

***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.

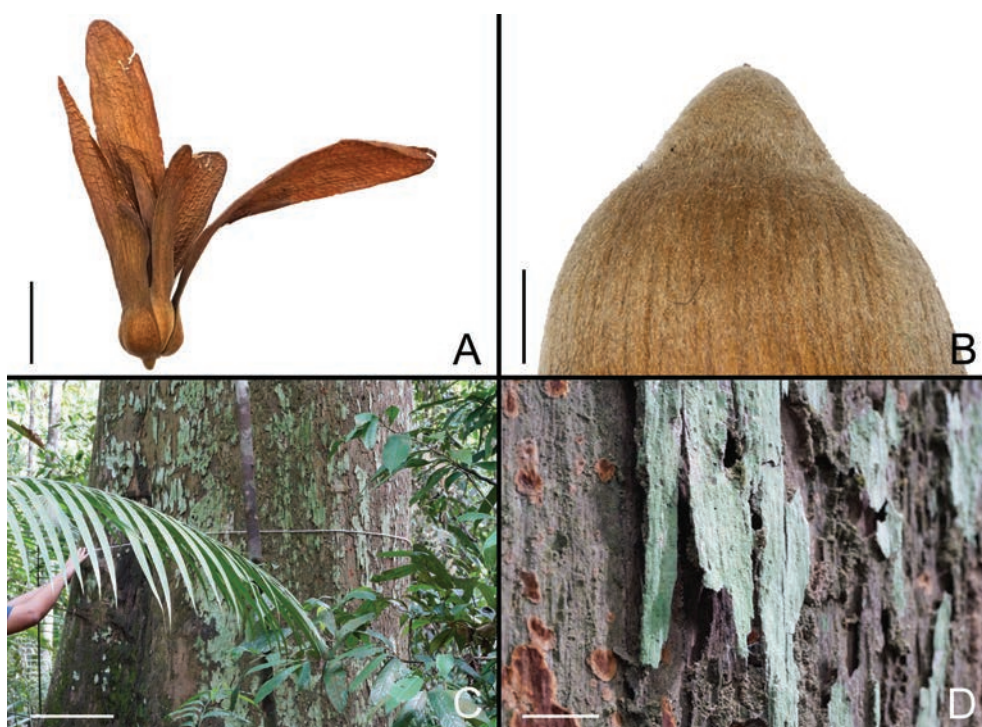


Fig. 1. *Shorea johorensis* Foxw. **A.** Fruit with saccate calyx lobe bases & prominent stalk (scale bar 2 cm). **B.** Pale tomentose nut (scale bar 2.5 mm). **C.** Bark with thin papery scales (scale bar 25 cm). **D.** Close-up of bark (scale bar 2 cm). A–B from *Lua SING 2009-408*; C–D from *Ganesan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

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