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EBENACEAE

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EBENACEAE

R.A. Kerrigan, I.D. Cowie & D.J. Dixon

Evergreen *trees* or shrubs, commonly dioecious; heartwood often black. *Stipules* absent. *Indumentum* of simple, 2-armed, branched, tufted or gland-tipped hairs. *Leaves* simple, alternate, rarely opposite, entire, often with distinct glands abaxially and occurring at base or along midrib. *Inflorescences* axillary, ramiflorous or cauliflorous, solitary or in small cymose clusters or fascicles. *Flowers* mostly unisexual, hypogynous. *Sepals* 3–8-lobed, connate at base, persistent in fruit. *Petals* 3–8-lobed, regular, connate at base, the lobes convolute, valvate or imbricate. *Male flowers* with a vestigial ovary. *Female flowers* often with staminodes. *Stamens* attached to the base of the corolla-tube or sometimes directly to the receptacle, usually twice as many as corolla lobes and in 2 whorls, but sometimes 4 or 5 times as many, paired and sometimes with filaments connate; anthers tetrasporangiate and dithecal, opening by longitudinal slits or apical pores. *Gynoecium* of 2–10 carpels united to form a compound, plurilocular ovary. *Styles* deeply cleft or almost so, or free. *Stigmas* usually well developed. *Ovules* 1 per locule. *Fruit* usually a juicy to leathery berry, rarely with a tardy dehiscence. *Seeds* up to 16, rarely 1, large, often ellipsoid or segment-shaped (like a quarter of an orange).

Consists of two genera, *Diospyros* and *Euclea*, and c. 500–600 species mostly distributed in the tropics of both hemispheres. Only *Diospyros*, to which almost all species belong, is found in Australia.

Some species of this family are used for their timber, e.g. Ebony (*D. ebenum*) from India and Sri Lanka, and others for their edible fruits, e.g. Persimmon (*D. virginiana*) from south-east U.S.A.

In more recent circumscriptions of the family the Lissocarpaceae are included in the Ebenaceae (e.g. Mabberley 2008).

Taxonomic references: Cronquist (1981); Wheeler (1992); Hyland *et al.* (2002); Sothers (2004); White & Verdcourt (1996); Wallnöfer (2004); Mabberley (2008).

DIOSPYROS L.

Trees or shrubs, with hard dark wood. *Inflorescences* axillary, supra-axillary, solitary or in cymes, dioecious. *Flowers* unisexual. *Sepals* erect to recurved. *Petals* imbricate and contorted in bud. *Male flowers*: stamens 2–many; filaments short, free or connate in pairs; rudimentary ovary present. *Female flowers*: staminodes absent to well developed; style usually free, rarely completely fused; stigma usually dilated and fleshy; ovary 4–10-celled. *Fruit* a berry. *Seeds* mostly ellipsoid or segment-shaped.

About 500–600 species mostly distributed in the tropical regions of both hemispheres but with a few from warm temperate zones. Perhaps 20 species native to Australia, with several undescribed entities recorded for Qld. Six species occur in the N.T., all of which are treated here.

Taxonomic references: Kostermans (1977); Kostermans (1981); Wheeler (1992); White & Verdcourt (1996); Hyland *et al.* (2002); Wallnöfer (2004).

- | | | |
|----|--|--------------------|
| 1 | Calyx strongly reflexed in mature fruit; leaves lacking sunken glands or if glands present, scattered across lower surface and leaves more than 54 mm long | 2 |
| 1: | Calyx clasping mature fruit; at least some leaves with paired sunken glands at base of midrib on lower leaf surface, if glands scattered leaves less than 54 mm long | 4 |
| 2 | Lower leaf surface with medifixed uneven armed hairs (requires high magnification as hairs may appear basifixed under $\times 10$); sepals 3 | D. compacta |
| 2: | Lower leaf surface with basifixed hairs or hairs absent; sepals 4 | 3 |

