

PODOCARPACEAE

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Endl., Syn. Conif. (1847) 203, nom. cons.; Pilger in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 13 (1926) 211; Keng, Tree Fl. Malaya 1 (1972) 44; Phengkklai, Fl. Thailand 2(3) (1975) 197; Keng, Ord. Fam. Malayan Seed Pl., ed. 3 (1983) 8; de Laubenfels, Fl. Males., ser. 1, 10(3) (1988) 351; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 2; Page in Kramer & Green (ed.), Fam. Gen. Vasc. Pl. 1 (1990) 332; Farjon, Fl. Penins. Malaysia, ser. 2, 1 (2010) 171; Middleton, Gard. Bull. Singapore 75 (2023) 69. **Type:** *Podocarpus* Pers.

Nageiaceae D.Z.Fu, Acta Phytotax. Sin. 30 (1992) 522. **Type:** *Nageia* Gaertn.

Evergreen shrubs or trees, trunks slightly resinous, dioecious, rarely monoecious. **Leaves** usually spirally arranged, sometimes oriented in a plane; lamina flattened (or scale-like elsewhere), simple, entire, often narrow. **Pollen cones** with the appearance of catkins, solitary or clustered, axillary or terminal, microsporophylls spirally arranged around cone axis, each with 2 pollen sacs; pollen grains bi-saccate (in Singapore). **Seed cones** axillary or terminal, usually solitary, basal bracts sterile and slightly to greatly swollen (in Singapore) with maturity (the receptacle), and apical bract(s) fertile with one ovule; mature cones consisting of a slightly to very swollen receptacle and seed seated on the receptacle. **Seeds** covered in a fleshy aril-like epimatium.

Distribution. A family of 17–20 genera and about 200 species, primarily in the southern hemisphere but extending to warm temperate regions of the northern hemisphere. In Singapore, 2 genera, each with 1 native species.

Ecology. Throughout its range in a wide variety of habitats. In Singapore, in forest and coastal vegetation. The species *Parasitaxus usta* (Vieill.) de Laub. from New Caledonia is the only known parasitic species of gymnosperm and is parasitic on another species of Podocarpaceae, *Falcatifolium taxoides* (Brongn. & Gris) de Laub.

Although studies are lacking for most species, it is assumed that the fleshy seed, and in *Podocarpus* the brightly coloured and fleshy receptacle, are attractive to birds to enable seed dispersal.

Uses. *Podocarpus* species are planted as ornamental trees and some species have traditional medicinal uses.

Taxonomy. In much of the earlier literature, the Podocarpaceae was not recognised as a distinct family but rather within differing subdivisions of the Coniferae, sometimes associated with taxa now in Taxaceae. It is now consistently recognised as a distinct family within the

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order Cupressales along with Araucariaceae, Cupressaceae, Sciadopityaceae and Taxaceae although opinions have differed as to the relationships of the families to each other (see Yang et al., *Plants* 13-2196 (2024) 1–15). Leslie et al. (*Amer. J. Bot.* 105 (2018) 1–14), summarising the state of knowledge on conifer phylogeny, have Podocarpaceae as sister to Araucariaceae.

Several of the genera now recognised in Podocarpaceae have at various times been placed in segregate families. As none of these segregate families has been recognised in Singapore or Peninsular Malaysia, they are not included here in synonymy.

In earlier literature, the genus *Podocarpus* had a wider delimitation, including *Nageia* and several other now-segregate genera not found in Singapore (see Page in Kramer & Green (ed.), *Fam. Gen. Vasc. Pl.* 1 (1990) 333). Recent phylogenetic research supports the recognition of these segregate genera, showing that even though *Nageia* was included in *Podocarpus* until relatively recently, it is more closely related to several other genera which collectively diverged from *Podocarpus* in the Cretaceous (Chen et al., *Mol. Phylogenet. Evol.* 166-107341 (2022)).

