *R. stylosa*. I, budding branch; J, flower and style; K, fruit; L, hypocotyl (I–L, G. Wightman 477, DNA).