Bothalia 30,2: 143–146 (2000)

FSA contributions 17: Casuarinaceae

C.M. WILMOT-DEAR*

Genera 3(or 4) with about 90 species native to Australia, S.E. Asia and Polynesia; many widely cultivated. One species, behaving as if indigenous in Madagascar and the East coast of tropical Africa is thought to be self-sown from sea-borne Pacific fruits, since infructescences can survive long periods of salt water immersion; this same species has more recently become naturalized in southern Africa. The family is easily distinguished by the '*Equisetum*-like' green deciduous branchlets unlike those of any other tree.

1855000 CASUARINA

Casuarina *L.*, Amoenitates academicae seu dissertationes variae physicae 4: 143 (1759); Adans.: 481, 543 (1763); G.Forst. & J.R.Forst.: 105, t. 52 (1776); Friis: 499 (1980); Wilmot-Dear: 1 (1985); Wilmot-Dear & M.G.Gilbert: 262 (1989); K.L.Wilson & L.A.S.Johnson: 100 (1989); Wilmot-Dear: 116 (1991). Type species: *C. equisetifolia* L.

Allocasuarina L.A.S.Johnson: 73 (1982); K.L.Wilson & L.A.S.Johnson: 110 (1989) (see note below).

Trees, dioecious, rarely monoecious. *Branches* of two kinds: main persistent woody branches bearing deciduous, little-branched, green, thin ± flexible branchlets. *Leaves* on both types of branch reduced to whorls of triangular scales united at base, midribs decurrent to lower node giving ribbed or grooved appearance to internode; leaf whorls alternating at consecutive nodes; on persistent branches leaves becoming separated as stem thickens. *Inflorescences* with closely-spaced, alternating whorls of bracts similar to scale leaves. *Male inflorescences* terminal on deciduous branches (rarely also axillary on woody stems), spicate, cylindrical but tapering to sterile basal region; flowers sessile and solitary in axils of bracts, enclosed by pair of lateral membranous-scarious bracteoles; perianth segments 1 or 2 (anterior and posterior), membranous, concave, enclosing single stamen and falling as stamen develops; mature anther exserted. *Female inflorescences* axillary towards apex of woody branches, short-stalked or ± sessile, globose or ovoid; bracteoles as in male; perianth 0; ovary 1-locular with short terminal style; stigmas 2, long, slender, well exserted at maturity. *Infructescence* cone-like and woody due to enlargement and thickening of accrescent bracts and bracteoles, the latter much the larger (often with dorsal protuberance) and forming a pair of 'valves' enclosing fruit in a 'cell'. *Fruit* a seed-like samara, compressed, dark brown-black and shiny or pale grey-fawn and rather dull, bearing large ± translucent wing with single longitudinal nerve excurrent at apex. *Seed* ovoid, somewhat flattened laterally, narrowly acute at apex, embedded in spongy air-filled tissue.

A genus of ± 75 species, distribution as for family; many widely cultivated as ornamentals and (especially in the past) for timber; one, much-used for soil stabilization in coastal area, now naturalized in parts of southern Africa.

Fifty-nine species, comprising all those with dorsally thickened fruit valves and dark shiny seeds and including all the shrubs, are now separated into a new genus, *Allocasuarina* L.A.S.Johnson (1982); for the sake of consistency with other African floras a broad concept of *Casuarina* is retained here. Keys and very full descriptions of both genera are given in Wilson & Johnson (1989).

