

COMBRETACEAE

Trees, shrubs or lianas. Indumentum of simple hairs often present. Leaves exstipulate, simple, entire, opposite, spirally arranged or alternate. Domatia and glands often present. Flowers bisexual or male, 4-5-merous, actinomorphic, in axillary spikes or racemes, epigynous. Bracteoles present or absent. Hypanthium usually in 2 distinct parts, the lower surrounding and adnate to the inferior ovary with the upper part projecting to form a short or long tube terminating in the 4-5(8) calyx lobes. Petals 0, 4-5. Stamens usually twice as many as petals (when the latter are present), inserted inside calyx, in 2 series. Ovary unilocular, usually with 2-6 pendulous ovules. Fruit a drupaceous or dry pseudocarp, indehiscent, often winged or ridged, 1-seeded.

A family of 20 genera and 500 species, widespread in tropical and subtropical regions of the world. In Australia there are 6 genera including 1 introduced; 3 genera occur in the DR. [Byrnes, 1977a; Pedley, 1990].

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|----|--|------------|
| 1. | Vines; leaves opposite | Quisqualis |
| 1. | Trees or shrubs; leaves spirally arranged | 2 |
| 2. | Mangroves; bracteoles adnate on hypanthium | Lumnitzera |
| 2. | Savanna or monsoon forest trees; bracteoles absent | Terminalia |

LUMNITZERA Willd.

Small evergreen trees. Leaves spirally arranged, sessile or almost so, spatulate, clustered towards ends of branchlets, slightly fleshy, with a subapical gland on the ventral surface (sometimes obscure in *L. racemosa*), base tapering gradually, apex obtuse to emarginate. Flowers in racemes, 5-merous. Hypanthium rigid. Bracteoles persistent on ovary wall, midway along flower. Stamens 5-10, in 2 series, borne on inner wall of hypanthium, same colour and length as style and petals. Fruit dry, with a tough corky mericarp, dispersed by water. Calyx lobes and style persisting in fruit. Limb of persistent hypanthium striate.

Distributed through E Africa, Madagascar, Asia, northern Australia and Polynesia. In Australia, 2 species, both occurring in the NT and the DR. [Wightman, 1989]

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|----|--|-------------|
| 1. | Inflorescences terminal; flowers red | L. littorea |
| 1. | Inflorescences axillary; flowers white | L. racemosa |

L. littorea (Jack) Voigt

Tree to 13 m tall with dark grey, fissured bark, and with slender knee-like pneumatophores. Leaf blades slightly discoloured, 40-110 mm long, 7-22 mm wide. Inflorescence dense, terminal, 30-50 mm long. Calyx lobes c. 1.5 mm long; petals red, narrowly elliptic, c. 7 mm long; ovary 4-5 mm long. Fruit green, ellipsoid, c. 15 mm long, 4 mm diam., ribbed. Flowering: June - Dec; fruiting: Feb, July - Aug. Fig. 45

Northern Qld and the NT; outside Australia in tropical Asia and Polynesia. Uncommon in the DR, where known from Melville Is. and Cox Peninsula. Often growing in sandy freshwater seepages on the landward fringes of mangrove communities.

L. racemosa Willd.

Tree to 7 m tall, bark black, fissured, trunk often bearing adventitious roots at base during the wet season; roots lacking knee-like pneumatophores. All parts usually glabrous, but young leaves and buds sometimes with a soft indumentum. Leaf blades concolorous, 20-82 mm long, 10-25 mm wide, subapical gland sometimes obscure. Inflorescences axillary, 10-25 mm long. Calyx lobes broadly triangular, c. 1.5 mm long; petals white, elliptic to narrowly elliptic, c. 5 mm long. Fruit green, ovoid, 10-12 mm long, c. 4 mm diam. Flowering: most months; fruiting: Nov - Mar. Fig. 45

Distributed along the north coast of Australia from Broome to Moreton Bay and outside Australia from East Africa, Madagascar, through tropical Asia to Polynesia. Common in the DR. Usually

growing on the landward edges of mangrove communities on sand or mud where there is fresh-water seepage. Uses of the timber are listed by Wightman (1989).

QUISQUALIS L.

A genus of 17 species occurring in Africa and Asia. One introduced species is known from Australia and the DR.

