

JOURNAL of the ADELAIDE BOTANIC GARDENS

AN OPEN ACCESS JOURNAL FOR AUSTRALIAN SYSTEMATIC BOTANY

flora.sa.gov.au/jabg

Published by the

STATE HERBARIUM OF SOUTH AUSTRALIA

on behalf of the

BOARD OF THE BOTANIC GARDENS AND STATE HERBARIUM

© Board of the Botanic Gardens and State Herbarium,
Adelaide, South Australia

© Department of Environment, Water and Natural Resources,
Government of South Australia

All rights reserved

State Herbarium of South Australia
PO Box 2732
Kent Town SA 5071
Australia



Board of the
Botanic Gardens and
State Herbarium



NOTES ON CASUARINACEAE II

L.A.S. Johnson

National Herbarium of New South Wales,
Royal Botanic Gardens, Sydney, N.S.W. 2000

Abstract

Allocasuarina L. Johnson, gen. nov., is recognised as separate from *Casuarina sens. strict.* and 40 combinations at specific and subspecific level are made under the new genus. *Casuarina grandis* L. Johnson and *C. oligodon* L. Johnson are described together with a new subspecies, *C. oligodon* ssp. *abbreviata* L. Johnson, and *C. equisetifolia* ssp. *incana* (Benth.) L. Johnson, *stat. nov.* In *Gymnostoma*, combinations are made for 11 species.

This paper formally establishes the new genus *Allocasuarina*, together with new combinations for all those described taxa that will be recognised in the revision of Casuarinaceae at present being completed. Various new taxa will be described therein, but it is necessary to provide descriptions here for two species and a subspecies that will be treated in a booklet on uses of *Casuarina* and allied genera being prepared as a result of the International *Casuarina* Workshop held in Canberra in August, 1981.

The publication of *Allocasuarina* will permit use of this name in the forthcoming new edition of Flora of South Australia, Part II. Detailed discussion of generic and infra-generic relationships and distinctions within the family must await publication of the revision, as must distributional details, keys, illustrations, nomenclatural discussion, and listing of synonyms and collections.

The family comprises four genera: *Gymnostoma* L. Johnson (Johnson 1980), "genus C" to be described (confined to Malesia), *Casuarina* Adans. s. str., and *Allocasuarina* L. Johnson. They are briefly discussed by Johnson and Wilson (1981), and our account of the family in Morley and Toelken (in press) gives a synopsis of the three genera native in Australia.

All types and isotypes cited have been examined in the herbaria named unless otherwise indicated.

ALLOCASUARINA L. Johnson

Allocasuarina L. Johnson, gen. nov.

Arbores vel frutices. Bracteolae infructescentiae plus minusve incrassatae protuberationibus dorsalibus saepe praeditae. Corpus samarae maturae castaneum vel fuscum vel nigrescens. Chromosomata maiora quam eis generis *Casuarinae*, $x = 10, 11, 12, 13, 14$.

Species typica: *A. torulosa* (Ait.) L. Johnson

Young persistent branchlets usually but not always distinguished from the deciduous branchlets; branchlets 4-13-ribbed, intercostal furrows deep, concealing the stomates as in *Casuarina*. Male flowers in simple short to long spikes, which in the flowering region are usually distinctly different from the vegetative branchlets. Female inflorescences as in *Casuarina*. Infructescences ("cones") borne amongst or below the assimilatory branchlets, pedunculate or sessile; bracts thin in the exposed portion, not vertically expanded; bracteoles considerably thickened and often divided so that the dorsal portion forms one or more distinct protuberances. Body of samara brown to black. Chromosomes $x = 10, 11, 12, 13$ or 14 , larger than in *Casuarina*.

About 46 species, chiefly in the southern part of Australia but four species extending to NE. Queensland and one in tropical and subtropical parts of the eremaeian region, usually on soils markedly deficient in nutrients.

The name is from Greek 'allos' = 'other', and *Casuarina*, which was first used by Rumphius (1743, p. 87) in allusion to the supposed resemblance of the "foliage" of *C. equisetifolia* to the plumage of the Cassowary, the name of the latter being latinised as *Casuaris*.

Allocasuarina acuaria (F. Muell.) L. Johnson, comb. nov.

Casuarina acuaria F. Muell., Fragm. 6: 16 (1867), basionym.

LECTOTYPE (here designated): Western Australia: in Australia occidentali, *Drummond 241* (MEL), ♀ infructescences. Isolectotypes: CAMB, K, LE, P.

Allocasuarina acutivalvis (F. Muell.) L. Johnson, comb. nov.

Casuarina acutivalvis F. Muell., Fragm. 10: 61 (1876), basionym.

HOLOTYPE: Western Australia: ad fontes Victoriae, *Young*, 30.ix.1875 (MEL), ♀ infructescence.

Allocasuarina acutivalvis* ssp. *prinsepiana (C. Andrews) L. Johnson, comb. et stat. nov.

Casuarina prinsepiana C. Andrews, J. West Aust. Nat. Hist. Soc. 1: 43 (1904), basionym.

HOLOTYPE: Western Australia: Mullewa, *C. Andrews*, vii.1903 (PERTH), ♀.

Allocasuarina campestris (Diels) L. Johnson, comb. nov.

Casuarina campestris Diels in Engler, Bot. Jahrb. 35: 126 (1905), basionym.

LECTOTYPE (Johnson 1972): Western Australia: Watheroo, *Diels 2038*, 31.xii.1900 (B), ♀ infructescences.

Allocasuarina campestris* ssp. *eriochlamys (L. Johnson) L. Johnson, comb. nov.