- 3 Mature fruit *c.* 15–17.5 mm long, 12.4–18 mm diam.; leaves evergreen, lower surfaces with appressed basifixed hairs **D. calycantha**
- 3: Mature fruit *c.* 20 mm long, 25–30 mm diam.; leaves deciduous, lower surfaces with short erect or hooked hairs **D. rugosula**
- 4 Lower leaf surface lacking sunken glands or glands scattered (including at base); petiole with erect hairs; fruit 5–10.6 mm diam. **D. humilis**
- 4: Lower surface of at least some leaves with paired sunken glands at base of midrib; petiole with appressed hairs; fruit 6.5–30 mm diam. **5**
- 5 Leaves dull, 2.5–11.5 cm long, hairs if present medifixed; mature fruit 6.5–14 mm diam. **D. littorea**
- 5: Leaves glossy, 6–21 cm long, hairs if present basifixed; mature fruit 12–30 mm diam. **D. maritima**

Diospyros

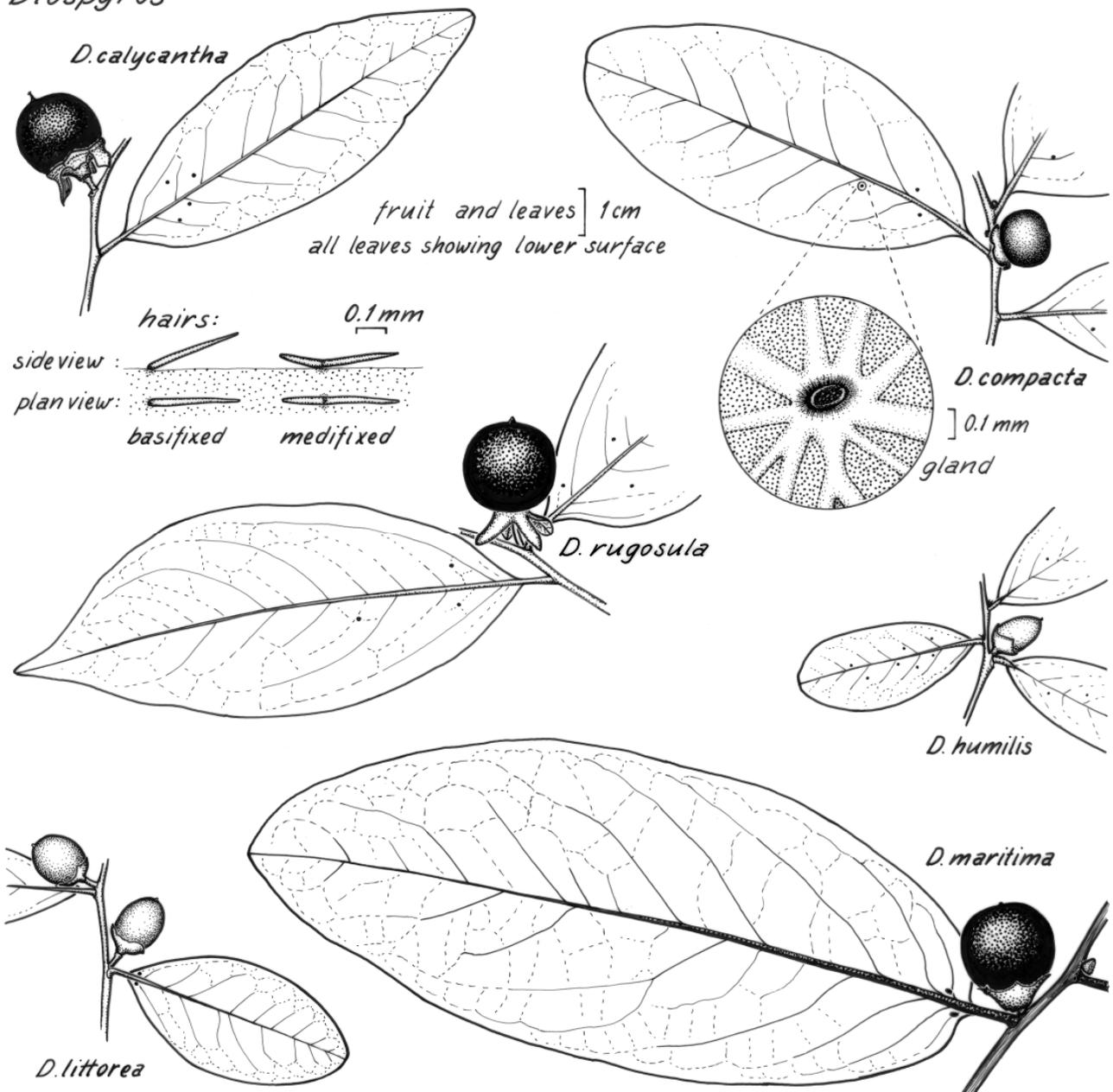


Fig. 1

D. calycantha O. Schwarz

Shrub or tree to 15 m. *Bark* mottled grey, occasionally basally buttressed or fluted. *Young branches* and shoots with short erect hairs, glabrescent. *Petiole* 2–6 mm long, with short erect hairs and occasionally long appressed basifixed hairs. *Lamina* elliptic to widely elliptic, ovate to lanceolate, obovate or rarely orbicular, 2–15.2 cm long, 1.2–6.6 cm wide, base cuneate to rounded, apex rounded or acute to acuminate, coriaceous; upper surface glabrescent, with sparse short erect hairs concentrated along base of midrib; lower surface glabrescent, with sparse long basifixed hairs, occasionally with a few scattered glands. *Inflorescence* axillary, solitary or few-flowered. *Male flowers*. *Sepals* 4, *c.* 2.5–2.8 mm long, connate. *Petals* 4, *c.* 8.9–10 mm long, connate for $\frac{1}{2}$ – $\frac{3}{4}$ their length, constricted at base; lobes reflexed, fleshy, white or cream. *Stamens* 10–18, dimorphic, to *c.* 6.6 mm long; anthers with a prominent mucro at apex and a black connective. *Female flowers*. *Sepals* 4, *c.* 2.5–2.8 mm long, connate for half their length, very widely ovate, spreading. *Petals* 4, *c.* 7 mm long, connate for half their length, constricted at base, white or cream; lobes reflexed. *Ovary* *c.* 2.5 mm long. *Style* *c.