

## ***Shorea johorensis* (Dipterocarpaceae), an addition to the flora of Singapore**

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**ABSTRACT.** A new distributional record to Singapore of *Shorea johorensis* Foxw. (Dipterocarpaceae) is described and illustrated. This species is known from remnant lowland dipterocarp forest in the Central Catchment Nature Reserve, Singapore. Notes on distribution, ecology and conservation status are given. This species is assessed as critically endangered for Singapore.

**Keywords.** Conservation assessment, Malaysia

### **Introduction**

The Herbarium at Singapore Botanic Gardens has recently embarked on a project to document the plants in the Republic of Singapore in the form of a comprehensive Flora. This offers opportunities for the critical re-examination of existing herbarium material and field collection of new herbarium material. One of the results of this is the discovery of new distributional records for Singapore. Here, a new record of *Shorea johorensis* Foxw. (Dipterocarpaceae) in Singapore is presented. *Shorea* Roxb. ex C.F.Gaertn. comprises about 196 species that are distributed from South Asia through Myanmar, Indochina, South China and Malesia. *Shorea* has been divided into 11 sections, some of which may be considered at generic rank (Ashton, 2004). Chloroplast molecular data has suggested that *Shorea* may be paraphyletic (Dayanandan et al., 1999; Gamage et al., 2004; Kamiya et al., 2005). However, there has been no re-circumscription of *Shorea* to date. This is probably due to limited sampling in the studies above (Pooma et al., 2017) and lack of diagnosable field characters for clades (Ashton, 2004). Twelve species of *Shorea* are listed for Singapore (Newman et al., 1995) and are now extant in Singapore only in patches of remaining primary forests at Bukit Timah Nature Reserve, Central Catchment Nature Reserve and the Gardens' Jungle at Singapore Botanic Gardens.