Key to cultivated species and hybrids

1a Ribs on both deciduous and persistent branches 4; scale leaves broadly triangular, free part 0.3–0.6 mm long and wide, adpressed; stigma yellowish; infrutescence cells 5 per whorl, separated by 7–10 mm of muricately-patterned surface formed from dorsal thickening of valves:
2a Deciduous branchlets 5–6 mm diam., strongly 4-angled ..... *C. decussata*
2b Deciduous branchlets 3–4(5) mm diam., almost terete ..... *C. torulosa*
1b Ribs on deciduous branchlets (6)7–many; scale leaves on persistent branches narrowly triangular, at least 1 mm long, ± reflexed; stigma red; infructescence cells (6)7–9 per whorl, dorsal thickening where present rarely as above:
3a Infructescence cells 6 or 7 per whorl, separated by 4–6 mm of muricate or irregularly rugose surface formed from dorsal thickening of valves; ribs on deciduous branchlets 6 ..... *C. fraseriana*
3b Infructescence cells (6)7–9 per whorl, separated by 4 mm or less, dorsal thickening where present never as above; ribs on deciduous branchlets (6)7–15:
4a Deciduous branchlets with 14 or 15 ribs; scale leaves adpressed, free for 0.5–0.7 mm; samaras brownish, not shiny ..... *C. glauca*
4b Deciduous branchlets with (6)7–10 ribs; scale leaves and samaras various:
5a Deciduous branchlets 0.8–1 mm diam.; leaf tips free for 1.0–1.3 mm; samaras dark brown, shiny ..... *C. verticillata*
5b Deciduous branchlets 0.4–0.6(–0.9) mm diam.; leaf tips free for 0.3–0.7 mm; samaras various:
6a Infructescence valves with large, triangular, transverse, dorsal ridge ± 1 mm high; samaras rich red-brown, shiny; male inflorescence 0.5 mm or less diam., whorls hardly overlapping, axis stalk often visible between; scale leaves and male bracts ± uniformly pale ..... *C. littoralis*

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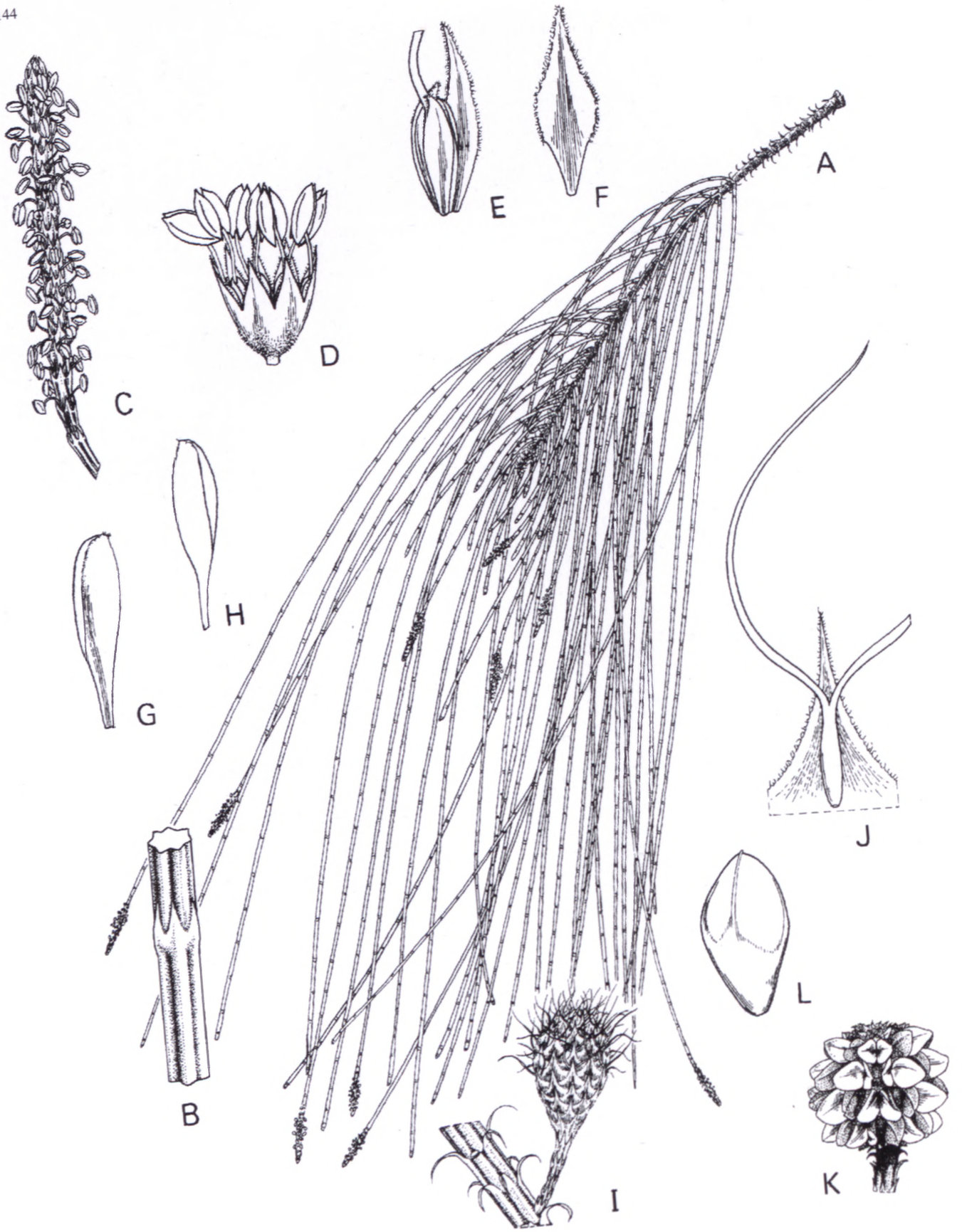

