

Brief Documentation on Selected Timber-Related Plant Species with Commercial Value in Kubah National Park, Sarawak

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ABSTRACT

A comprehensive learning experience in biodiversity-related discipline is the only practical way to introduce students into the world of flora. Thus, this study was carried out at Kubah National Park as the park is known for its flora and fauna diversity to investigate plant species which are of timber-related importance. The study identified and documented seven different plant families with 12 species of timber-related usage at Kubah National Park.

Keywords: Biology, foundation, Kubah, Sarawak, timber

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INTRODUCTION

Malaysia is well known as mega diversity country particularly in East Malaysia including Sarawak and Sabah. Out of 18 million hectare (mil ha) of total forested area in the country including the 444 protected areas nationwide, five mil ha are managed by the respective federal and state forest authorities as resources for timber production (Cedergren, Falck, Garcia, Goh & Hagner, 2002; Lee & Watling, 2005; MNRE, 2015; Pakhriazad & Mohd Hasmadi, 2010; Teo, Chai & Phua, 2013). This gazetted area was known as one of the world's top timber producer in furniture and household industry-linkage (MTII, 2011; Pakhriazad & Mohd Hasmadi, 2010; SCMP, 2017).

Meanwhile, the remaining 13 mil ha areas are preserved and conserved as national parks and for wildlife including Kubah National Park (KNP). Generally, KNP in Matang, Kuching was established in 1989. The park is situated on massive sandstone ridge with its three mountain peaks, Gunung Serapi (911 meters, m high), Gunung Selang and Gunung Sendok (Abu Bakar, Radam, Samdin & Yacob, 2016; Boyce & Wong, 2008; Brahim, 2005; Das & Charles, 1993; Hanan, 2014; Kamri, 2013; Lateef, Sepiah & Bolhassan, 2015; Lesley *et al.*, 2016; Meekiong, Latiff, Tawan & Miraadila, 2012; Pearce, 1992; Poulsen & Leong-Škorničková, 2017; SF, 2003; Teo *et al.*, 2013; Wahab, 2012; Yee & Chin, 1989).

To date, the country is in ongoing transition becoming a developed nation and has exerted various pressures on local biodiversity, leaving many valuable heritages vulnerable with some even facing threats of extinction and habitats that are degrading problems (Demies, Lading & Silang, 2008; Teo *et al.*, 2013). As reported by the MNRE (2015), nearly half of the nation's plant diversity is facing various levels of threat. Therefore, documenting and recording the existence of timber-related plant species in KNP are timely.

In order to promote, inculcate and preserve awareness of the importance of ecology, biodiversity and environments to the students, among the action taken was by introducing the relevant topic and issues in the academic syllabus. On that note, further measures need to be adopted and practice towards the sustainable utilisation of the biodiversity resource on disseminating ecology, biodiversity and environment education such as Kubah National Park. The park was chosen since it promotes conservation education and nature study and serves as a recreational facility (Abu Bakar *et al.*, 2016).

The park was opened to the public in 1995. Ever since, the park has received increasing numbers of visitors owing to its exceptional biodiversity, ecosystem, ecology, environment, habitat, species and nature including plants, fungi, mammals, amphibians, reptiles and insects. The parks cover an area of 2,230 ha and comprise of heavily forested slopes and ridges of the Serapi range (Brahim, 2005; Meekiong *et al.*, 2012; Pearce, 1992; Teo *et al.*, 2013).

Kubah National Park's most renowned feature is its orchids and palmetum with almost hundred different palm species found in an area of just over 22 km² (Boyce & Wong, 2008; Brahim, 2005; Lesley *et al.*, 2016; Pearce, 1992; Poulsen & Leong-Škorničková, 2017; Vermeulen & Lamb, 2011) besides numerous other tropical rainforest trees including timber-related plant species such as mixed Dipterocarpaceae, Myrtaceae, Myristicaceae, Burseraceae and Lauraceae (Abang Bohari, 2015; Corlett & Primack, 2005; Kanzaki, Yap, Okauchi, Katsuhiko & Yamakura, 2003; Sasaki, 2006; Teo *et al.*, 2013). The most dominant species in terms of importance value is *Syzygium havilandii*, followed by *Hopea dryobalanoides*, *Shorea macroptera*, *Santiria tomentosa* and *Shorea parvifolia* (Abang Bohari, 2015; Appanah & Turnbull, 1998; Kanzaki *et al.*, 2003; MTII, 2011; Pakhriazad & Mohd Hasmadi, 2010; Roszaini & Salmiah, 2015; Soepadmo & Wong, 1995).