Key to genera

1. Leaves without a distinctive midrib, ≥ 1.8 cm wide; receptacle only slightly swollen when mature **1. Nageia**
- Leaves with a distinctive midrib, ≤ 1.3 cm wide; receptacle very swollen when mature ...
..... **2. Podocarpus**

1. NAGEIA Gaertn.

(from a vernacular name)

Fruct. Sem. Pl. 1 (1788) 191; de Laubenfels, *Blumea* 32 (1987) 209, p.p.; de Laubenfels, *Fl. Males.*, ser. 1, 10(3) (1988) 389; Page in Kramer & Green (ed.), *Fam. Gen. Vasc. Pl.* 1 (1990) 339; Farjon, *Fl. Penins. Malaysia*, ser. 2, 1 (2010) 186; Farjon, *Handb. World's Conifers*, ed. 2, 1 (2017) 536. **Synonym:** *Podocarpus* sect. *Nageia* (Gaertn.) Endl., *Syn. Conif.* (1847) 207. **Type:** *Nageia japonica* Gaertn. (= *Nageia nagi* (Thunb.) Kuntze).

Podocarpus Pers. sect. *Dammaroideae* Benn., *Pl. Jav. Rar.*, fasc. 1 (1838) 41. **Synonyms:** *Decussocarpus* de Laub. sect. *Dammaroideae* (Benn.) de Laub., *J. Arnold Arbor.* 50 (1969) 348, as '*Dammaroides*'. – *Nageia* Gaertn. sect. *Wallichiana* D.Z.Fu, *Acta Phytotax. Sin.* 30 (1992) 525, nom. illeg. superfl. **Type:** *Podocarpus latifolius* Wall. (= *Nageia wallichiana* (C.Presl) Kuntze).

Trees, dioecious or monoecious; bark thin. **Leaves** spirally arranged or subopposite; petioles twisted to present leaves in more or less a flat plane; lamina coriaceous, ovate to elliptic, midrib not distinct. **Pollen cones** axillary, small scales at base, clustered (or solitary outside Singapore); microsporophylls spirally arranged around cone axis, triangular, 2 pollen sacs at base of each. **Seed cones** axillary, solitary, with several bracts, these either withering or fusing and only slightly enlarging, only terminal bract fertile. **Seeds** 1, surrounded by a fleshy epimatium.

Distribution. A genus of 5 species in South, East and continental Southeast Asia through Malesia to New Britain. In Singapore, 1 native species.

Ecology. In evergreen, kerengas, peat swamp and freshwater swamp forest.

Taxonomy. Although the genus was first described in the eighteenth century, for most of its history the species of *Nageia* have been included in a wider concept of the genus *Podocarpus*. De Laubenfels (J. Arnold Arbor. 50 (1969) 340) recognised *Nageia* as separate from *Podocarpus* but under the name *Decussocarpus* de Laub. He later (de Laubenfels, Blumea 32 (1987) 209) corrected the name to *Nageia*, albeit with a wider circumscription (including *Afrocarpus* (J. Buchholz & N.E. Gray) C.N. Page and *Retrophyllosum* C.N. Page) than later adopted (Page in Kramer & Green (ed.), Fam. Gen. Vasc. Pl. 1 (1990) 339) and employed here.

***Nageia wallichiana* (C. Presl) Kuntze**

(Nathaniel Wallich, 1786–1854, Superintendent of the Calcutta Botanic Garden)

Revis. Gen. Pl. 2 (1891) 800; de Laubenfels, Blumea 32 (1987) 210; de Laubenfels, Fl. Males., ser. 1, 10(3) (1988) 391, fig. 41; Turner, Gard. Bull. Singapore 45 (1993) 21; Turner et al., Gard. Bull. Singapore 48 (1998 [‘1996’]) 140; Chew et al., Gard. Bull. Singapore 49(2) (1999 [‘1997’]) 208; Eckenwalder, Conifers World (2009) 356; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 63, 98, 209; Farjon, Fl. Penins. Malaysia, ser. 2, 1 (2010) 190, fig. 5: C; Farjon, Handb. World’s Conifers, ed. 2, 1 (2017) 541; Lim et al., Fl. Singapore 1 (2019) 89; Lindsay et al., Gard. Bull. Singapore 74(Suppl. 1) (2022) 115; Middleton, Gard. Bull. Singapore 75 (2023) 69. **Basionym:** *Podocarpus wallichianus* C. Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 3 (1845) 540 as ‘*wallichianum*’; Ridley, J. Straits Branch Roy. Asiat. Soc. 60 (1911) 57; Keng, Tree Fl. Malaya 1 (1972) 53; Keng, Gard. Bull. Singapore 26(2) (1973) 235; Phengklai, Fl. Thailand 2(3) (1975) 203, fig. 22; Corner, Gard. Bull. Singapore, Suppl. 1 (1978) 82; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 3. **Synonyms:** *Podocarpus latifolius* Wall., Pl. Asiat. Rar. 1, fasc. 2 (1830) 26, t. 30, as ‘*latifolia*’, nom. illeg. non (Thunb.) R.Br. ex Mirb. (1825). – *Nageia latifolia* Gordon & Glend., Pinetum (1858) 138, nom. illeg. superfl. – *Decussocarpus wallichianus* (C. Presl) de Laub., J. Arnold Arbor. 50 (1969) 349. **Type:** *da Silva s.n.* [EIC 6050], [India], Pundua (lectotype K-W [K000553406], designated by Khurajam & Wiersema, Phytotaxa 550 (2022) 299; isolectotypes A [A00022519], BR [BR0000013469092], CAL [CAL0000074778, CAL0000074779, CAL0000074780], E [E00127472], P [P00748865, P00748866]). **Fig. 1.**