* 3 mm long. *Stigma* obscurely lobed. *Fruit* solitary, depressed-globular to ellipsoid, 15–17.5 mm long, 12.4–18 mm diam., maturing orange to red; calyx persistent, strongly reflexed, densely hairy on inner surface. *Seeds* segment-shaped, *c.* 10–14 mm long, *c.* 3–8 mm wide, brown, rugose. *Flowering & fruiting*: throughout the year.

Fig. 1 (*Cowie* 506; *Martenz* AE193); Pl. 1–2 (unvouchered).

New Guinea and Australia (W.A., N.T., Qld). In the N.T. it occurs from Victoria River east to Groote Eylandt and is common in the D.R. Grows in coastal vine forest, riparian forest, monsoon vine forest, and *Allosyncarpia* forest on a variety of substrates.

D. compacta (R. Br.) Kosterm.

Shrub or tree to 15 m. *Bark* smooth mottled grey to tessellated black. *Young branches* and shoots with medifixed uneven armed hairs and short erect hairs, glabrescent. *Petiole* 1.5–8 mm long, with medifixed hairs and short erect hairs. *Lamina* narrowly elliptic, ovate to lanceolate, obovate or rarely orbicular, 1.8–12 cm long, 1.8–6.5 cm wide, base cuneate to rounded, apex emarginate to obtuse, coriaceous; upper surface glabrescent with sparse short erect hairs concentrated along base

of midrib; lower surface glabrescent, with sparse medifixed uneven armed hairs, occasionally with 1–4 light brown to yellow glands scattered across lamina or rarely at base. *Inflorescence* axillary, solitary or few-flowered racemes or cymes. *Male flowers*. *Sepals* 3, *c.* 3.5–6 mm long, connate for half their length. *Petals* 3, *c.* 6.2–8 mm long, connate for $\frac{1}{2}$ – $\frac{3}{4}$ their length, white or cream; lobes with a villous patch of hairs on the outer surface. *Stamens* 5–8, *c.* 3.5 mm long. *Female flowers* with perianth as per male flower. *Ovary* *c.* 2 mm long, densely hairy. *Style* stout, *c.* 0.5–1 mm long. *Stigma* with erect lobes. *Fruit* solitary, depressed-globular, 8–13 mm long, 8–13 mm diam., maturing orange to yellow red; calyx persistent, strongly reflexed and densely hairy on the inner surface. *Seeds* segment shaped, *c.* 5–7 mm long, *c.* 4–5 mm wide, brown, rugose. *Flowering*: May, Sept.–Dec. *Fruiting*: Nov.–Mar.