Casuarina campestris ssp. *eriochlamys* L. Johnson, Nuytsia 1: 264 (1972), basionym.

HOLOTYPE: Western Australia: Comet Vale, *J.T. Jutson 255*, viii.1917 (NSW), ♀.

Allocasuarina campestris* ssp. *grossa (L. Johnson) L. Johnson, comb. nov.

Casuarina campestris ssp. *grossa* L. Johnson, Nuytsia 1: 264 (1972), basionym.

HOLOTYPE: Western Australia: 5½ miles (9 km) N. of Norseman, *L. Johnson W177*, 18.xii.1960 (NSW), ♀ infructescences. Isotype: PERTH.

Allocasuarina corniculata (F. Muell.) L. Johnson, comb. nov.

Casuarina corniculata F. Muell., Fragm. 10: 62 (1876), basionym.

HOLOTYPE: Western Australia: prope montem Churchmanii, *Young*, 1875 (MEL), ♀ infructescences. Isotype: B.

Allocasuarina decaisneana (F. Muell.) L. Johnson, comb. nov.

Casuarina decaisneana F. Muell., Fragm. 1: 61 (1858), basionym.

HOLOTYPE: Western Australia: juxta Mount Mueller, *Mueller* (MEL—not found), ♀. Isotype: K (vegetative).

This is a distinctive species and readily recognised from vegetative material.

Allocauarina decussata (Benth.) L. Johnson, comb. nov.*Casuarina decussata* Benth., Fl. Austral. 6: 200 (1873), basionym.HOLOTYPE: Western Australia: towards Cape Riche, *Drummond 5th coll. n. 434* (K), ♂, ♀ infructescences. (monoecious species). Isotypes: FI, LE, MEL.**Allocauarina dielsiana** (C.A. Gardner) L. Johnson, comb. nov.*Casuarina dielsiana* C.A. Gardner, J. Roy. Soc. West. Australia 22: 119 (1936), basionym.HOLOTYPE: Western Australia: summit of Mt. Singleton, *C.A. Gardner 2218*, 9.vii.1931 (PERTH), ♀ infructescences. Isotype: B.**Allocauarina distyla** (Vent.) L. Johnson, comb. nov.*Casuarina distyla* Vent., Jard. Cels: 62, t. 62 (1800), basionym.LECTOTYPE (here designated): presumably New South Wales (but recorded as "Cap de Diémen"), cult. Jardin de Cels, *herb. Ventenat* (G—not seen), ♀ infructescences. Isotypes: K, P; fragment NSW ex G.

The species represented by the type material does not occur in Tasmania, hence there must be an error in the locality recorded by Ventenat (Johnson in Curtis 1967).

Allocauarina drummondiana (Miq.) L. Johnson, comb. nov.*Casuarina drummondiana* Miq., Rev. Cas.: 26, t. I (1848), basionym.HOLOTYPE: Western Australia: Swan River, *Drummond in Hb. Hook.* (K). Isotype: U.**Allocauarina fibrosa** (C.A. Gardner) L. Johnson, comb. nov.*Casuarina fibrosa* C.A. Gardner, J. Roy. Soc. West. Australia 13: 61 (1928), basionym.HOLOTYPE: Western Australia: in distr. Avon prope Tammin, *C.A. Gardner*, ix.1926 (PERTH), ♀ infructescences and inflorescence. Isotype: MEL.**Allocauarina fraseriana** (Miq.) L. Johnson, comb. nov.*Casuarina fraseriana* Miq., Rev. Cas.: 59, t. VI D (1848), basionym.LECTOTYPE (here designated): Western Australia: in arenosis sylvae circa oppidum Perth, *Preiss 2000*, 9.iv.1840 (U), ♀ infructescence. Isolectotypes: B, LE, MEL, W.An amendment made to the International Code of Botanical Nomenclature at Sydney in 1981 requires the epithet in cases such as this to be spelled "-eriana", etc. Determinations made by me under earlier editions of the Code, as "*fraserana*", should thus be corrected.**Allocauarina grevilleoides** (Diels) L. Johnson, comb. nov.*Casuarina grevilleoides* Diels in Engler, Bot. Jahrb. 35: 130 (1905), basionym.HOLOTYPE: Western Australia: in distr. Avon ad Moore River in collium quos vocant Babilon Hills, *Diels 4019*, 30.viii.1901 (B), ♂, ♀ (monoecious).**Allocauarina helmsii** (Ewart & Gordon) L. Johnson, comb. nov.*Casuarina helmsii* Ewart & Gordon, Proc. Roy. Soc. Victoria 32: 192 (1920), basionym.LECTOTYPE (here designated): Western Australia: Gnarlbine, *Helms*, 12.xi.1891 (MEL), ♀ infructescences. Isolectotypes: K, LE, MEL.

Allocasuarina huegeliana (Miq.) L. Johnson, comb. nov.

Casuarina huegeliana Miq. in Lehm., Pl. Preiss. 1: 640 (1845), basionym.

LECTOTYPE (here designated): Western Australia: inter fragmenta rupium ad latus orientale montis Brown, distr. York, *Preiss 2006* p.p., 5.ix.1839 (U), ♂ Isolectotypes: BR, C, FI, K, L, LE, MEL, P, S. Lectoparatype: *Preiss 2006* p.p. (LE), ♀.

Miquel describes male and female material for *Preiss 2006* but only a male specimen could be found in U.

Allocasuarina humilis (Otto & Dietr.) L. Johnson, comb. nov.

Casuarina humilis Otto & Dietr., Allg. Gartenzeitung 9: 163 (1841), basionym.