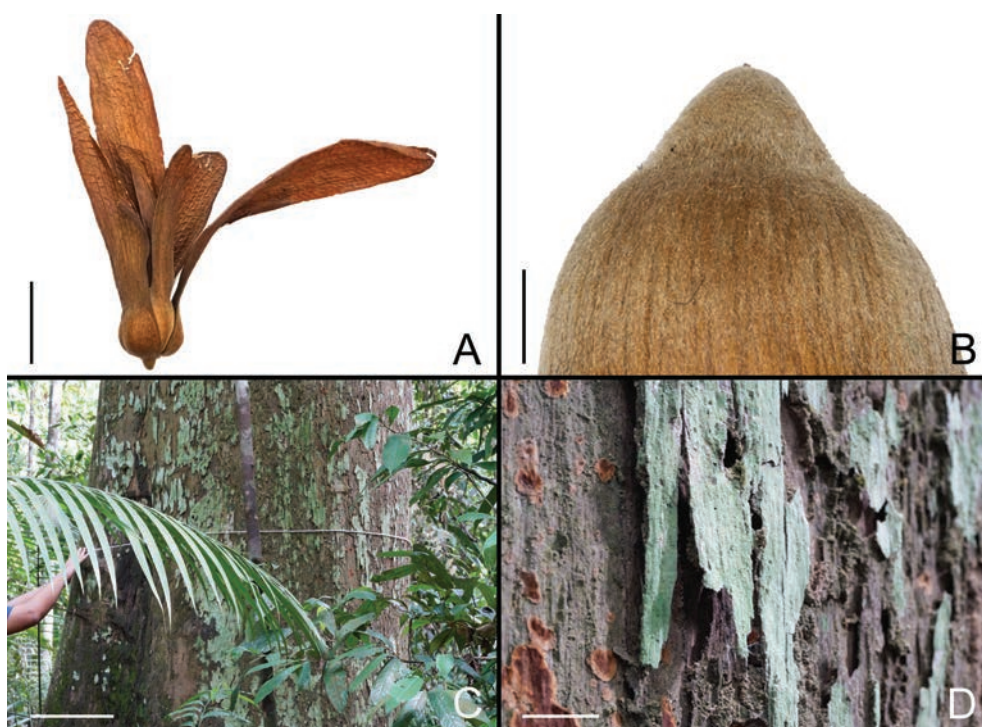
### New species record in Singapore

*Shorea johorensis* Foxw., Malayan Forest Rec. 10: 236 (1932); Ashton, Gard. Bull. Singapore 22: 294 (1964); Ashton, Fl. Males., Ser. 1, Spermat. 9(2): 513 (1982); Ashton, Tree Fl. Sabah & Sarawak 5: 274 (2004); Coode et al. (eds), Checkl. Fl. Pl. Gymnosperms Brunei Darussalam 78 (1996); Newman et al., Man. Dipt. Forest.: Borneo Isl. Light Hardwoods 152 (1996); Newman et al., Man. Dipt. Forest.: Sumatra Light Hardwoods 101 (1996); Symington et al., Malayan Forest Rec. 16: 206 (2004). – TYPE: Peninsular Malaysia, Johor, G. Panti, 22 July 1923, *V. Bain* 5992 (lectotype K [K000671438], designated by Ashton (1967); isolectotype SING [SING0123256]). (Fig. 1)

*Shorea leptocladus* Symington, Gard. Bull. Straits Settlem. 10: 376 (1939); Ashton, Man. Dipt. Trees Brunei 195 (1964); Meijer & Wood, Sabah Forest Rec. 5: 9 (1964); Ashton, Man. Dipt. Trees Brunei & Sarawak, Suppl. 110 (1968). – TYPE: Brunei, Sungei Batu Apoi, 22 April 1935, *Forest Dept. FMS* 30533 (holotype KEP [85102]; isotype BRUN).

**Tree** up to 50 m tall, diameter up to 100 cm. **Buttresses** present. **Bark** brown with thin papery white scales, inner bark pink. **Twig** terete, grey-buff pubescent. **Stipules** early caducous, lanceolate, up to 7 mm long. **Leaves** alternate; petiole slender, 1.7–2.1 cm long, grey-buff pubescent; blade simple, symmetric, ovate, chartaceous to subcoriaceous, 8–14 × 4–7 cm, base obtuse; apex acuminate, acumen 0.8–1 cm long, midrib visible and flat to slightly raised above, prominent below, grey-buff pubescent above, glabrous below, side veins 10–13 pairs, faintly visible and flat above, visible and prominent below, glabrous above, grey-buff pubescent below, straight then arching near margin to c. 30°, tertiary veins faint and flat above, visible and prominent below, glabrous above, grey-buff pubescent below, scalariform, reticulations flat above, prominent below, glabrous above, grey-buff pubescent below. **Flowers** not known from Singaporean material (Peninsular Malaysian material will be used to augment the description here for the Flora of Singapore account along with the Singaporean tree if it flowers before publication). **Fruit** stalk prominent 4–5 mm long, calyx inner surface pubescent at the base, glabrescent elsewhere; longer lobes 3, spatulate, unequal in length, 8.6–10.5 × 1.5–1.8 cm, apex obtuse, base saccate, thickened and widened, 1.1–1.5 × 1.1–1.2 cm; shorter lobes 2, narrowly oblong, unequal in length, 4.8–5.5 × 0.6–0.7 cm, apex obtuse, base similar to that of longer lobes. **Nut** ovoid, glabrous proximally, pale tomentose distally, 1.7–1.9 × 1.1–1.2 cm, with short stylar remnant.

**Distribution.** Peninsular Malaysia, Sumatra and Borneo. In Singapore known from one collection with fruits and two sterile collections, Central Catchment Forest, MacRitchie Nature Trail. The new distribution record for Singapore is congruent with the overall global distribution for this species.