FIGURE 1.—*Casuarina equisetifolia*. A, flowering branch, × 0.8; B, portion of deciduous branchlet showing whorl of scale leaves, × 9.6; C, male inflorescence, × 3.6; D, whorl of male flowers, × 12; E, male flower showing bract, bracteoles and perianth (anther removed), × 24; F, male bract, × 24; G, male bracteole, × 24; H, male perianth segment, × 24; I, portion of woody branch with female inflorescence, × 3.6; J, female flower, × 24; K, infructescence, × 2.4; L, samara, × 6. A–H, *Ward 1331*; I–K, *Stapleton 9398*; L, *H. Haig 2364*. (Reproduced with the permission of the Director, Royal Botanic Gardens, Kew. Artist: Eleanor Catherine).

6b Infructescence valves not dorsally thickened nor transversely ridged; samaras pale, not shiny; male inflorescence whorls usually crowded and overlapping; scale leaves various:
7a Scale leaves uniformly pale; internodes with prominent angled ribs; infructescence valve apices free for 1.5–3.0 mm, backs longitudinally wrinkled or ridged . . . . . *C. equisetifolia*
7b Scale leaves with distinct transverse brown band; internodes with inconspicuous rounded ribs; infructescence valves various:
8a Deciduous branchlets long, (110–)330–540 mm, and robust, 0.6–0.9 mm diam., ribs 9; infructescence valve apices free if at all up to 1 mm, backs thus not easily visible . . . . . *C. junghuhniana*
8b Deciduous branchlets usually comparatively short, 90–200(–250) mm, and thin, 0.4–0.6(–0.8) mm diam., ribs various; infructescence valve apices free for 2–3 mm, backs easily visible:
9a Deciduous branchlets 0.4–0.6 mm diam. with 7–9 ribs; infructescence valve backs with several irregular longitudinal wrinkles . . . . . *C. cunninghamiana*
9b Deciduous branchlets 0.7–0.8 mm diam. with 10–13 ribs; infructescence valve backs with single longitudinal ridge . . . . . *C. cunninghamiana* × *?obesa*

Casuarina equisetifolia *L.*, Amoenitates academicae seu dissertationes variae physicae 4: 143 (1759); Engl.: 159 (1895); C.H.Wright: 315 (1917); Battiscombe: 68 (1926); Battiscombe: 83 (1936); Brenan: 122 (1949); Williams: 182, photo opp. p. 135 (1949); Cufod.: 2 (1953); Dale & Greenway: 130, t. 26, photo 26 (1961); Hutch.: 142 (1967); J.H.Ross: 147 (1972); R.A.Dyer: 29 (1975); Wilmot-Dear: 5 (1985); Wilmot-Dear & M.G.Gilbert: 262 (1987); Wilmot-Dear: 120 (1991). Type: Rumph., Herb. Amb. 3(4), t. 57 (1743).