**Q. indica* L.

A vigorous evergreen root suckering scrambler or vine. Lower bark reddish and fibrous. Branchlets with an indumentum of crisped, rusty coloured hairs. Leaves opposite, pellucid-dotted; petioles 5-7 mm long, rusty tomentose, partly persisting after fall of leaves and their bases forming thorns up to 15 mm long; blades elliptic, 45-90 mm long, 17-49 mm wide, varying from tomentose to nearly glabrous, base rounded to subcordate, apex acuminate. Flowers in terminal or axillary bracteate spikes, 5-merous, sweetly scented, the whole inflorescence minutely rusty tomentose. Hypanthium

60-68 mm long; calyx lobes broadly triangular, 1.5-3 mm long; corolla pink to white with red markings, turning red with age, lobes oblong, 11-20 mm long; stamens 10, the upper series exsert, the lower included. Fruit dry, ovoid to ellipsoid, with 5 longitudinal wings, to 40 mm long. Flowering: most months; rarely fruiting in the DR. Fig. 45

Rangoon Creeper

Widespread in the tropics and subtropics of the Old World; widely cultivated elsewhere. Commonly cultivated in Darwin and often persisting in areas of past habitation. A difficult plant to control because of its root suckering habit.

TERMINALIA L.

Trees, mostly deciduous, branching usually sympodial. Leaves spirally arranged, often crowded towards ends of branchlets, petiolate, often with glands and domatia. Flowers 5-merous, in axillary spikes, usually with male flowers towards apex and bisexual flowers towards base. Hypanthium short; calyx lobes deltoid or triangular; petals absent. Stamens 10, exserted. Fruit fleshy or dry and winged.

A genus of c. 200 species widely distributed through the tropics of the Old World. In Australia there are 29 native species of which 12 occur naturally in the DR. *Terminalia catappa*, *T. melanocarpa* and *T. bellirica* are cultivated in Darwin for shade; some local species (e.g. *T. microcarpa*, *T. erythrocarpa*) are also cultivated. Pedley's (1990) treatment differs in some detail to that given here. The following account more closely follows that of Byrnes (1977a).

Three mechanisms of dispersal (wind, water and animals) are evident in the Australian species. The fruit of species of sea coasts and river margins typically have spongy or corky outer layers adapting them for water dispersal (e.g. *T. catappa*, *T. erythrocarpa* and *T. platyphylla*). The small fleshy fruited *T. microcarpa* is well adapted for dispersal by frugivorous birds. The larger fleshy fruited species of open forest and woodland (e.g. *T. ferdinandiana*, *T. latipes* and *T. carpentariae*) are probably dispersed by larger birds such as emus and bower birds. The widespread *T. grandiflora* has a large fruit with a thick stony endocarp and may be dispersed by emus or in the past by now extinct megafauna. Species with winged fruit which typically live in savannas are wind dispersed (e.g. *T. platyptera*, *T. canescens* and *T. pterocarya*).

Various Australian species are used by humans. Three species have been tested for their food value (Miller et al., 1993). The kernel of Indian Almond (*T. catappa*) has a protein content of 20% and is used for food in many tropical countries. The kernels of *T. grandiflora* are of similar protein content. The fleshy fruit of *T. ferdinandiana* is high in vitamin 'C'; this species is now commercially available as Kakadu Plum jam. The flesh of *T. catappa*, *T. carpentariae* and *T. microcarpa* are eaten by Aboriginal people. [Coode, 1973; Byrnes, 1977a; Pedley, 1990].