HOLOTYPE: (presumably Western Australia): in Nova Hollandia,—(B), ♂ ♀ inflorescence (monoecious species).

It is endemic in south-western Australia.

Allocasuarina inophloia (F. Muell. & F.M. Bailey) L. Johnson, comb. nov.

Casuarina inophloia F. Muell. & F.M. Bailey, Chem. & Druggist Australas. Suppl. 4: 92 (1882), basionym.

LECTOTYPE (here designated): Queensland: no locality (MEL), sterile, with bark and with Mueller's manuscript description and a letter from Bailey (12.1881) to Mueller in which the cones are described. Possible syntypes: BRI, K, MEL.

Allocasuarina lehmanniana (Miq.) L. Johnson, comb. nov.

Casuarina lehmanniana Miq. in Lehm., Pl. Preiss. 1: 639 (1845), basionym.

LECTOTYPE (here designated): Western Australia: in solo sublimoso distr. Hay, *Preiss 2005*, 7.xi.1840 (U), ♀. Isolectotypes: LE, MEL.

Allocasuarina littoralis (Salisb.) L. Johnson, comb. nov.

Casuarina littoralis Salisb., Prodr.: 2 (1796), basionym.

HOLOTYPE: New South Wales: Botany Bay, *Banks & Solander* (BM). Isotypes: NSW, P.

Allocasuarina luehmannii (R.T. Baker) L. Johnson, comb. nov.

Casuarina luehmannii R.T. Baker, Proc. Linn. Soc. N.S.W. 24: (1900), basionym.

LECTOTYPE: To be designated in the revision in preparation; there will be no change in the application of the name. The syntypes are from New South Wales.

Allocasuarina microstachya (Miq.) L. Johnson, comb. nov.

Casuarina microstachya Miq. in Lehm., Pl. Preiss. 1: 642 (1845), basionym.

LECTOTYPE (here designated): Western Australia: in arenosis planitiei haud longe a praedio rustico Maddington distr. Perth, *Preiss 1999*, 2.xi.1839 (U), ♂ Isolectotypes: B, BR, L, MEL, P, PR, S.

Allocasuarina monilifera (L. Johnson) L. Johnson, comb. nov.

Casuarina monilifera L. Johnson in Curtis, Student's Fl. Tasmania 3: 651 (1967), basionym.

HOLOTYPE: Tasmania: Tasman Arch, Eaglehawk Neck, *L. Johnson NSW 62593*, 15.i.1949 (NSW), ♂ Isotype: HO.

Allocasuarina muelleriana (Miq.) L. Johnson, comb. nov.*Casuarina muelleriana* Miq., Nederl. Kruidk. Arch. 4: 99 (1856), basionym.HOLOTYPE: South Australia: in monte Torrens, Lofty Ranges, *F. Mueller* viii.1850 (U), ♀ infructescence. Isotype: MEL.See note on orthography under *A. fraseriana*; similar considerations apply here.**Allocasuarina nana** (Sieber ex Spreng.) L. Johnson, comb. nov.*Casuarina nana* Sieber ex Spreng., Syst. 3: 804 (1826), basionym.HOLOTYPE: (presumably New South Wales): Nova Hollandia, *Sieber 328* (B), ♂. Isotypes: BR, C, FI, K, L, LE, MEL, P, PR, S.

Sieber probably collected the type material in the Blue Mountains, or just possibly in the area of the Royal National Park.

Allocasuarina paludosa (Sieber ex Spreng.) L. Johnson, comb. nov.*Casuarina paludosa* Sieber ex Spreng., Syst. 3: 803 (1826), basionym.HOLOTYPE: (The locality would be in N.S.W.): Nova Hollandia, *Sieber 329* (B), ♂, ♀ (the species is generally monoecious). Isotypes: BR, C, FI, K, L, LE, MEL, PR.**Allocasuarina paradoxa** (Macklin) L. Johnson, comb. nov.*Casuarina paradoxa* Macklin, Kew Bull.: 150 (1931), basionym.LECTOTYPE (Johnson in Curtis 1967): Victoria: Cheltenham, *Audas*, v.1925 (AD), ♀ infructescences. Isolectotype: K.

The type material is unlikely to have been collected by Macklin despite some apparent duplicates in various herbaria bearing her numbers. In her paper (Macklin, 1927, p. 275), she says "The material from which the above description and figures were taken was collected at Cheltenham, Victoria, and made available to me through the kindness of Messrs. Audas and Morris, of the National Herbarium of Melbourne".

Specimens of this species have largely been determined by me as "*C. pusilla* ssp. *robusta*" or "*C. pusilla* ssp. *miserata*". Apart from a few collections from the southern Mount Lofty region of South Australia (Mount Compass, Myponga, Upper Hindmarsh Valley, Inman Hills) that are referable to *A. robusta* (q.v.), all such specimens belong to one or other of the forms of the variable *A. paradoxa*, and the specific determinations should be corrected. Some southern Mount Lofty material is indeed *A. paradoxa*. Distinctions will be given by Johnson & Wilson, *Flora S. Austral.*, ed. 3. Part II.**Allocasuarina pinaster** (C.A. Gardner) L. Johnson, comb. nov.*Casuarina pinaster* C.A. Gardner, J. Roy. Soc. West. Australia 27: 166 (1941), basionym.LECTOTYPE (here designated): Western Australia: Kukerin, *Gardner 1732* (PERTH—not seen but there is no doubt of its identity). Possible isolectotype: NSW.**Allocasuarina pusilla** (Macklin) L. Johnson, comb. nov.*Casuarina pusilla* Macklin, Trans. Roy. Soc. South Australia 51: 272 (1927), basionym.LECTOTYPE (here designated): South Australia: Encounter Bay, *Macklin 020*, I.vii.1927 (AD), ♀ infructescences. Isolectotypes: BRI, K, MEL, NSW.Specimens of this species have largely been determined by me as "*C. pusilla* ssp. *pusilla*". These determinations should be corrected. For material determined under other supposed subspecies see the notes on *A. paradoxa* and *A. robusta*.