Podocarpus latifolius Blume, Enum. Pl. Javae 1 (1827) 89, as ‘*latifolia*’, nom. illeg. non (Thunb.) R.Br. ex Mirb. (1825). **Synonyms:** *Podocarpus blumei* Endl., Syn. Conif. (1847) 208; Ridley, Fl. Malay Penins. 5 (1925) 281. – *Podocarpus agathifolius* Blume, Rumphia 3 (1849 [‘1847’]) 217, nom. illeg. superfl. – *Nageia blumei* (Endl.) Gordon & Glend., Pinetum (1858) 135. **Type:** *Blume s.n.*, [Indonesia], Java (lectotype L [L0050820], designated by de Laubenfels, J. Arnold Arbor. 50 (1969) 350).

Trees to 10 m tall (reported to 50 m in Malaysia), to 60 cm dbh; bark blackish brown, scaly lenticellate. **Leaves** opposite or subopposite; petioles 3–5 mm long; lamina coriaceous and stiff, ovate to elliptic, sometimes somewhat falcate, size often very variable within an individual, (6.4–)10.3–20.5 × (1.8–)2.3–7.9 cm, 2.9–4.1 times as long as wide, apex acuminate, more rarely acute or obtuse, base cuneate, margin flat, no obvious midrib, veins numerous, arising from base and converging towards apex. **Pollen cones** axillary, clustered at apex of

peduncle, peduncle 5–8 mm long, cones 9–16 mm long, c. 4 mm diam., microsporophylls with an apiculate apex and fimbriate margin, bearing 2 pollen sacs. **Seed cones** axillary, solitary, peduncle 11–15 mm long, cone bracts fused to form a pale yellow swollen receptacle, 8–14 mm long, the tips of the bracts free at base. **Seeds** globose, 14–18 mm long, 14–15 mm diam., epimatium dark grey-green ripening dark purple.

Distribution. India, China, continental Southeast Asia and through Malesia to the Moluccas. In Singapore, formerly known in Changi (*Ridley s.n.*, 18 Dec 1891, BM) but now known only in Nee Soon (*Ali Ibrahim et al. SING2013-240*, 1 Sep 2013, SING [SING0201449]).

Ecology. In Singapore, only reported from freshwater swamp forest but in Malaysia also reported from various evergreen forest types to 2100 m.

Conservation assessment. Globally, Least Concern (LC) (IUCN Red List, 2026). Reported ‘Extinct in Singapore’ by Farjon (Fl. Penins. Malaysia, ser. 2, 1 (2010) 190) but rediscovered in 2013 and reassessed as Critically Endangered (CR/D) by Middleton et al. (in Davison et al. (ed.), Singapore Red Data Book, ed. 3 (2024) 465).

Uses. Sometimes planted as an ornamental tree in parks and gardens.

Vernacular names. *Brown’s pine*, 肉托竹柏 (NParks’ Flora & Fauna Web, 2026)

Notes. The rather complex nomenclatural history of this species is discussed by Middleton (Gard. Bull. Singapore 75 (2023) 69).