KEY BASED ON LEAF CHARACTERS

1.	Plants <1 m high.....	<i>T. ferdinandiana</i>
1.	Plants >1 m high.....	2
2.	Leaf blades 7-14 times as long as wide.....	3
2.	Leaf blades <7 times as long as wide.....	4
3.	Leaves glabrescent or glabrous.....	<i>T. grandiflora</i>
3.	Leaves usually densely sericeous.....	<i>T. canescens</i>
4.	Young vegetative growth and older leaves glabrous (<i>T. erythrocarpa</i> sometimes sparsely hairy).....	5
4.	Young vegetative growth hairy, older leaves sericeous, glabrescent or glabrous.....	7
5.	Leaf blades >2.2 times as long as wide.....	<i>T. erythrocarpa</i>
5.	Leaf blades <2 times as long as wide.....	6
6.	Rachis of inflorescence and fruit tomentose.....	<i>T. latipes</i>
6.	Rachis of inflorescence and fruit glabrous.....	<i>T. ferdinandiana</i>
7.	Mature leaves densely and persistently tomentose or sericeous, at least below.....	8
7.	Mature leaves glabrous or glabrescent.....	12
8.	Leaves 4-8 times as long as wide.....	<i>T. canescens</i>
8.	Leaves 1-2 times as long as wide.....	9
9.	Domatia usually conspicuous and many; petiolar glands absent.....	<i>T. fitzgeraldii</i>
9.	Domatia inconspicuous, often absent; lateral glands present on petiole.....	10
10.	Leaves ± concolorous, older ones densely tomentose above.....	<i>T. carpentariae</i>
10.	Leaves discolorous, older ones glabrescent above.....	11
11.	Petiole usually <20 mm long.....	<i>T. platyptera</i>
11.	Petiole usually >20 mm long.....	<i>T. platyphylla</i>
12.	Leaves usually >200 mm long, narrowly cordate at base.....	<i>T. catappa</i>
12.	Leaves <200 mm long, not narrowly cordate at base.....	13
13.	Leaves concolorous.....	14
13.	Leaves discolorous.....	15
14.	Petiole usually >20 mm long.....	<i>T. fitzgeraldii</i>
14.	Petiole <20 mm long.....	<i>T. pterocarya</i>
15.	Petiole usually >20 mm long.....	<i>T. platyphylla</i>
15.	Petiole <20 mm long.....	16
16.	Domatia present.....	<i>T. microcarpa</i>
16.	Domatia absent.....	<i>T. volucris</i>

KEY BASED ON FRUIT CHARACTERS

1.	Plants <1 m high.....	<i>T. ferdinandiana</i>
1.	Plants >1 m high.....	2
2.	Fruit dry, broadly winged.....	3
2.	Fruit lacking wings, although sometimes flattened.....	6
3.	Wing on fruit of nearly even width, continuing around body; leaves concolorous.....	4
3.	Wing on fruit not of even width around body; leaves discolorous.....	5

4.	Older leaves densely tomentose, leaves 4-8 times as long as wide	<i>T. canescens</i>
4.	Older leaves glabrous to glabrescent, leaves <4 times as long as wide	<i>T. pterocarya</i>
5.	Fruit hairy, 50-120 mm wide including wing	<i>T. platyptera</i>
5.	Fruit glabrous, 20-70 mm wide including wing	<i>T. volucris</i>
6.	Leaves 7-14 times as long as wide	<i>T. grandiflora</i>
6.	Leaves <5 times as long as wide	7
7.	Fruit >50 mm long; leaves >140 mm long, narrowly cordate at base	<i>T. catappa</i>
7.	Fruit <50 mm long; leaves usually <140 mm long, base cuneate, truncate, attenuate or cordate	8
8.	Both rachis of inflorescence and fruit glabrous or very sparsely hairy	9
8.	Rachis of inflorescence (and often fruit) hairy	10
9.	Leaves >2 times as long as wide; fruit <10 mm diam., <20 mm long, red when mature	<i>T. erythrocarpa</i>
9.	Leaves <2 times as long as wide; fruit >11 mm diam., >21 mm long, yellow-green when mature	<i>T. ferdinandiana</i>
10.	Mature fruit glabrescent	11
10.	Mature fruit tomentose or sericeous	12
11.	Fruit <15 mm diam.; leaves discolorous	<i>T. platyphylla</i>
11.	Fruit >20 mm diam.; leaves concolorous	<i>T. fitzgeraldii</i>
12.	Fruit <18 mm long, thinly fleshy, sericeous	<i>T. microcarpa</i>
12.	Fruit >18 mm long, thickly fleshy, tomentose	13
13.	Leaves glabrous	<i>T. latipes</i>
13.	Leaves tomentose	<i>T. carpentariae</i>

T. canescens (DC.) Radlk.

An evergreen tree to 8 m tall. Bark brown-grey, plated. Petioles 4-28 mm long, densely sericeous. Leaf blades narrowly elliptic, elliptic, narrowly oblanceolate to oblanceolate, 28-75 mm long, 5-35 mm wide, L/W (2)4-8, usually densely sericeous, rarely glabrescent, 1-several domatia often present, base attenuate with a pair of indistinct lateral glands at the junction with the petiole, apex obtuse. Inflorescences 15-90 mm long. Fruit dry, winged, flattened, elliptic to obovate, 15-40 mm long, 11-21 mm wide overall, wing 3-8 mm wide. Flowering: Nov - Feb; fruiting: Mar - Sept. Fig. 45

WA, NT and Qld, from the northern Pilbara to the Gulf. Rare in the DR where known only from the south of the Region and from the Adelaide River/Litchfield area. In open woodlands on skeletal soils. The above description does not include *T. bursarina* F. Muell. which is synonymised under *T. canescens* by Pedley (1990).