Fig. 1 (*Russell-Smith* 4826); Pl. 3 (unvouchered).

Australia (W.A., N.T., Qld). In the northern N.T. ranges from the Daly River east to Groote Eylandt. Grows in coastal vine forest, riparian forest, mangrove edges and spring-fed rainforests on a variety of substrates.

D. humilis (R. Br.) F. Muell.

Shrub or tree to 15 m. *Bark* tessellated, black to grey. *Young branches* and shoots with short erect hairs and long appressed medifixed hairs with a very short arm, glabrescent. *Petiole* 2–6 mm long, glabrescent, with short erect hairs and occasionally long appressed medifixed hairs. *Lamina* elliptic to widely elliptic, obovate to widely obovate, 1.2–5.4 cm long, 1.0–3.2 cm wide, base obtuse to cuneate, apex rounded to acute or emarginate, coriaceous; upper surface glabrescent, with sparse short erect hairs concentrated along midrib; lower surface glabrescent, with appressed medifixed hairs with a very short arm, glands absent or occasionally with 1–4 (11) scattered across lamina. *Inflorescence* axillary, solitary or few-flowered racemes or cymes. *Male flowers*. *Sepals* 3 or 4, *c.* 2.5 mm long, connate to about half their length, densely villous on outer surface. *Petals* 3 or 4, *c.* 5 mm long, connate for half their length, fleshy, white or cream. *Stamens* 9, 6 in outer whorl, 3 in inner whorl, all to *c.* 3 mm long. *Female flowers*. *Sepals* 3, *c.* 3.5–4.5 mm long, connate for two-thirds their length, finely puberulous. *Petals* 3, *c.* 5–5.2 mm long, connate for half their length, white or cream. *Ovary* *c.* 1–2.6 mm long. *Stigma* more or less sessile, 3 branches, hairy at base. *Fruit* solitary,

spheroidal to broadly ellipsoid, 10–14.2 mm long, 5–10.6 mm diam., maturing yellow to orange; calyx persistent, glabrous, clasping fruit. *Seeds* segment-shaped, *c.* 7.5 mm long, *c.* 5.5 mm wide, brown, rugose. *Flowering:* recorded Apr., May, Oct. & Nov. *Fruiting:* throughout the year.

Fig. 1 (Cowie 2255).

New Guinea and Australia (W.A., N.T., Qld). Widely distributed in the northern N.T., from Victoria River east to Groote Eylandt and Wollongorang. Grows in coastal vine forest, riparian forest, monsoon vine forest, open woodland, shrubland and adjacent mangroves on a variety of substrates.

D. littorea (R. Br.) Kosterm.

Shrub or tree to 15 m, rarely with pneumatophores. *Bark* smooth, grey. *Young branches* and shoots with medifixed hairs, glabrescent. *Petiole* 2–6 mm long, with appressed medifixed hairs. *Lamina* elliptic to narrowly elliptic or obovate to oblanceolate, 2.5–11.5 cm long, 1.2–5.5 cm wide, base cuneate, apex emarginate to obtuse; upper surface glabrescent, with scattered medifixed hairs, and sparse short simple hairs occasionally scattered along midrib; lower surface glabrescent, with medifixed hairs, with 1–3 sunken black glands either side of midrib at base of lamina. *Inflorescence* axillary, solitary or few-flowered. *Male flowers* few-flowered racemes or cymes. *Sepals* 3, *c.* 4 mm long, connate for half their length. *Petals* 3, *c.* 6 mm long, connate for half their length, with a villous patch of hairs on the outer surface of the lobes, white or cream. *Stamens* 6–9, sessile, anthers *c.* 2.5 mm. *Female flowers*, perianth as per male flowers. *Ovary* *c.* 1.5 mm long. *Stigma* with 3 triangular, erect lobes. *Style* stout, *c.* 0.8–1.5 mm long, with hairs at base. *Fruit* solitary, globular, ellipsoid, 11–16.8 mm long, 6.5–14 mm diam., maturing yellow to red; calyx persistent, clasping fruit. *Seeds* 5 or 6, segment-shaped, *c.* 7–10 mm long, *c.* 4 mm wide, brown, rugose. *Flowering:* June–Dec. *Fruiting:* throughout the year.