Allocasuarina ramosissima (C.A. Gardner) L. Johnson, comb. nov.

Casuarina ramosissima C.A. Gardner, J. Roy. Soc. West. Australia 47: 54 (1964), basionym.

HOLOTYPE: Western Australia: in distr. Avon prope Dandaragan, *Gardner 9013* (PERTH), ♀ infructescences—(not seen but there is no doubt of its identity).

Allocasuarina rigida (Miq.) L. Johnson, comb. nov.

Casuarina rigida Miq., Rev. Cas.: 61, t. VII D (1848), basionym.

LECTOTYPE (Johnson in Curtis 1967): Queensland: sinus Moreton, *Fraser 189*, (K) [actually from or near Mt Lindsay], ♀ infructescences. Isolectotype: U.

Allocasuarina robusta (Macklin) L. Johnson, comb. et stat. nov.

Casuarina paludosa var. *robusta* Macklin, Trans. Roy. Soc. South Australia 51: 271 (1927), basionym.

LECTOTYPE: South Australia: Upper Hindmarsh Valley, *Macklin 014*, 1.vii.1927 (AD), ♀ infructescences (but the species is monoecious). Isolectotypes: BRI, K, MEL, NSW.

Most specimens determined by me, and some of those determined earlier by Macklin, with the epithet "*robusta*" in various ranks and combinations (chiefly as "*C. pusilla* ssp. *robusta*") in fact belong to *A. paradoxa*, q.v. *A. robusta* is very restricted.

Allocasuarina scleroclada (L. Johnson) L. Johnson, comb. nov.

Casuarina scleroclada L. Johnson, Nuytsia 1: 261 (1972), basionym.

HOLOTYPE: Western Australia: c. 40 km SSE. of Caiguna (c. 3.2 km in from sea), *L. Johnson 2155*, 1.ix.1967 (NSW), ♀ infructescences. Isotype: PERTH.

Allocasuarina striata (Macklin) L. Johnson, comb. nov.

Casuarina striata Macklin, Trans. Roy. Soc. South Australia 51: 267 (1927), basionym.

LECTOTYPE (here designated): South Australia: Belair, *Macklin 036*, 18.viii.1927 (AD), ♀. Isolectotypes: BRI, K, MEL, NSW.

Allocasuarina tessellata (C.A. Gardner) L. Johnson, comb. nov.

Casuarina tessellata C.A. Gardner, J. Roy. Soc. West. Australia 22: 119 (1936), basionym.

HOLOTYPE: Western Australia: summit of Mt Singleton, *C.A. Gardner 2217*, 9.viii.1931 (PERTH), ♀ infructescences. Isotypes: B, K.

Specimens of this were formerly determined by me as a subspecies of *C. campestris*. It is now clear that *A. tessellata* is best treated as a species, and determinations should be corrected accordingly.

Allocasuarina thuyoides (Miq.) L. Johnson, comb. nov.

Casuarina thuyoides Miq. in Lehm., Pl. Preiss. 1: 641 (1845), basionym.

LECTOTYPE (here designated): Western Australia: in planitie arenosa Quangen, distr. Victoria et in planitie arenosa prima eis fl. Gordon, distr. Hay, *Preiss 2004*, 20.iii.1840 and 7.xi.1840 (U), ♂ (impossible to separate localities and dates; on same sheet as ♀ specimen).

Allocasuarina torulosa (Ait.) L. Johnson, comb. nov.

Casuarina torulosa Ait., Hort. Kew ed. 1, 3: 320 (1789), basionym.

NEOTYPE: Queensland: Bay of Inlets, *Banks & Solander*, 1770 (BM), ♀ infructescences. Isoneotypes: MEL, NSW.

Miquel (1848) reported that Aiton's specimens had been lost. Aiton indicated Banks' collections as the source; his specimens were presumably from cultivated plants. The neotype collection also includes ♂ material, to be regarded as paraneotype.

Allocasuarina trichodon (Miq.) L. Johnson, comb. nov.

Casuarina trichodon Miq. in Lehm., Pl. Preiss. 1: 641 (1845), basionym.

HOLOTYPE: Western Australia: in saxosis ad latera collium Konkoberup, distr. Kent, *Preiss 2001*, 19.xi.1840 (U), ♂. Isotypes: L, LE, MEL, NSW, P.

Allocasuarina verticillata (Lam.) L. Johnson, comb. nov.

Casuarina verticillata Lam., Encycl. 2: 501 (1788), basionym.

LECTOTYPE: cult. Jardin du Roi (probably collected in Tasmania), *herb. Lamarck* (P-LA, photograph seen), vegetative; with a note attached giving manuscript description of male spikes (? in herb. Thouin—not now to be found in Montpellier), which corresponds in a number of distinctive phrases with Lamarck's published description.

C. stricta Ait., Hort. Kew ed. 1, 3: 320 (1789), synonym. nov.

Determinations by me as *C. stricta* should be corrected. There is no doubt of the identity of the type material or of the application of the protologue. The epithet *verticillata* evidently refers to the tendency for semi-juvenile shoots to bear strongly radiating whorls of branchlets, as evident in the type material. The epithet *stricta*, though well known in recent years for this species, was formerly applied to various members of the *distyla* group, and is far from apt for the Drooping She-oak. Thus, the unavoidable change is perhaps more bearable than it would otherwise be.