**Fig. 1.** *Shorea johorensis* Foxw. **A.** Fruit with saccate calyx lobe bases & prominent stalk (scale bar 2 cm). **B.** Pale tomentose nut (scale bar 2.5 mm). **C.** Bark with thin papery scales (scale bar 25 cm). **D.** Close-up of bark (scale bar 2 cm). A–B from *Lua SING 2009-408*; C–D from *Ganesan et al. SKG 340*. (Photos: S.K. Ganesan)

*Ecology.* The specimens studied from Singapore were collected from remnant lowland dipterocarp forest on well-drained, gently undulating terrain. This habitat matches the ecological information of this species in Ashton (1982) and Symington et al. (2004).

*Vernacular names.* *Meranti pepijat, Majau* (Malay)

*Provisional IUCN conservation assessment.* *Shorea johorensis* has been assessed globally as Critically Endangered A1cd ver. 2.3 (Ashton, 1998). Only one mature individual has been found in Singapore thus far. This specimen has a diameter of 100 cm and an estimated height of 50 m. It is known to have fruited in 2009 and more recently during the general flowering and fruiting of Dipterocarps in 2014. However, on a visit to the locality of the tree in December 2017, there was no sign of regeneration. Fruits were collected during the 2014 fruiting and have germinated successfully. The saplings are being raised in the National Parks Board Nursery at Pasir Panjang and can form part of a species recovery programme. Based on the IUCN ver. 3.1 criteria as interpreted in Davison et al. (2008), as there are fewer than 50 mature individuals, the national conservation status of *Shorea johorensis* in Singapore is assessed here as Critically Endangered D.

*Specimens examined.* SINGAPORE: **Central Catchment Nature Reserve:** MacRitchie nature trail, 30 Jul 2009 (fr), *Lua*, SING 2009-408 (SING); *ibid.*, 15 Jul 2009 (ster), *Khoo*, KMS 104 (SING); *ibid.*, 28 Dec 2017 (ster), *Ganesan et al.* SKG 340 (SING).

*Notes.* Only one gathering was mentioned in the protologue of *Shorea johorensis* (Foxworthy, 1932). Ashton (1967) located only one specimen of this collection, in K. However, we have found an isolectotype in the general collection at SING.

Some of the leaves of the specimens from Singapore were observed to have domatia at their bases but this character is variable. It is present in collections of *Shorea johorensis* from Sumatra and East Borneo but absent from collections from Peninsular Malaysia and western Sarawak (Ashton, 1982).

In Singapore, this species can be confused with *Shorea pauciflora* King. *Shorea johorensis* differs in that its bark has thin papery white scales which are not present in *S. pauciflora*. Also the fruit is prominently stalked, whereas in *Shorea pauciflora* it is sessile to sub-sessile. A key to the *Shorea* species in Singapore will be provided in the forthcoming Flora of Singapore account.

ACKNOWLEDGEMENTS. The authors would like to thank Dr David Middleton for his advice on nomenclature.