T. carpentariae C.T.White

T. hadleyana subsp. *carpentariae* (C.T.White) Pedley

A deciduous tree usually c. 6 m tall, rarely to 15

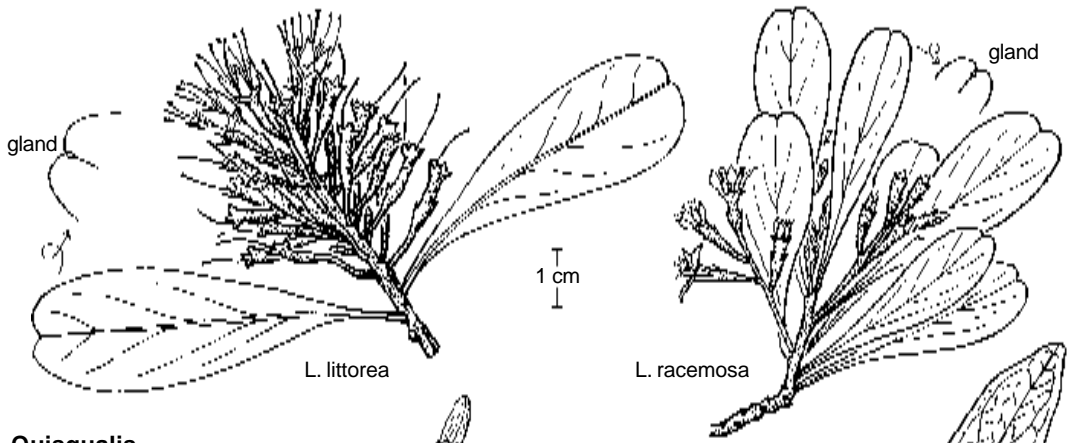
m. Bark grey, flaking to reveal pale orange-brown inner bark. All parts densely and persistently tomentose with brown (rarely white) hairs. Petioles 16-50 mm long, with a pair of conspicuous lateral glands. Leaf blades coriaceous, \pm concolorous, elliptic to broadly elliptic, orbicular, occasionally oblong or obovate, 50-160 mm long, 38-107 mm wide, L/W 1-2, domatia inconspicuous, base rounded, truncate or cordate, sometimes unequal, apex rounded to emarginate. Inflorescences 75-224 mm long. Fruit fleshy, yellow-green when ripe, ovoid to ellipsoid, 14-37 mm long, 12-15 mm diam., densely tomentose, sometimes with a short beak or angles. Flowering: Oct - Dec, with or just after the previous year's fruit ripens; fruiting: Sept - Nov. Fig. 45

In northern Australia, from the eastern Kimberley to the southern Gulf. In the DR relatively rare. Usually grows on skeletal soil on sandstone, but also on lateritic ridges and coastal sand dunes.

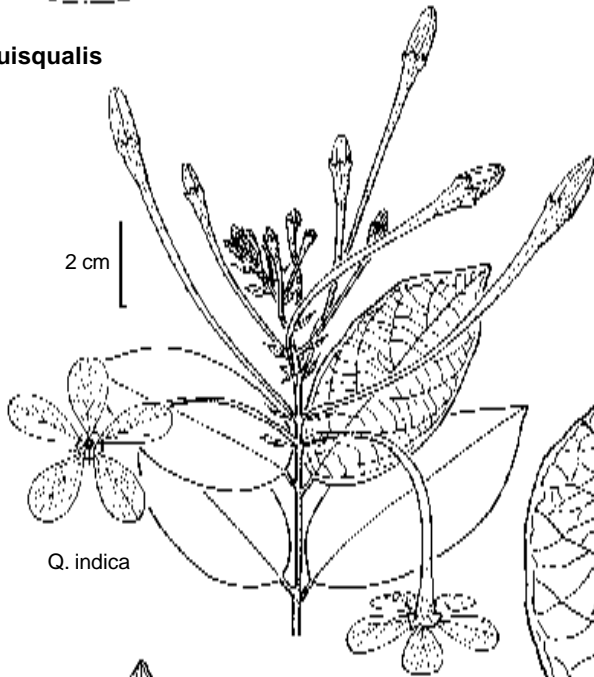
T. catappa L.