CASUARINA Adans.

Casuarina equisetifolia Forst. & Forst. f. ssp. *incana* (Benth.) L. Johnson, stat. nov.

C. equisetifolia var. *incana* Benth., Fl. Austr. 6: 197 (1873), basionym.

LECTOTYPE (here designated): New South Wales: Port Macquarie, *A. Cunningham* ⁴⁵ May 1819 (K).

Casuarina grandis L. Johnson, sp. nov.

Arbor usque and 50-60 m alta, dioica; ramuli patentes vel subpenduli; articuli plerumque 6-11 mm longi, c. 0.4 mm diametro; phyllichnia angulata, angulis plus manifestis quam eis *C. cunninghamiana* sed minus acutis quam eis *C. oligodontis*; sulci sine pilis protrudentibus; laminae foliorum (dentes) 8-10, 3 mm longae, deltoideae, basi brunnei sed apice pallide marcescentes; spicae masculae ignotae; infructescentiae in pedunculis 6-10 mm longis, 14-18-stichae, globoso-cylindricae utrinque truncatae, 6-11 mm longae, 9-11 mm diametro, bracteolis fructiferis glabris brunneisque parte protrudenti 1.5-2.0 mm longa, 1.0-2.0 mm lata.

HOLOTYPE: Papua New Guinea: Northern District: Tufi subd.: Mafo Barracks (on Ibinamo River), *P. Darbyshire 1156*, 19.vii.1963 (NSW), ♀. Isotypi: CANB, K.

Tree to 50-60 m tall, dioecious; branches spreading or ± pendulous; articles mostly 6-11 mm long, c. 0.4 mm diam.; phyllichnia angular, the angles more prominent than in *C. cunninghamiana* but less acute than in *C. oligodon*; furrows with protruding hairs; leaf-laminae ("teeth") 8-10, 3 mm long, deltoid, with a dark brown base, the apex



Fig. 1. Holotype of *Casuarina grandis* L. Johnson (Darbyshire 1156: NSW).



Fig. 2. Cones of *C. grandis* (from holotype).

withering pale; male spikes unknown; infructescences ("cones") on peduncles 6-10 mm long, 14-18-stichous, globose-cylindrical with both ends truncate, 6-11 mm long, 9-11 mm diam.; fruiting bracteoles glabrous, brown, with the protruding portion 1.5-2.0 mm long, 1.0-2.0 mm broad.

Known only from the south-eastern end of Papua from near Tufi in the Northern District to the Gwariu River in the Milne Bay District. The species is not recorded at more than 600 m altitude. It forms dense stands along rivers, regenerating on gravel banks and other open sites, possibly partly from root suckers as in *C. cunninghamiana*. It may also occur in small gullies eroded from volcanic debris. The trees appear frequently to attain heights of 35-40 m but there is one record (*Brass 23791*) of a height of 50-60 m. As a tall, fast-growing tropical species, *C. grandis* is considered to have economic potential in other parts of the world. In view of its close relationship to other species and the general lack of barriers to hybridisation within *Casuarina s. str.*, *C. grandis* is also likely to hybridise freely if grown with other species of *Casuarina s. str.*, with consequent difficulties of identification of progeny.

C. grandis is closely related to *C. cunninghamiana*, which is restricted to Australia, and also to an undescribed species from the Timor region, previously included in *C. junghuhniana*. Collections have been misdetermined, by myself as well as others, as *C. cunninghamiana* or *C. oligodon*. The differences between the species in this complex will be dealt with elsewhere.

***Casuarina oligodon* L. Johnson, sp. nov.**

Arbor usque ad 30 m alta; dioica vel rarissime monoica; ramuli penduli; articuli 4-7 mm longi, 0.5-0.8 mm diametro; phyllichnia acutangula; sulci non vel vix pilosa; laminae foliorum (dentes) 5-7 acutae pallide marcescentes; spicae masculae 1.5-4.5 cm longae, plerumque in ramulis terminales vel rare subsessiles, verticillis circa 12-20 per cm; flores masculae bracteolis persistentibus, tepalis cucullatis glabriusculis, antheris rotundatis 0.5-0.6 mm longis; infructescentiae in pedunculis 0.5-1.0 cm longis, plerumque 12-stichae, breviter cylindricae vel subcylindricae, 4-10 mm longae, 0.7-0.9 mm diametro, bracteolis fructiferis glabris parte protrudenti 1.5-2.0 mm longa, c. 1.5 mm lata.

HOLOTYPUS: Papua New Guinea: Eastern Highlands: Goroka subd.: Bena River, near Goroka, *J.S. Womersley NGF 24983*, 14.viii.1967 (NSW), ♂. Isotypi: BISH, BRI (also sent to A, BO, CANB, K, L, PNH, SING, US).

Tree to 30 m tall; dioecious or very rarely monoecious; branchlets pendulous; articles 4-7 mm long, 0.5-0.8 mm diam.; phyllichnia sharply angled; furrows not or scarcely hairy; leaves ("teeth") 5-7, acute, withering pale; male spikes 1.5-4.5 cm long, usually on terminal branchlets or rarely sessile, with c. 12-20 whorls per cm; male flowers: bracteoles persistent, tepals hooded and becoming glabrous, anthers round, 0.5-0.6 mm long; infructescences ("cones") on peduncles 5-10 mm long, usually 12-stichous, shortly cylindrical or subcylindrical, 4-10 mm long, 0.7-0.9 mm diam.; the fruiting bracteoles glabrous, the protruding portion 1.5-2.0 mm long, c. 1.5 mm broad.