## References

- Ashton, P.S. (1967). Taxonomic notes on Bornean Dipterocarpaceae. *Gard. Bull. Singapore* 22: 294.
- Ashton, P.S. (1982). Dipterocarpaceae. In: van Steenis, C.G.G.J. (ed.) *Flora Malesiana*, ser.1, vol. 9, part 2, pp. 237–552, 575–600. The Hague/Boston/London: Martinus Nijhoff/Dr. W. Junk Publishers.
- Ashton, P. (1998). *Shorea johorensis*. *The IUCN Red List of Threatened Species 1998*: e.T33119A9758343. <http://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T33119A9758343.en>. Accessed 4 Jan. 2018.
- Ashton, P.S. (2004). Dipterocarpaceae. In: Soepadmo, E., Saw L.G. & Chung, R.C.K. (eds) *Tree Flora of Sabah Sarawak*, vol. 5, pp. 63–388. Malaysia: Forest Research Institute Malaysia (FRIM)/Sabah Forestry Department/Sarawak Forestry Department.
- Davison, G.W.H. (2008). Criteria for determining category of threat. In: Davison, G.W.H., Ng, P.K.L. & Ho, H.C. (eds) *The Singapore Red Data Book*, 2<sup>nd</sup> ed., p. 268. Singapore: The Nature Society (Singapore).
- Dayanandan, S., Ashton, P.S., Williams, S.M. & Primack, R.B. (1999). Phylogeny of the tropical tree family Dipterocarpaceae based on the nucleotide sequences of the *rbcL* gene. *Amer. J. Bot.* 86:1182–1190.
- Foxworthy, F.M. (1932). *Dipterocarpaceae of the Malay Peninsula*. *Malayan Forest Records*, no. 10. Kuala Lumpur: Forest Department, F.M.S.
- Gamage, D.T., De Silva, M.P., Inomata, N., Yamazaki, T. & Szmidt, A.E. (2004). Comprehensive Molecular Phylogeny of the Sub-Family Dipterocarpoideae (Dipterocarpaceae) Based on Chloroplast DNA Sequences. *Genes Genet. Syst.* 81(1):1–12.

- Kamiya, K., Harada, K., Tachida, H. & Ashton, P.S. (2005). Phylogeny of *PgiC* gene in *Shorea* and its closely related genera (Dipterocarpaceae), the dominant trees in the Southeast Asian tropical rainforests. *Amer. J. Bot.* 92(5): 775–788.
- Newman, M.F., Burgess, P.F. & Whitmore, T.C. (1995). *Manuals of Dipterocarps for Foresters: Singapore*. Edinburgh: Royal Botanic Garden Edinburgh.
- Pooma, R., Poopath, M. & Newman, M.F. (2017). Dipterocarpaceae. In: Santisuk, T. & Balsev, H. (eds) *Flora of Thailand*, vol. 13, part 4, pp. 557–685. Bangkok: The Forest Herbarium, Royal Forest Department.
- Symington, C.F., Ashton, P.S. & Appanah, S. (2004). In: Barlow, H.S. (ed.) *Foresters' Manual of Dipterocarps. Malayan Forest Records*, no. 16, 2<sup>nd</sup> ed. Kuala Lumpur: Forest Research Institute Malaysia/Malaysian Nature Society.

Shorea johorensis - Foxw. Common Name. Seraya majau, Meranti majau. Family. Dipterocarpaceae. USDA hardiness. 10-12. Dammar has many commercial applications, though many of these uses are less important nowadays due to the advent of synthetic materials. Commercially, it is an ingredient of inks, lacquers, oil paints, varnishes etc, and is used as a glazing agent in foods[891 ]. Harvesting of the resin commences when the bole is around 25cm in diameter (approx 20 years old). Triangular cuts (becoming circular with age) are arranged in vertical rows around the trunk. The cuts are several centimetres wide at first, but become enlarged at every tapping and eventually become holes of 15 - 20cm in depth and width. Familia: Dipterocarpaceae Subfamilia: Dipterocarpoideae Genus: Shorea Sectio: Shorea sect. Brachypterae Species: Shorea johorensis. Shorea johorensis Foxw. Malayan Forest Records. Singapore and Calcutta 10:236. 1932. Shorea johorensis in the Germplasm Resources Information Network (GRIN), U.S. Department of Agriculture Agricultural Research Service. Accessed on 09-Oct-10. IUCN: Shorea johorensis Foxw. (Critically Endangered). English: Light red meranti. Shorea Johorensis on WN Network delivers the latest Videos and Editable pages for News & Events, including Entertainment, Music, Sports, Science and more, Sign up and share your playlists. This page contains text from Wikipedia, the Free Encyclopedia - [https://wn.com/Shorea\\_johorensis](https://wn.com/Shorea_johorensis). Fullscreen pause. Email this Page Play all in Full Screen Show More Related Videos.