2. PODOCARPUS Pers.

(Greek, *podo-* = foot, *-carpus* = fruit; referring to the shape of the receptacle and seed in the female plant)

Syn. Pl. 2, fasc. 2 (1807) 580, nom. cons.; Ridley, Fl. Malay Penins. 5 (1925) 280; Buchholz & Gray, J. Arnold Arbor. 29 (1948) 54; Keng, Tree Fl. Malaya 1 (1972) 48; Phengkklai, Fl. Thailand 2(3) (1975) 199; de Laubenfels, Blumea 30(2) (1985) 251; de Laubenfels, Fl. Males., ser. 1, 10(3) (1988) 395; Page in Kramer & Green (ed.), Fam. Gen. Vasc. Pl. 1 (1990) 340; Farjon, Fl. Penins. Malaysia, ser. 2, 1 (2010) 191; Farjon, Handb. World’s Conifers, ed. 2, 2 (2017) 819. **Type:** *Podocarpus elongatus* (Aiton) L’Hér. ex Pers.

Shrubs or trees, usually dioecious, rarely monoecious; bark often scaly and peeling. **Leaves** spirally arranged or subopposite; petiole short; lamina coriaceous, most often elliptic or ovate and narrow, midrib distinct. **Pollen cones** axillary, with bud scales, clustered (or solitary elsewhere); microsporophylls spirally arranged around cone axis, triangular, 2 pollen sacs at base of each. **Seed cones** axillary, usually solitary, with 2–5 bracts of which the upper 1–2 bracts fertile, the sterile bracts fused and swelling to form the swollen receptacle, this usually coloured and smooth. **Seeds** 1 (in Singapore), attached at the top of the receptacle at an angle, surrounded by a thinly fleshy epimatium.



Figure 1. *Nageia wallichiana* (C.Presl) Kuntze. **A.** Habit. Inset: Trunk. **B.** Fertile leafy branches. **C.** Pollen cones. **D.** Seed cones. (A–D including inset from Singapore, A & A inset, Singapore Botanic Gardens (cultivated); B–D, MacRitchie (cultivated). Photos: A & A inset, Zaki Jamil; B–D, X.Y. Ng).

Distribution. A genus of approximately 110 species (Farjon, Handb. World's Conifers, ed. 2, 2 (2017) 819–942) in warm temperate and tropical Africa, Asia, Australasia, Pacific islands, Central and South America and the Caribbean islands. In Singapore, 1 native species.

Ecology. In a variety of evergreen forest habitats, often at higher elevations in Southeast Asia. Also in coastal vegetation, including the species found in Singapore.

Uses. Several species have been utilised for timber, particularly for indoor use such as on floors and to make furniture. A number of species are also grown as horticultural ornamentals.

Taxonomy. A thorough overview of the history and taxonomy of the genus *Podocarpus* was published by Mill (Edinburgh J. Bot. 71 (2014) 309–360).

***Podocarpus polystachyus* R.Br. ex Endl.**

(Greek, *poly*- = many, much, *stachys* = spikes; referring to the clusters of cones)

Syn. Conif. (1847) 215, as '*polystachya*'; Miquel, Fl. Ned. Ind. 2, fasc. 7 (1859) 1072, as '*polystachya*'; Ridley, J. Straits Branch Roy. Asiat. Soc. 60 (1911) 58; Ridley, Fl. Malay Penins. 5 (1925) 282; Keng, Tree Fl. Malaya 1 (1972) 53; Keng, Gard. Bull. Singapore 26(2) (1973) 235, as '*polystachyus*'; Phengklai, Fl. Thailand 2(3) (1975) 200, fig. 18; de Laubenfels, Blumea 30(2) (1985) 276; de Laubenfels, Fl. Males., ser. 1, 10(3) (1988) 417, fig. 62; Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. (1990) 3, fig. 2.3; Turner, Gard. Bull. Singapore 45 (1993) 21; Turner et al., Gard. Bull. Singapore 46(2) (1995 ['1994']) 9, as '*polystachus*'; Turner, Gard. Bull. Singapore 47 (1997 ['1995']) 86; Chew et al., Gard. Bull. Singapore 49(2) (1999 ['1997']) 208; Eckenwalder, Conifers World (2009) 540; Chong et al., Checkl. Vasc. Pl. Fl. Singapore (2009) 71, 98, 210; Farjon, Fl. Penins. Malaysia, ser. 2, 1 (2010) 195; Neo et al., Nat. Singapore 6 (2013) 283; Farjon, Handb. World's Conifers, ed. 2, 2 (2017) 910; Hung et al., Nat. Singapore 10 (2017) 15, 19, 22; Hung et al., Nat. Singapore 10 (2017) 43; Lindsay et al., Gard. Bull. Singapore 74(Suppl. 1) (2022) 116; Middleton, Gard. Bull. Singapore 75 (2023) 70. **Type:** *Wallich s.n.* [EIC 6052B], Singapore, October 1822 (lectotype K-W [K000552940], designated by Farjon, Handb. World's Conifers 1 (2010) 882; islectotype BM [BM000959898]). **Fig. 2, 3.**

Podocarpus neglectus auct. non Blume: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 151.