Representative ♀ specimen: PAPUA NEW GUINEA: Western Highlands: Laiagam subd.: near Kepilam village, Lagaip valley, *R. Hoogland & R. Schodde 7250*, 30.vii.1960 (K, LAE, NSW, UC).

The name is derived from Greek 'oligos' = 'few' and 'odon' = 'a tooth', since the teeth (leaves) on the branchlets are fewer than in *C. equisetifolia* Forst. & Forst. f. and the type race of *C. cunninghamiana* Miq., with which the species was first compared.

This New Guinea endemic is most closely related to two undescribed species, which are endemic respectively in Sulawesi (Celebes) and the island of Luzon in the Philippines.



Fig. 3. Holotype of *C. oligodon* L. Johnson (Womersley NGF 24983: NSW).



Fig. 4. Representative female specimen of *C. oligodon* ssp. *oligodon*.

It is close also to *C. cunninghamiana*, *C. grandis*, *C. junghuhniana* Miq. and an undescribed species from Timor and neighbouring islands. The distinctions from all these will be dealt with in the revision.

The species is well-known in New Guinea but in earlier times was often confused with *C. equisetifolia*, which is strictly coastal on the island. It has also been confused with *C. grandis*, q.v.

Two subspecies are readily distinguished.

a. ssp. **oligodon**

Leaves (teeth) long-acuminate, 0.8-1.0 mm long when undamaged.

East New Guinea (i.e. Papua New Guinea) in highland areas, chiefly on river banks but often planted near native gardens. It occurs chiefly between 1500 m and 2500 m altitude, but is recorded from as low as 250 m along the Ramu River. From near Aiyura in the Eastern Highlands, and from the Finisterre Range in the Madang District, extending at least as far west as the upper Strickland River.

b. ssp. **abbreviata** L. Johnson, ssp. nov.

Laminae (dentes) acute triangulares, 0.4-0.5 mm longae.

HOLOTYPE: West New Guinea (Irian Jaya): Wissel Lake region, *Eyma 4541*, 12.ii.1939 (L), ♀. Isotypi: A, BO, CANB, K, L, LAE, NSW.

Highland areas of West New Guinea, from the Bele and Upper Balim Valleys at least as far west as the Wissel Lake region. As well as the markedly shorter teeth, to which the subspecific epithet refers, this subspecies tends to have shorter, more crowded whorls of male flowers, probably shorter anthers, and somewhat smaller infructescences than the eastern (type) race. I have seen many specimens, none of which are intermediate, but the differences are not great and subspecific rank seems sufficient.

GYMNOSTOMA L. Johnson

Gymnostoma chamaecyparis (Poiss.) L. Johnson, comb. nov.

Casuarina chamaecyparis Poiss., Nouv. Arch. Mus. Hist. Nat., ser. 1, 10: 108 (1874), basionym.

LECTOTYPE (here designated): New Caledonia: Mont Poume, *Balansa 3315*, v. 1871 (P), ♀ infructescences.

There is also a sheet bearing the same number with ♂ flowering material; since the species is dioecious, this is excluded from the lectotype, though it is conspecific.

Gymnostoma deplancheanum (Miq.) L. Johnson, comb. nov.

Casuarina deplancheana Miq. in Candolle, Prodr. 16 II: 342 (1868), basionym.

HOLOTYPE: New Caledonia, *Deplanche 113* (L), ♀ infructescences. Probable isotypes: A, K, P, UPS.

There are specimens labelled *Deplanche 113* in all the herbaria cited, most of which are ♂ and bear infructescences and agree with the holotype. However, there was some admixture under this number and there are pieces in FI (♀) and UPS (vegetative) that belong to *G. poissonianum* and *G. glaucescens* respectively.

Gymnostoma glaucescens (Schlechter) L. Johnson, comb. nov.

Casuarina glaucescens Schlechter, Bot. Jahrb. Syst. 40, Beiblatt 92: 21 (1908), basionym.

HOLOTYPE: New Caledonia: Süd-Bezirk: Pouéta, *Le Rat 738*, vii.1903 (B) ♂
Isotypes: ? P, ? NSW.

***Gymnostoma intermedium* (Poiss.) L. Johnson, comb. et stat. nov.**

Casuarina deplancheana Miq. γ [var.] *intermedia* Poiss., *Nouv. Arch. Mus. Hist. Nat.*, sér. 1, 10: 50 (1874), basionym.

HOLOTYPE: "Forêts couronnant le mont Mi," *Balansa 1166*, 9.iii.1869 (P) ♀
 infructescences. Isotype ? : NSW.

***Gymnostoma leucodon* (Poiss.) L. Johnson, comb. nov.**

Casuarina leucodon Poiss., *Nouv. Arch. Mus. Hist. Nat.*, ser. 1, 10: 107, t. VII (1874),
 basionym.

HOLOTYPE: New Caledonia: Collines ferrugineuses à l'ouest de Messioncoué près
 le Port Bouquet, *Balansa 2180*, 1868-70 (P), ♀ infructescences.

***Gymnostoma nobile* (Whitmore) L. Johnson, comb. nov.**

Casuarina nobilis Whitmore, *Tropical Rainforests of the Far East*: 134 (1975),
 basionym.

HOLOTYPE: Sabah (N. Borneo): Sepitang Forest District: Seungau, *A. Cuadra*
A3292 (K), ♀ with mature infructescences. Isotypes: A, L, NSW, US.