The study was conducted to achieve the learning objective of ecology, biodiversity and environmental module by addressing certain emerging environmental issues on ecosystems, natural resources and environment. The insights gained from the study can be applied to many categories of current and future environmental issues (Abu Bakar *et al.*, 2016; Kamri, 2013; Kerfahi, Tripathi, Lee, Edwards & Adams, 2014; Mahidin & Sofwan, 2012; MNRE, 2006; 2015).

In order to comprehend the study, there are three components within this study, namely the acquisition of systematic understanding of environmental issues, the development of innovative study methods and tools, and the collection and dissemination of comprehensive environmental data (Appanah & Turnbull, 1998; Kanzaki *et al.*, 2003; MNRE, 2006; 2015; MRPE, 2012; Sasaki, 2006; Vincent, 2002). All of the components are necessary in environmental problem-solving issue which is based on a foundation of biological study.

On that note, the objective of this study was to align with the course learning outcomes by promoting a comprehensive understanding and perception of the student's learning unit in the class towards biodiversity, ecology and environment including identification, protection, prevention and preservation of timber-related plants species in KNP. At the same time, the students observe and identify the diversity of timber-related plant species in KNP.

MATERIALS & METHODS

Study Site

The study area is located in Kubah National Park (1° 36' 45.9"N, 110° 11' 49.2"E) (Figure 1). The park is located around 25 km from Kuching city centre, and partially undisturbed natural forest situated on a small sandstone plateau which includes Gunung Selang, Sendok and Serapi. The parks is also consisting of five main vegetation types of forest namely lowland mixed dipterocarp, kerangas, alluvial, submontane and high mixed dipterocarp forest (Abang Bohari, 2015; Boyce & Wong, 2008; Brahim, 2005; Meekiong *et al.*, 2012; Poulsen & Leong-Škorničková, 2017; SFD, 2003; Vermeulen & Lamb, 2011).

Field Observation

The study was conducted by observation and documentation activities on selected timber-related plant species by trekking; beginning from the Park Headquarters at 0 m up to the Waterfall Trail at 1,600 m distance (150-450 m altitude), with the detailed documentation and recording was done at every 100 m (Figure 2). The sampling method was set out to be random and all vascular trees that have closed distance observe (approximately 5 m) along the trekking were recorded and documented.

The trekking passed through kerangas forest, mixed dipterocarp forest until it reaches the riverine forest at Rayu river valley, which takes about 2 hr. The trail demonstrated some steep and slippery sections, and consistently descending into the river valley.

Timber-related plant species identified along the trekking journey were recorded. The observation and documentation were made by hand notes, taking photographs and videos. Preliminary identification was made during the visit, but the detailed analysis was made once returned to the campus.

Timber-Related Plant Species Identification

Records of timber-related plant species in KNP which were initially recorded were further categorized according to the scientific and local name, and commercial purposes. A brief analysis of the collected data was done based on reference metadata, scientific and academic books, articles, journals and official-related website revision established prior fieldwork made to finalize the obtained results.

The plant species were identified using keys including plant form or shape, size, the area or habitat of growing, area or habitat characteristics, bark characteristics, and unavailable characteristics at time of observation such as colour and size of seeds or fruit (Abang Bohari, 2015; Appanah & Turnbull, 1998; Ashton, 2004; Cedergren *et*

al., 2002; Corlett & Primack, 2005; Demies *et al.*, 2008; Eyssartier, Stubbe, Walley & Verbeken, 2009; IUCN, 2017; Kanzaki *et al.*, 2003; Lin, Chung & Peng, 2017; Meekiong *et al.*, 2012; Mohd Isa, 2013; Poulsen & Leong-Škorničková, 2017; Sasaki, 2006; SF, 2003; Soepadmo & Wong, 1995; Vincent, 2002). The documents were also compared with Sarawak Herbarium, Sarawak Forestry Department.