Podocarpus neriifolius auct. non D.Don: Ridley, J. Straits Branch Roy. Asiat. Soc. 33 (1900) 151, as '*neriifolia*'.

Trees or shrubs to 10 m tall, to 32 cm dbh; bark dark grey-brown, flaky, slightly fissured; branches spreading, ends erect; twigs glabrous, longitudinally ridged; terminal buds with narrowly ovate scales, c. 5 mm long, margins erose. **Leaves** spirally arranged, subopposite to alternate; petiole 2–5 mm long; lamina oblong to narrowly ovate, sometimes weakly falcate, base acute to cuneate, rarely to attenuate (all shapes on same plant), apex rounded to acute, mucronulate, 2.8–10.5 × 0.6–1.3 cm, 3.5–10 times as long as wide, midrib raised above and below, glabrous, mid to dark green above, paler beneath. **Pollen cones** in clusters of up to 12 at nodes, cones sessile, to 24 mm long, 5.5 mm wide; microsporophylls 1.5–2 × 1.2–1.3 mm, apex a small triangular structure with irregular acute to short acuminate apex. **Seed cones** on

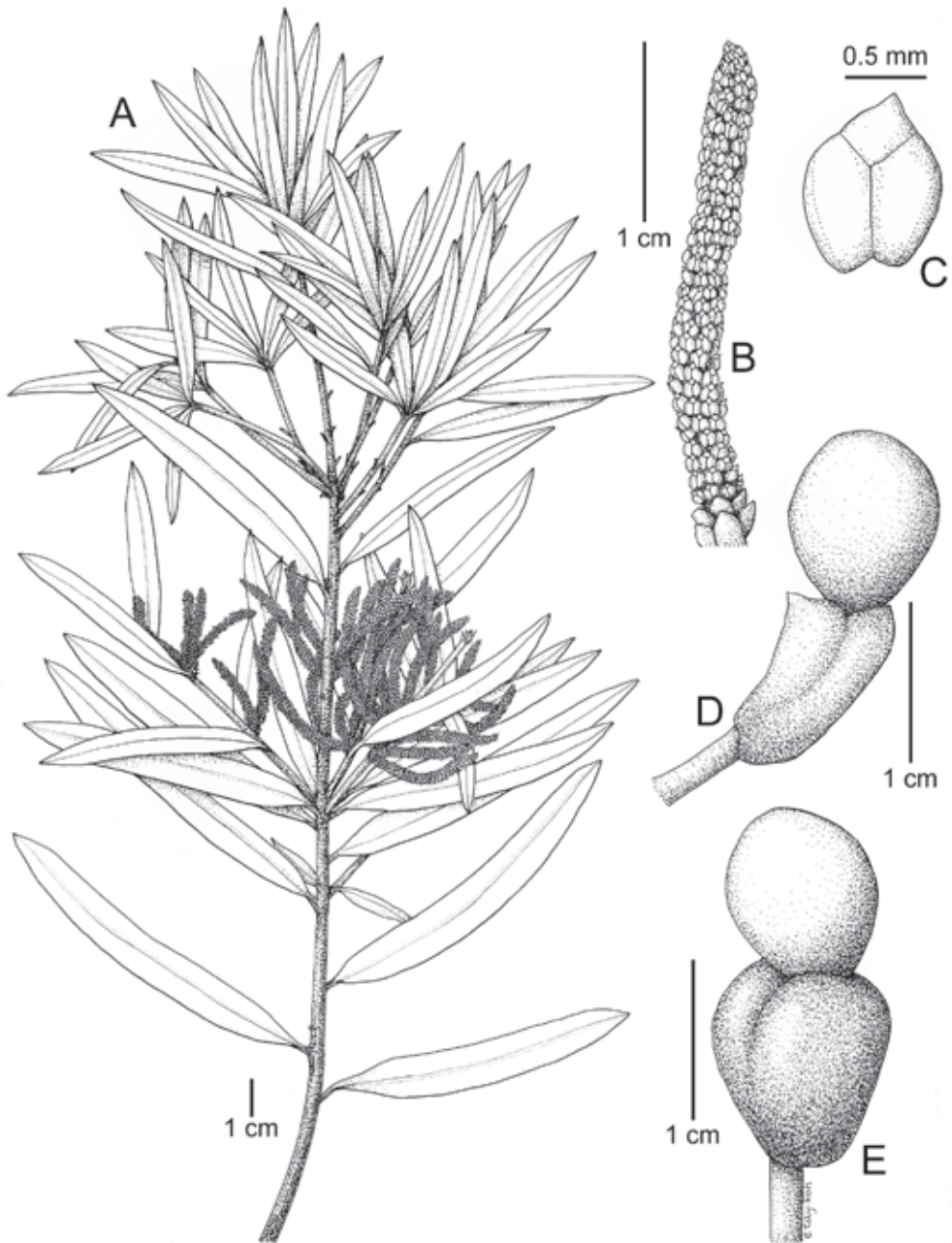


Figure 2. *Podocarpus polystachyus* R.Br. ex Endl. **A.** Habit. **B.** Pollen cone. **C.** Microsporophyll. **D.** Seed cone. **E.** Mature seed cone with fleshy receptacle. (A–E from Singapore, A–C, Labrador, Maxwell JF 82-174; D & E, Drawn from live material from Big Sister's Island. Drawn by E. Tay-Koh).



Figure 3. *Podocarpus polystachyus* R.Br. ex Endl. **A.** Habit. **B.** Trunk. **C.** Young pollen cones. **D.** Mature pollen cones. **E.** Mature seed cones each with a fleshy receptacle. Inset: Young seed cones. (A–E including inset from Singapore, A, Pulau Jong, *Lua et al. SING2019-1239*; B & C, Braddell (cultivated); D, E & E inset, Big Sister’s Island, *Lim & Ng SING2021-500*. Photos: A & D, X.Y. Ng; B & C, Zaki Jamil; E & E inset, S. Lee).