A deciduous tree to 15 m tall. Bark grey-brown, \pm smooth. Young growth brown sericeous, becoming glabrous with age. Petioles 5-15 mm long, densely

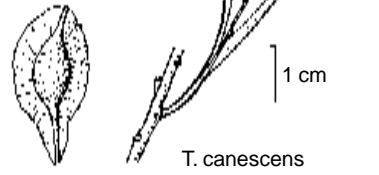
Lumnitzera



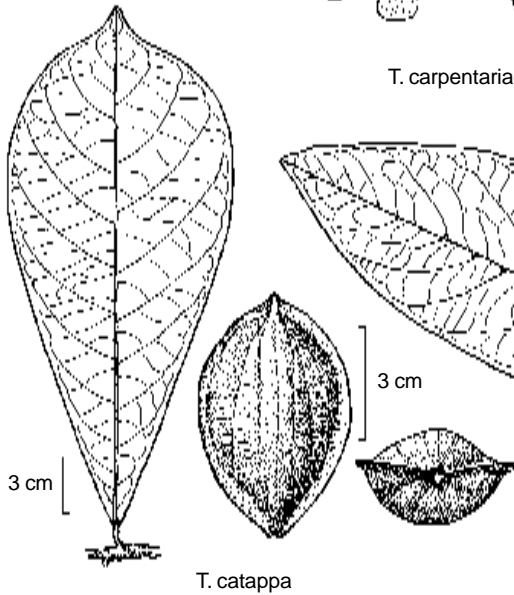
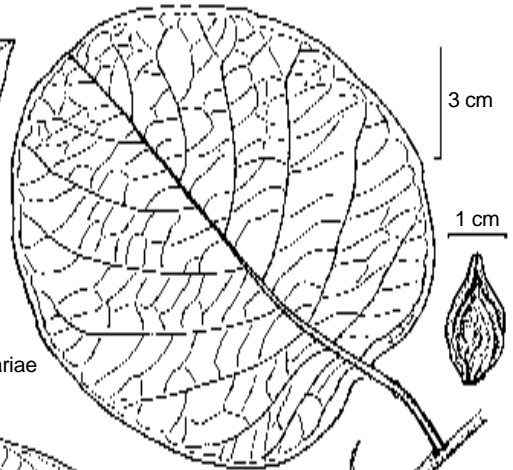
Quisqualis



Terminalia



T. carpentariae



T. erythrocarpa

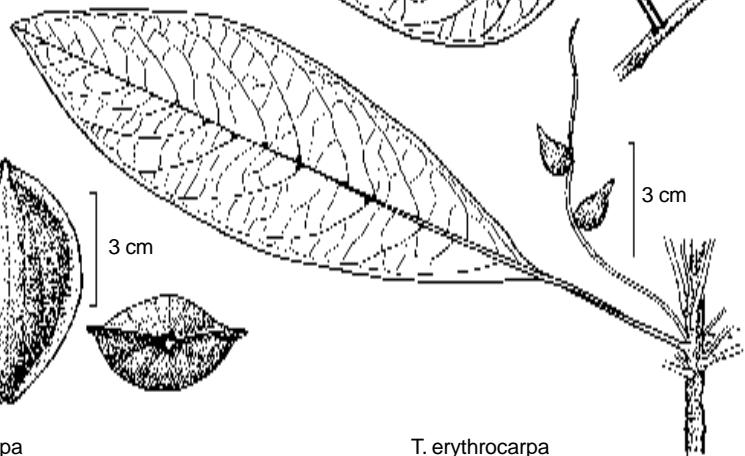


Fig. 45

brown sericeous. Leaf blades slightly discoloured, glossy above, obovate, 140-260 mm long, 106-145 mm wide, L/W 1.3-2.2, domatia many, base narrowly cordate, glands present at base of blade, apex obtuse to shortly acuminate. Inflorescences 70-200 mm long. Fruit yellow or red when ripe, firmly fleshy, compressed ellipsoid, 57-65 mm long, 37-42 mm wide, glabrous. Flowering: Oct - Feb; fruiting: Dec - Jan. Fig. 45

Indian Almond

Occurring naturally above beaches in India, SE Asia, Polynesia, eastern Arnhem Land and north Qld. Widely planted in the tropics. Cultivated in the DR. Coode (1973) mentions that the fruit of the New Guinea species is red while yellow fruited trees are regarded as cultivars.