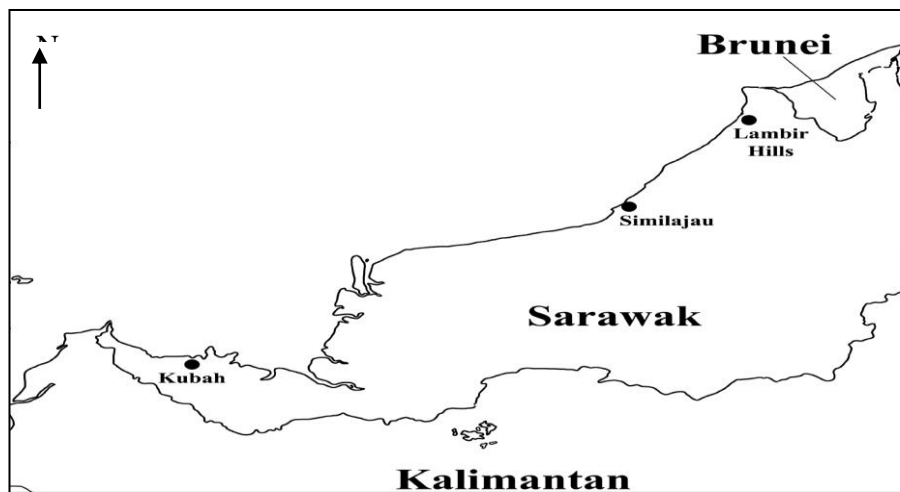


Figure 1. Aerial map of Kubah National Park, Sarawak (Dow & Reels, 2010).

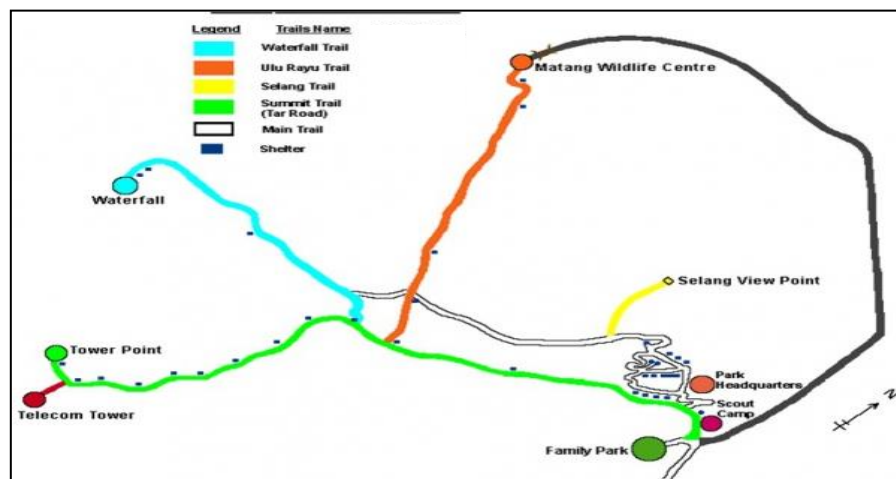


Figure 2. Trail of the study area (Sarawak Tourism, 2018).

RESULTS & DISCUSSION

Site Characteristics

The study area along the Waterfall Trail has encountered the richness of kerangas forest with the first part of the forest is a small, open and permanently saturated area providing with a fascinating patch of plants adapted to the sandy ground. The path also descends steeply into dipterocarp forest valley with a few observations and documentation of timber-related plant species (Abang Bohari, 2015; Boyce & Wong, 2008; Brahim, 2005; Pearce, 1992).

Timber-Related Plants Species

The study has discovered twelve timber-related plant species along the study area. Eight species recorded under Dipterocarpaceae family were identified as *Shorea albida*, *Shorea rugosa*, *Shorea dealbata*, *Shorea pauciflora*, *Dipterocarpus baudii*, *Dipterocarpus sarawakensis*, *Dryobalanops beccarii*, and *Dryobalanops oblongifolia* (Figure 3, A-H). Meanwhile, each one in four species was recorded under Euphorbiaceae family known as *Endospermum diadenum*; Ixonanthaceae family, *Ixonanthes icosandra*; Fabaceae family, which is *Koompassia malaccensis*; and Cannabaceae family, *Girroniera nervosa* (Figure 3, I-L).





Figure 3. Timber-related plant species in Kubah National Park. A. *Shorea albida*, B. *Shorea rugosa*, C. *Shorea dealbata*, D. *Shorea pauciflora*, E. *Dipterocarpus baudii*, F. *Dipterocarpus sarawakiensis*, G. *Dryobalanops beccarii*, H. *Dryobalanops oblongifolia*, I. *Endospermum diadenum*, J. *Ixonanthes icosandra*, K. *Koompassia malaccensis*, and L. *Gironniera nervosa*.