Tree 7–25 m tall, monoecious; bark grey-brown. *Deciduous branchlets* 0.5–0.7 mm diam., ribs 7 or 8, angled, prominent. *Scale leaves* (6)7 or 8 per whorl, greenish or straw-coloured; on persistent branches free to 2–3 mm, thickly chartaceous, much reflexed, pubescent; on deciduous branchlets (0.4–)0.5–0.7 mm, thinly chartaceous, adpressed, glabrous, margin ciliate. *Male inflorescences* 10–30(–40) × 1.2–2.0 mm (excluding anthers), whorls 15–25; bracts adpressed, 1.1–1.8 × 0.4–0.5 mm, pubescent outside; bracteoles ovate, 0.7–1.0 × 0.3 mm, acute, erose-dentate-ciliate. *Perianth* segments 2, up to 0.7 × 0.4 mm, rounded. *Filaments* exserted 1.5 mm; anthers 0.8–1.0 mm, long, brownish. *Female inflorescences* 3–5 mm long; stalk 3–10 mm long; bracts as male. *Stigmas* exserted 3–4 mm, red. *Infructescence* shortly cylindrical-subglobose, apex flattened, 8–17(–25) × 10–16 mm; whorls (6–)8 or 9(–12); valves 7 or 8 per whorl, 1.5–3.2 mm wide (but smaller and fewer towards apex), ± obovate, acute to mucronate, apical 1.5–3.0 mm free, gap between pairs 0.5–1.0 mm, valve backs with 2(3) longitudinal ridges. *Samaras* pale brown, dull, 5–7 mm long, to 1 mm thick; wing 3.5–4.5 × 2–3 mm (those from small valves smaller). *Seeds* slightly over $^1/_4$ length of whole fruit. Figure 1.

Naturalized on coast of southeastern KwaZulu-Natal in sandy areas and on seashore; also planted in Mpumalanga and Eastern Cape to stabilize coastal dunes and as an ornamental street tree. Very ancient introduction (fruits ?sea-borne, self sown; see note on p. 143 above) in coastal East Africa and Madagascar; indigenous in Malaysia, Australasia and Polynesia; cultivated widely throughout the world in tropical and warm temperate regions. Figure 2.

The nodular roots fix nitrogen.

Vouchers: *Ross 2306* (NH); *Van der Meulen 1682* (PRE); *Ward 1331* (NU).

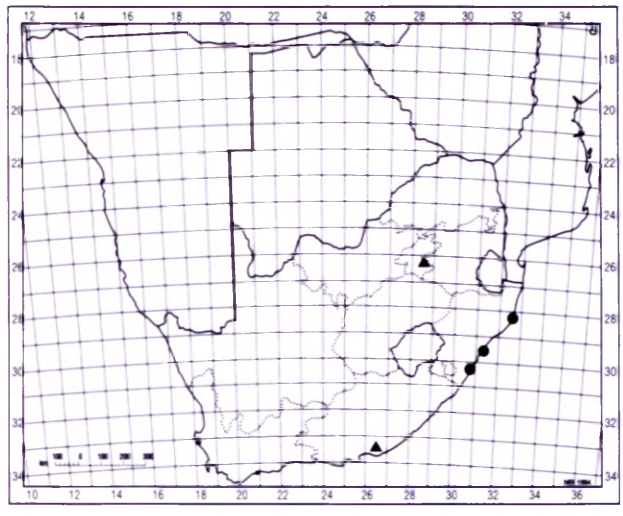

FIGURE 2.—Distribution of *Casuarina equisetifolia*: naturalized, ●; cultivated, ▲.

Ornamental species and hybrids of cultivated origin

C. cunninghamiana Miq.

Deciduous branchlets 0.4–0.6 mm diam., ribs 7–9, inconspicuous. *Scale leaves* free for 0.3–0.5(–0.6) mm, 0.1–0.2 mm wide with distinct dark red-brown band. *Male inflorescences* 1.0–1.5 mm diam.; bracts adpressed. *Infructescences* ovoid, 8–12 × 7–10 mm; valves with several irregular longitudinal fine wrinkles. *Samaras* pale brown, dull. Cultivated in Pretoria and Johannesburg in Gauteng, Cape Town in Western Cape and Grahamstown in Eastern Cape.

A hybrid between *C. cunninghamiana* and *C. equisetifolia*, which is not in the key, with prominent ribs but dark-banded scale leaves, has been cultivated in Namibia (Ombangua, Bethanie), Johannesburg, and in and near Cape Town.

A hybrid of *C. cunninghamiana*, possibly with *C. obesa* Miq. or *C. glauca* Miq. (see 9b of key), with deciduous branchlets 0.7–0.8 mm. diam., ribs 10–13 very inconspicuous, scale leaves as in *C. cunninghamiana*, male inflorescences ± 2 mm diam. with adpressed bracts, and infructescences up to 18 × 12 mm with valve backs bearing single well-defined off-central dorsal ridge, has been cultivated in Cape Town, Knysna and Johannesburg; it is also widespread in Ethiopia.