T. erythrocarpa F.Muell.

A riverine tree to 6 m tall. Bark grey, flaked, finely fissured. All parts glabrous. Leaves crowded or widely spaced; petioles 17-70 mm long; blades slightly discoloured, narrowly elliptic, rarely broader or ovate, 90-225 mm long, 26-60 mm wide, L/W (1.9)2.3-4.2, domatia usually present, base cuneate, a pair of indistinct lateral glands present near junction of blade and petiole, margin slightly sinuate, apex acute. Inflorescences 4-140 mm long. Fruit fleshy, red when mature, ovoid, with a distinct beak, 14-20 mm long, 7-8 mm diam. Flowering: Oct - Jan; fruiting: Jan - June. Fig. 45

Endemic to the northern NT, from Victoria River to eastern Arnhem Land. Relatively common in the DR. A strictly riparian species, often growing with *Barringtonia acutangula* (L.) Gaertner, with which it is easily confused when sterile.

T. ferdinandiana Exell

T. latipes subsp. *psilocarpa* Pedley

A deciduous small tree to c. 7 m tall. Bark grey, irregularly tessellated. All parts glabrous. Petioles 12-118 mm long. Leaf blades strongly discoloured, subglaucous, broadly elliptic to broadly ovate, occasionally obovate, 110-330 mm long, 87-235 mm wide, L/W 1-1.7, domatia prominent, base truncate, a pair of (sub)opposite lateral glands present near junction of blade and petiole, apex rounded. Inflorescences 160-190 mm long, glabrous throughout. Fruit fleshy, yellow-green when mature, ovoid, ± flattened, 20-30 mm long, 12-18 mm wide, when immature beaked and with prominent lateral ridges. Flowering: Oct - Dec; fruiting: Apr - June. Fig. 46 Green Plum, Salty Plum, Kakadu Plum

In the NT north of 15°S, from central Arnhem Land to Broome in the Kimberley Region. Common in the

DR. Growing on better drained sites in Eucalypt communities, on a variety of soil types. Plants regenerating after fire frequently exist as low regrowth <1 m tall, and can flower and fruit at this size. These have been described as *T. prostrata* by Pedley (1990).

T. fitzgeraldii C.Gardner

A tree to 12 m tall. Bark dark grey, deeply tessellated. All vegetative parts sericeous (rarely glabrescent), with brown hairs. Petioles 15-42 mm long. Leaf blades concolorous, ovate to elliptic, rarely obovate to spatulate, 40-110 mm long, 27-73 mm wide, L/W 1.3-2, domatia usually conspicuous and many, base attenuate, apex obtuse to rounded, rarely acute. Young foliage often densely brown sericeous with a distinct sheen. Inflorescences 55-90 mm long. Fruit purple when ripe, fleshy, smooth, glabrescent, ovoid with a distinct beak, 30-40 mm long, 22-25 mm diam. Flowering: Sept - Dec; fruiting: Jan - June. Fig. 46

From the western Kimberley to the Top End, between Derby and the Alligator Rivers region. Uncommon in the DR. On clay soils on seasonally inundated floodplains. Sucker regrowth occurs after fire and can flower and fruit at ground level.

T. grandiflora Benth.

A deciduous tree to 14 m tall. Bark grey, deeply fissured. All parts brown sericeous when young. Foliage pendulous. Petioles 3-25 mm long. Leaf blades narrowly oblanceolate to narrowly elliptic, 40-130 mm long, 6-16 mm wide, L/W 7.2-13.9, sparsely sericeous, domatia usually present, irregular, clustered, glands absent, base tapered gradually, apex obtuse. Inflorescences 40-90 mm long. Fruit black and shiny, globular to ovoid, glabrous, 35-45 mm long, 22-28 mm wide, with a fine beak. Flowering: with the new growth, July - Oct; fruiting: Dec - Feb, occasionally later. Fig. 46

In the Kimberley and Top End from Broome to the Gulf of Carpentaria. Common in the DR. On deeper sandy soils in coastal and inland situations, often on the margins of broad drainage lines.

T. latipes Benth.

A deciduous tree to 10 m tall. Bark tessellated, grey, flaking to expose the orange inner bark. All parts glabrous except for the inflorescence. Petioles 15-60 mm long, with 1 or more pairs of lateral glands. Leaf blades broadly elliptic to broadly obovate, coriaceous, 77-200 mm long, 56-140 mm wide, L/W 1-1.7, domatia ± conspicuous, base truncate or shortly

tapered, apex obtuse to rounded. Inflorescences 60-170 mm long, with an indumentum of short tomentose brown hairs. Fruit fleshy, yellowish-green, ovoid, 22-40 mm long, 13-18 mm wide, with a persistent indumentum of short tomentose brown hairs, flattened and beaked when immature. Flowering: with the new growth during Sept - Oct; fruiting: immature fruit are held until they ripen in the following Sept - Oct. Fig. 46

In the Kimberley and the Top End, from Broome to eastern Arnhem Land and Vanderlin Is. In the southern part of the DR. Growing on skeletal soils on sandstone or quartzite.