Fig. 1 (Brock 752); Pl. 4 (unvouchered).

Thailand to New Guinea and Australia (W.A., N.T., Qld). In the N.T. found from the Daly River east to the Sir Edward Pellew Islands. Grows in coastal vine forest, riparian forest, mangrove edges and spring-fed rainforests on a variety of substrates from wet clay to sand.

D. maritima Blume

Tree to 13 m. *Bark* black to grey, often blotched. *Young branches* and shoots with short appressed basifixed hairs, glabrescent. *Petiole* 5–12 mm long, with appressed basifixed hairs. *Lamina* ovate to lanceolate or elliptic to narrowly elliptic, 5.9–21 cm long, 2.3–9.5 cm wide, base acute or obtuse or rarely rounded, apex acute to obtuse, coriaceous; upper surface glabrous, glossy; lower surface glabrescent, with sparse appressed basifixed hairs, 2 sunken black glands either side of midrib at base of lamina. *Inflorescence* supra-axillary, solitary or few-flowered. *Male flowers.* *Sepals* 4, *c.* 3.2–4.6 mm long, connate throughout. *Petals* 4, *c.* 9–15 mm long, connate for three-quarters their length, lobes strongly reflexed, densely pilose on outer surface of lobes, white or cream. *Stamens* 14–22, connate in pairs, apparently in 2 whorls, *c.* 3–5 mm. *Female flowers* not seen. *Fruit* solitary, globular to depressed-globular, 12–30 mm diam., maturing black; calyx persistent, clasping fruit. *Seeds* segment-shaped, *c.* 10.4–13 mm long, *c.* 5.3–7.5 mm wide. *Flowering:* Nov.–Feb. *Fruiting:* throughout the year.

Fig. 1 (Booth 506; Russell-Smith 5446); Pl. 5 (unvouchered).

Indonesia, Timor, New Guinea and Australia (W.A., N.T., Qld). Widely distributed across the coastal regions of the N.T., extending from Daly River east to Groote Eylandt. Usually growing in coastal vine forest, and monsoon vine forest on coastal sand, coral rubble or sandy loam.

D. rugosula R. Br.

D. bundeyana Kosterm.
D. cordifolia auct. non Roxb.
D. montana auct. non Roxb.

Shrub or tree to 7 m, rarely seen as a scandent shrub, deciduous. *Bark* smooth, grey to black. *Young branches* and shoots with short erect to hooked hairs and long straight basifixed hairs, glabrescent. *Petiole* 1.5–7 mm long, short erect to hooked hairs and long straight basifixed hairs, glabrescent. *Lamina* elliptic to narrowly elliptic, ovate or rarely orbicular, 1–11 cm long, 1–5 cm wide, base cuneate to rounded or rarely cordate or truncate, apex acuminate to obtuse, soft and papery; upper surface puberulous or occasionally glabrescent, with short erect hairs often just on midrib; lower surface puberulous to occasionally glabrescent, with short erect or hooked hairs, glands 1–6 and scattered across lamina. *Inflorescence* axillary, solitary or few-flowered, bracteoles