This species was distinguished by myself, and many specimens were determined as *Gymnostoma nobile*. Whitmore (1975) adopted the epithet without acknowledgement and published the species, without my agreement, under *Casuarina*, using a type of his own choosing, and with a description that is quite undiagnostic, taken in isolation. Under the I.C.B.N., I have no choice but to take the binomial *G. nobile* as formally based upon *C. nobilis* Whitmore, with the citation as given above. Previous determinations in various herbaria do not, of course, give any parenthetical author's name. This may be added, if thought appropriate.

The characters that in fact distinguish *G. nobile* will be detailed in my revision, wherein it will be treated as the sole species of a series. It has been compared with *G. sumatranum*, from which it is readily distinguished by the thicker branchlets, generally smaller cones (infructescences) and lack of longitudinal striation on the infructescence bracts and bracteoles.

It forms a tree up to 20 m or more in height, although often smaller, with a fairly broad crown. It is commonly found in "heath-forest" at low altitudes (see, e.g., Whitmore 1975) on soils poor in nutrients, but also occurs on hills on various substrates, including limestone, up to 1400 m altitude. There are many collections from Borneo, where I have seen it on leached sands and peat.

A collection from the Cyclops Mountains in western New Guinea (Irian Jaya), formerly thought to belong to this species, proves to represent a new species of the series containing *G. sumatranum*. It will be described in the revision of the family. Determinations should be corrected accordingly.

***Gymnostoma papuanum* (S. Moore) L. Johnson, comb. nov.**

Casuarina papuana S. Moore, *J. Bot.* 61, Suppl.: 53 (1923), basionym.

HOLOTYPE: Papua New Guinea: Sogeri region: South Cape, *H.O. Forbes 913a*,
 1885-6 (BM), ♀ infructescence. Isotype: LE.

Gymnostoma poissonianum (Schlechter) L. Johnson, comb. nov.*Casuarina poissoniana* Schlechter, Bot. Jahrb. Syst. 39: 91 (1907), basionym.HOLOTYPE: New Caledonia: Süd-Bezirk: auf den Hügeln am Ngoye, *Schlechter 15144*, 29.xi.1902 (B), ♀ immature infructescences. Isotypes: BO, BR, K, NSW, S.*C. deplancheana* Miq. var. *debilis* Poiss., Nouv. Arch. Mus. Paris, sér. 1, 10: 106 (1874).LECTOTYPE (here designated): New Caledonia: Kanala, *Vieillard 1269*, 1861-67 (P), ♀ infl. and immature infructescences.

Schlechter referred to *C. poissoniana* as "n. sp." in the protologue and on the specimen labels, but stated that "sie identisch ist mit der von Poisson als *C. Deplancheana* Miq. var. *debilis* bezeichneten Pflanze". It seems reasonable to accept the sole collection cited as the holotype (with duplicates as isotypes), but if the view were taken that the material on which the species was based included the citation of Poisson's variety, then the Schlechter collection should be taken as lectotype, since it forms the main basis of his description as a "new species". There is no doubt of the specific identity of the elements concerned, so the matter is of little consequence.

Gymnostoma rumphianum (Miq.) L. Johnson, comb. nov.*Casuarina rumphiana* Miq., Flora 48: 23, 38 (1865), basionym.LECTOTYPE (here designated): Amboina [Ambon], *de Vriese s.n.* (L 899. 173-99). Possible isotypes: B, BO, BR, K, LE, P, S.

The *Synopsis specierum Casuarinae* of Miquel (1865) was clearly written as a single paper, but was published in two successive issues of the journal *Flora*: No. 2 (25 Jan. 1865) and No. 3 (4 Feb. 1865), in both of which there is reference to *C. rumphiana*.

On p. 18 (January) under the entry "18. *C. Rumphiana* Miq. n. sp.", there is a diagnosis followed by the reference: "*C. montana* Rumph. Herb. Amb. III. p. 87. tab. 58. excl. fig. A—Satis bona, sed ramuli nimis regulariter dispositi, et strobili haud exacta delineati. Cf. Rev. [i.e. Miquel 1848, L.J.] p. 16, ubi ad *C. nodifloram* provisorie retuli." and the distributional note: "Amboina, remotius a mari, in montibus et planitiebus."

In so far as this was all that was "associated with [the] name at its first publication" (Stafleu et al. 1978, footnote to Recommendation 7B), it would constitute the protologue, and one might at first suppose that the reference to Rumphius's [pre-Linnaean] description and figure should be taken as indicating the holotype under Art. 7.3: "A *holotype* is the one specimen or other element used by the author . . .", and Art. 9.3: "if . . . a name is without a type specimen, the type may be a description or figure". However, Miquel's diagnosis includes observations (especially dimensions) that could not have been derived from the figure (very poor) and text in the *Herbarium Amboinense* of Rumphius (1743). That Miquel in fact *used* (cf. Art. 7.3) other material in drawing up his diagnosis is confirmed by the further treatment on page 38 (February) where, under "Adnotationes", he expresses satisfaction that the species described and delineated by "the immortal Rumphius" had been found again in Amboina by Teysmann and de Vriese, who had brought back fruiting specimens, of which he then proceeds to provide further detailed description. He refers also on p. 38 to a sterile specimen (which I have seen) collected earlier by Reinwardt, but neither this nor the figure or description of Rumphius could have been the source of Miquel's description on p. 24 of the *bracts* (as distinct from the bracteoles) of the infructescences. Thus, he must have had the Teysmann and de Vriese material available when drawing up the brief description in the first part of the paper.

In this paper in general, Miquel cited only *references* in the main enumeration (which ran over both dates of publication), reserving the citation of *specimens* for the "annotations", of which the further treatment of *C. rumphiana* on page 38 was one.