pedicels c. 2.5 mm; receptacle green, turning brownish red, finally black, when mature 0.9–1.2 mm long, 0.7–0.8 mm wide. **Seeds** ovoid, $8-9 \times 5-7$ mm, epimatium green, shiny.

Distribution. Thailand and through Malesia to the Moluccas. In Singapore, now known from the Western Catchment (*Lua et al. SING2019-1442*, 26 Dec 2019, SING [SING0296198]) and some of the Southern Islands such as Big Sisters (*Ng et al. SING2020-354*, 3 Mar 2020, SING [SING0340857]) and St. John's (*Lua et al. SING2020-1023*, 26 Aug 2020, SING [SING0361066]). Previously also known from other coastal areas such as Kranji (*Ridley 4823*, 1893, BM [BM014605203]) Changi, Jurong and Labrador. The earliest collection known is *Wallich s.n.* [EIC 6052B], 1822, BM [BM000959898], K-W [K000552940].

Ecology. In Singapore, in sandy soil and rocky outcrops usually near the sea. Elsewhere in the region, also in kerengas forest.

Conservation assessment. Globally, Vulnerable (VU A4ac) (IUCN Red List, 2026). In Singapore, assessed as Endangered (EN/D) by Middleton et al. (in Davison et al. (ed.), Singapore Red Data Book, ed. 3 (2024) 32, 465).

Uses. Sometimes planted as an ornamental tree in parks and gardens.

Vernacular names. *Jati bukit, jati laut, podo laut, sea teak, sentada, setada, sintada*, 印度蓝屿罗汉松 (NParks' Flora & Fauna Web, 2026).

Notes. Farjon (Fl. Penins. Malaysia, ser. 2, 1 (2010) 195) reports trees to 20(–40) m tall and to 45 cm dbh in Peninsular Malaysia. Trees even approaching this size have not been reported in Singapore although tree height and dbh are rarely given on older specimens. The sizes given in the description are for the largest trees currently known in Singapore but it should be noted that larger trees may have been present in the past and may again be found in the future.