present. *Male flowers* in few-flowered racemes or cymes. *Sepals* 4, *c.* 2 mm long, connate at base to half way. *Petals* 4, *c.* 5–8 mm long, connate for half their length; lobes imbricate, white or cream. *Stamens* 14–16, connate in pairs, dimorphic to *c.* 3–4 mm long; anthers shortly mucronate at apex. *Female flowers* solitary. *Sepals* 4, *c.* 5–7 mm long, connate for one-quarter their length, very widely ovate. *Petals* as in male flower, apex of lobes with tuft of hairs. *Staminodes* 4. *Ovary* pyramidal, *c.* 2.2 mm long. *Style* *c.* 0.4 mm long. *Stigma* 4-branched. *Fruit* solitary, globular, *c.* 19 mm long, *c.* 25–30 mm diam., pale yellow to red; calyx persistent, strongly reflexed and puberulous on both surfaces. *Seeds* segment-shaped, *c.* 8–15 mm long, *c.* 3–5 mm wide, brown, rugose. *Flowering*: Oct.–Dec. *Fruiting*: throughout the year.

Fig. 1 (*Booth 1615; Cowie 7944*); Pl. 6 (unvouchered).

Australia (W.A., N.T.). Widely distributed across the Top End of the N.T., from Judbarra (Gregory)

N.P. east to Borroloola. Grows in coastal vine forest, riparian forest, monsoon vine forest, and *Allosyncarpia* forest on a variety of substrates.

The name *D. rugosula* is used here for the north Australian material since it is based on a type from this region. However, Australian material comes close to *D. montana* Roxb. from Indonesia and Timor and further investigation of the relationship between this taxon as well as the south-east Asian *D. cordifolia* Roxb. is needed. The former name represents a wider species concept than *D. rugosula* and the name *D. cordifolia* an even wider one (L.W. Jessup, *pers. comm.*, Mar. 2007).

The type specimen of *D. bundeyana* comes from Mt Bundey in the N.T. and was separated by Kosterman (1977) from *D. cordifolia* by the fruiting calyx and pustular fruit, but the fruit are too crushed in the type to allow effective comparison. It is currently regarded as a synonym of *D. rugosula*.

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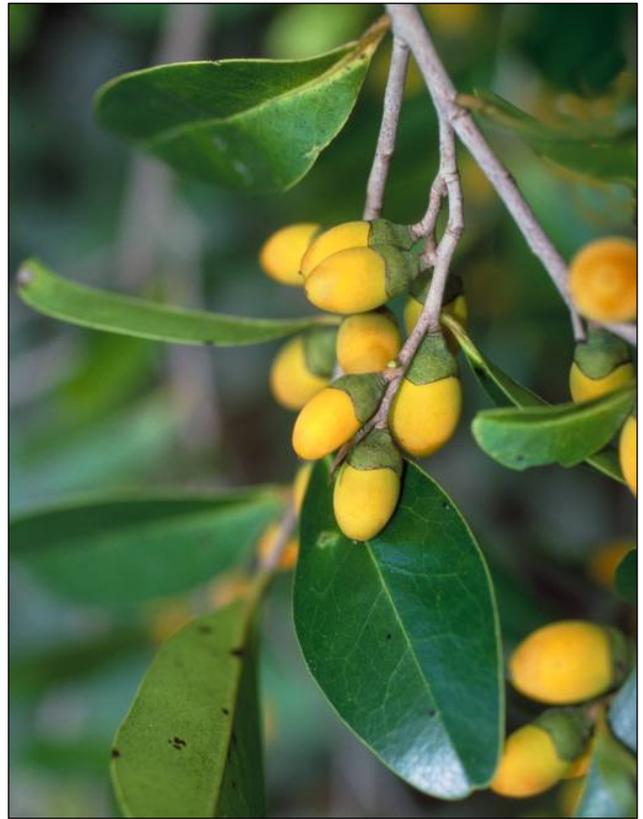
Pl. 1 *Diospyros calycantha* (Photo: I.D. Cowie)



Pl. 2 *Diospyros calycantha* (Photo: B.M. Stuckey)



Pl. 3 *Diospyros compacta* (Photo: NT Herbarium)



Pl. 4 *Diospyros littorea* (Photo: G.M. Wightman)



Pl. 5 *Diospyros maritima* (Photo: B.M. Stuckey)



Pl. 6 *Diospyros rugosula* (Photos: B.M. Stuckey)