T. microcarpa Decne
T. sericocarpa F.Muell.

A semideciduous or deciduous tree to 30 m tall. Bark black, fissured, hard. Young shoots brown sericeous to tomentose, becoming glabrous with age. Petioles 2-10 mm long, glands absent. Leaf blades discolorous, obovate to spatulate, occasionally elliptic, 40-160 mm long, 15-70 mm wide, L/W 1.5-3.1, sericeous to glabrous, domatia present, base cuneate to attenuate, apex obtuse to emarginate, often shortly acuminate. Inflorescences 35-114 mm long, sericeous. Fruit purple, thinly fleshy, flattened-ellipsoid, 11-14 mm long, 7-8 mm wide, sericeous. Flowering: Sept - Nov; fruiting: mainly Nov, but occasionally later. Fig. 46

New Guinea and Australia from the Kimberley to Qld, between Kalumburu and Rockhampton, mostly within 100 km of the coast. A monsoon forest species, common in the DR along streams and floodplain margins where there is moisture at least at depth. The fruit are a favourite with frugivorous birds; also palatable to humans. Byrnes (1977a) comments on the closeness of *T. sericocarpa* and *T. microcarpa* and after examination of material at Kew (by GJL and M. Coode) we are convinced that the two are synonymous.

T. platyphylla F.Muell.

A semideciduous tree to 10 m tall, rarely more. Bark grey, fissured. All parts softly tomentose. Petioles 17-50 mm long, bearing glands. Leaf blades slightly discolorous, coriaceous, elliptic to obovate, 74-195 mm long, 40-125 mm wide, L/W 1.1-2, becoming glabrescent above, domatia sometimes present, inconspicuous, glands present on the veins of the lamina, base attenuate to truncate, apex obtuse to broadly emarginate. Inflorescences 64-165 mm long. Fruit purple, thinly fleshy, narrowly ellipsoid, occasionally ovoid to obovoid, 20-40 mm long, 9-12

mm wide, including a narrow beak of 3-10 mm long, glabrescent. Flowering: Oct - Feb; fruiting: May - Sept. Fig. 46

Found across northern Australia north of 20°S latitude. Common in the DR; on banks of permanent and seasonal streams or occasionally on alluvium.

T. platyptera F.Muell.

A deciduous tree to 10 m. Bark grey, tessellated. All parts softly tomentose when young, becoming less hairy with age. Petioles 10-18 mm long, with a pair of lateral glands. Leaf blades coriaceous, discolorous, oblanceolate, obovate or elliptic, 35-95 mm long, 14-40 mm wide, L/W 1.5-3.5, undersurface with distinct, fine reticulate venation; usually tomentose when mature, at least below, domatia absent, base cuneate, often unequal, apex obtuse (occasionally emarginate). Inflorescences 50-150 mm long. Fruit 2-winged, yellow, body 20-28 mm long, including divaricate wings 59-115 mm wide, tomentose to sparsely tomentose. Flowering: Nov - Jan; fruiting: Apr - Sept. Fig. 46

From the eastern Kimberley to Qld. In the DR known only from near the Douglas R. Grows on a variety of soils, but often with a high clay content. Forms woodland and open woodland communities.

T. pterocarya F.Muell.

A slender evergreen tree to 5 m, sometimes in short coppicing stands. Bark brown-grey, plated. Branchlets pendulous. Petioles, base of leaves, young leaves and branchlets with a short adpressed indumentum which is sparse or absent on the older leaves. Petioles 5-18 mm long, tomentose. Leaf blades concolorous, elliptical, broadly elliptic to obovate, occasionally rhomboidal, 22-75 mm long, 10-50 mm wide, L/W 1.3-2.5, 1-several domatia often present, base attenuate with a pair of indistinct lateral glands at the junction with the petiole, apex obtuse to occasionally emarginate. Inflorescences 24-110 mm long. Fruit dry, winged, flattened, elliptic, 25-30 mm long, 11-20 mm wide overall, wing 7-10 mm wide. Flowering: most months but mainly Dec - Mar; fruiting: Mar - July. Fig. 46

Endemic to the Top End and common in the DR. On sandy soils along broad drainage lines or on alluvial soils near creeks. Closely related to *T. canescens*.