Thus, although by the accident of split publication it might be technically considered not to be part of the protologue, the text on page 38 provides information on the original material *used* by the author in drawing up the protologue. According to 4b of the "Guide for the Determination of Types" (Stafleu et al. 1978) "other things being equal, a specimen should be given preference over pre-Linnaean or other cited descriptions or illustrations when lectotypes . . . are designated, providing that the choice is in accordance with Rec. 7B" [i.e. preserves current usage]. In the present case, there is no doubt that all the elements (except possibly the vegetative specimen of Reinwardt) used by Miquel as the basis of his *C. rumphiana* are of the same species, and from the same small island. Consequently, I have chosen as lectotype one amongst the several specimens that were collected on Ambon by Teysmann and de Vriese jointly or separately.

The Leiden sheet cited was seen by Miquel.

The infructescence designated as "A" in the Rumphius plate cited belongs to *G. sumatranum*.

***Gymnostoma sumatranum* (Jungh. ex de Vriese) L. Johnson, comb. nov.**

Casuarina sumatrana Jungh. ex de Vriese, Tijdschr. Natuur. Gesch. Physiol. 11: 115 (1844), basionym.

HOLOTYPE: In planitie alta Silantom et Tobah (3-4000' [feet]), *Junghuhn* (L), ♀ infructescences. Isotype: U.

***Gymnostoma webbiana* (Miq.) L. Johnson, comb. nov.**

Casuarina webbiana Miq., Flora 48: 33, 38 (1865), basionym.

LECTOTYPE (here designated): New Caledonia, *Labillardière* (ex herb. Webb) (K), vegetative; ♀ infructescence figured by Miquel apparently lost. Isolectotypes: FI, ♀ infructescence; BR, P, ♀ inflorescence.

"*C. nodiflora* var. *robustior dentibus obtusis*" Miq., Rev. Cas.: 17, t. IB (1848) (as "var. *robustior*" under the figure).

HOLOTYPE: as lectotype of *C. webbiana*, above, but cited as "Austro-Caledonia, sp. fem. (Webb, in Herb. Hook.)".

"*C. nodiflora* [var.] *β robusta* Miq." in Candolle, Prodr. 16 II: 342 (1868). This refers to "Miq. Rev. l.c." and can therefore be taken as an error for or variant of the earlier form with the epithet "*robustior*". The legitimacy of these varietal names may be arguable, but is of little consequence when the taxon is treated in specific rank.

Miquel (1865, pp. 33, 38) based his *C. webbiana* on two elements: (1) a reference to his earlier *C. nodiflora* var. *robustior*, (2) specimens collected in Borneo by de Vriese. The former element is here chosen as lectotype, the latter (one "de Vriese, Borneo", vegetative specimen in L) is referable to *G. nobile*.

As pointed out when describing *Gymnostoma* (Johnson 1980), the name *Casuarina nodiflora* has been widely misapplied to species throughout the range of *Gymnostoma*. In New Caledonia, beginning with Poisson (1874), it has been generally applied to the present species, and the true *G. nodiflorum* (Thunb.) L. Johnson has been known under the later synonym *Casuarina angulata* Poiss. Collections determined by A. Guillaumin, and not subsequently seen by myself, may have continued to bear such wrong names, and their determinations should be corrected.

Acknowledgements

Mrs Karen Wilson has worked closely with me in recent years on this study; I thank her for assistance in many ways. Thanks are due to the Directors and Curators of the many herbaria in which relevant material has been studied or from which loans have been made. These will be fully enumerated when the revision of the family is published. Dr J.F. Veldkamp, Rijksherbarium, Leiden, and Dr L.Y. Th. Westra, Utrecht, very kindly re-examined several sheets for me in relation to lectotypification.

References

- Curtis, W.M. (1967). "The Student's Flora of Tasmania", vol. 3 (Govt Printer: Tasmania).
- Johnson, L.A.S. (1972). New species and subspecies of *Casuarina* in Western Australia. *Nuytsia* 1: 261-265.
- Johnson, L.A.S. (1980). Notes on Casuarinaceae. *Telopea* 2: 83-84.
- Johnson, L.A.S., & Wilson, K.L. (1981). Casuarinaceae, then and now. XIII International Botanical Congress Abstracts: 278.
- Johnson, L.A.S., & Wilson, K.L. (in production). Casuarinaceae. In Jessop, J.P. (ed.), "Flora of South Australia" ed. 3, Vol. 2. (Govt. Printer: Adelaide).
- Miquel, F.A.G. (1848). Revisio critica Casuarinarum. *Nieuwe Verh. Eerste Kl. Kon. Ned. Inst. Wetensch. Amsterdam*, ser. 2, 13: 267-350, i.xii.
- Miquel, F.A.G. (1865). Synopsis specierum Casuarinae. *Flora* 48: 17-24, 33-39.
- Morley, B., & Toelken, H. (eds.) (in press). "Flowering Plants in Australia". (Rigby: Adelaide).
- Poisson, J. (1874). Recherches sur les Casuarines et en particulier sur ceux de la Nouvelle Calédonie. *Nouv. Arch. Mus. Hist. Nat.*, ser. 1, 10: 59-111, pl. IV-VII.
- Rumphius, G.E. (1743). "Herbarium Amboinense", Vol. 3. (Meinard Uytwerf: Amsterdam).
- Stafleu, F.A., et al. (eds.) (1978). International Code of Botanical Nomenclature. *Regnum Veg.* 97.
- Whitmore, T.C. (1975). "Tropical rain forests of the Far East". (Clarendon Press: Oxford).