C. decussata Benth. = *Allocasuarina decussata* (Benth.) L.A.S.Johnson

Tree very similar to *C. torulosa* (see below) but deciduous branchlets 5–6 mm diam., strongly angled with very prominent ribs. Cultivated in Cape Town.

C. fraseriana Miq. = *Allocasuarina fraseriana* (Miq.) L.A.S.Johnson

Deciduous branchlets 0.8–1.0 mm diam.; ribs 6, conspicuous. *Scale leaves* ± reflexed, free for 0.6–0.8 mm, 0.2–0.3 mm wide, straw-coloured. *Male inflorescences* ± 1 mm diam., whorls little-overlapping. *Infructescences* cylindrical, 20–30 × 15–25 mm, cells separated widely by dorsal protuberances as in *C. torulosa*. Cultivated in Cape Town.

C. glauca Sieber ex Spreng.

Deciduous branchlets 0.7–0.9 mm diam.; ribs 14 or 15, inconspicuous. *Scale leaves* adpressed, free for 0.5–0.7 mm, ± 0.15 mm wide, banded as in *C. cunninghamiana*. *Male inflorescences* ± 2 mm diam., bracts ± reflexed, free for 1.6–2.0 mm, banded as leaves. *Infructescences* cylindrical or depressed-ovoid, 10–15 × 10–15 mm, valve backs, where visible, with several fine longitudinal ridges. *Samaras* pale brownish, dull. Cultivated near Pretoria and in parts of Cape (Simonstown, Port Elizabeth, Queenstown).

C. junghuhniana Miq. = *C. montana* Miq.

Deciduous branchlets 0.6–0.9 mm diam., ribs 9. *Scale leaves* free for 0.5–0.6 mm, 0.2–0.25 mm wide with distinct dark red-brown band. *Male inflorescences* 1.3–1.5 mm diam.; bracts adpressed. *Infructescences* spherical to elongate- or depressed-ovoid, valve backs hardly visible, often with 1 or 2 longitudinal ridges. *Samaras* light brown, dull. Cultivated in Cape Town.

C. littoralis Salisb. = *C. suberosa* Otto & Dietr. = *Allocasuarina littoralis* (Salisb.) L.A.S.Johnson

Deciduous branchlets 0.5 mm diam.; ribs 8 often prominent. *Scale leaves* free for ± 0.7 mm, 0.2 mm wide, straw-coloured (in dry state), apex sometimes indistinctly darkened. *Male inflorescences* up to 0.5 mm diam., axis often visible between widely spaced whorls. *Infructescences* long-cylindrical, valve backs with large transverse ridge-like protuberances. *Samaras* rich red-brown, shiny. Cultivated in Northern Province, Johannesburg in Gauteng, Pietermaritzburg in KwaZulu-Natal, and near Cape Town in Western Cape.

C. torulosa Aiton = *Allocasuarina torulosa* (Aiton) L.A.S.Johnson

Deciduous branchlets resembling permanent ones, 0.3–0.4(–0.5) mm diam., almost terete since ribs not well-marked; ribs 4. *Scale leaves* broadly triangular, free part 0.3–0.4 mm long and wide. *Male inflorescences* up to 0.6 mm diam., axis often visible between well-spaced whorls. *Infructescences* cylindrical or depressed-ovoid, 15–22 × 15–18 mm; cells separated very widely by large dorsal protuberances forming a regularly and deeply muricate-patterned surface. *Samaras* very dark brown, shiny. Cultivated in Empangeni (eastern KwaZulu-Natal), parts of Eastern Cape and near Cape Town.

C. verticillata Lam. = *C. quadrivalvis* Labill. = *C. stricta* Aiton = *Allocasuarina verticillata* (Lam.) L.A.S. Johnson

Deciduous branchlets, 0.8–1.0 mm diam., ribs 9–10, inconspicuous. *Scale leaves* somewhat reflexed, free for 1.0–1.3 mm , ± 0.2 mm wide, rather indistinctly darkening towards apex. *Male inflorescences* 2–3 mm diam., whorls often little-overlapping. *Infructescences* ovoid-elongate, 20–35 × ± 20 mm; valve backs much thickened, sometimes with small, ± triangular dorsal thickening near base, usually irregularly longitudinally wrinkled. *Samaras* as in *C. torulosa*. Cultivated near Johannesburg, Cape Town, Port Elizabeth, Grahamstown, and Pietermaritzburg.

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