T. volucris R.Br. ex Benth.

T. oblongata subsp. *volucris* (R.Br. ex Benth.) Pedley

A deciduous tree to 7 m tall. Bark grey, tessellated, persistent. Young parts densely sericeous to tomentose, becoming glabrescent at maturity.

Terminalia

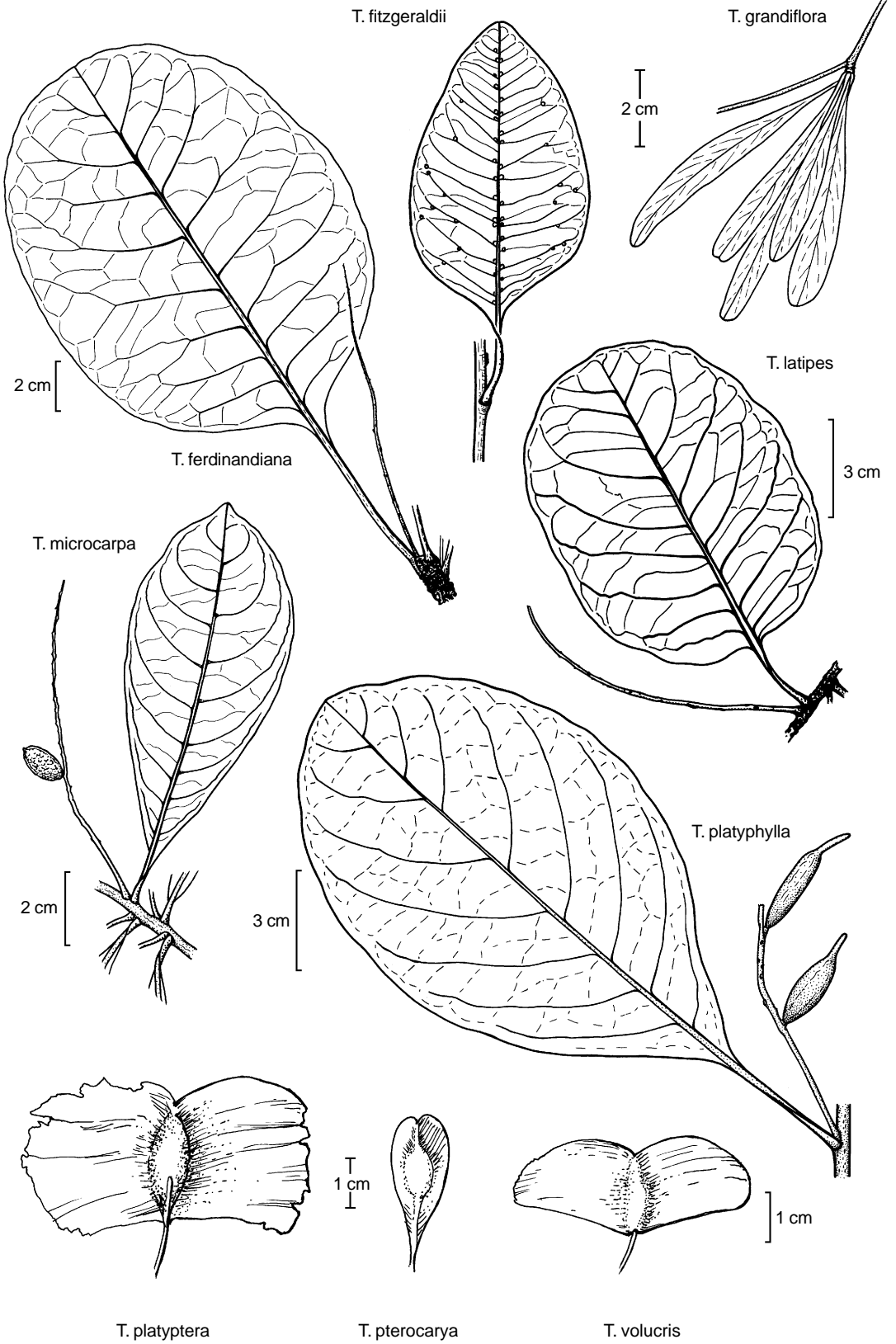


Fig. 46