Dipterocarpaceae is the largest family dominating Sarawak's rainforest, and giving their name mixed dipterocarp rainforest. The name Dipterocarpaceae refers to the seeds, which have two or more wings, enabling them to disperse by wind and gravity, like little spinning helicopters (Ashton, 2004; Cedergren *et al.*, 2002; Corlett & Primack, 2005; SF, 2003; Teo *et al.*, 2013). Meanwhile, *Shorea* is the largest genus of hardwood and semi-hardwood trees within this family (Lateef, Sepiah & Bolhassan, 2016; Pakhriazad & Mohd Hasmadi, 2010; Soepadmo & Wong, 1995). Many of these species are of significant commercial value for the timber-related industry (Ismaili, Openg, Abdul Rahim & Duju, 2016; MTII, 2011; Roszaini & Salmiah, 2015; Roszaini *et al.*, 2017; Wong, 1995) (Figure 4 and Table 1).

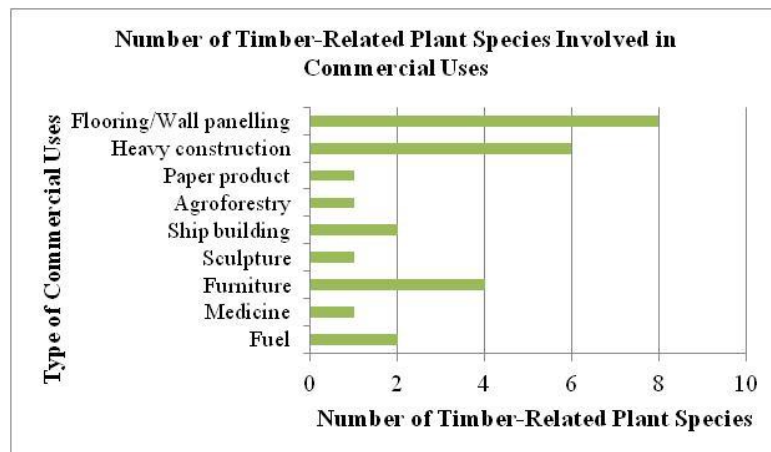


Figure 4. Number of timber-related plant species involved in commercial uses.

Table 1. List of timber-related plants species with possible value and residential observed in Kubah National Park, Sarawak (Ashton, 2004; IUCN, 2017; SF, 2003).

No.	Taxonomic Level	Habitat and Ecology	Value and Residential
1.	Order: Malvales Family: Dipterocarpaceae Genus: <i>Shorea</i> Species: <i>Shorea albida</i> Sym Local/Common Name (Vernacular): Meranti Merah Muda Alan Batu	Terrestrial Swamp forest Up to 600 m elevation	Used for timber industry. Classified as Endangered in IUCN Red List. Classified as Vulnerable in Sarawak Plant Red List. The species can range in size from a sub-canopy tree around 20 m tall to an emergent tree up to 75 m tall with a vast, diffuse canopy. The straight cylindrical bole can be 50 to 250 cm in diameter as for the larger trees with large buttresses up to 4 m high. The peat-swamp forest habitats where this tree grows are seriously threatened as regeneration is reported to be non-existent.
2.	Order: Malvales Family: Dipterocarpaceae Genus: <i>Shorea</i> Species: <i>Shorea rugosa</i> Local/Common Name (Vernacular): Meranti Merah Tua Seraya Kerukup	Terrestrial Sandy soils or heath forest Up to 400 m elevation	Used for interior and exterior panelling and joinery, light carpentry, furniture, etc. Classified as Critically Endangered in IUCN Red List. Classified as Vulnerable in Sarawak Plant Red List. The species grows on hills in lowland mixed dipterocarp forest. This huge tree has elliptical, papery, wavy leaves that measured up to 16 cm long and 7 cm wide. The bark can be almost smooth as on young trees. However, when the trees ages, furrows develop, which deepen as time passed. The inner bark is light brown to yellowish and has a slightly stringy texture.
3.	Order: Malvales Family: Dipterocarpaceae Genus: <i>Shorea</i> Species: <i>Shorea dealbata</i> Local/Common Name (Vernacular): Meranti Putih Meranti Bumbang	Terrestrial Sandy soils and on low hills forest Up to 150 m elevation	Used for timber industry. Classified as Critically Endangered in IUCN Red List. Classified as Vulnerable in Sarawak Plant Red List. Classified as Endangered in Malaysia Plant Red List. Classified as Endangered in Peninsular Malaysia Plant Red List. The species can grow up to 30 m tall. This species grows frequently in kerangas forest and sometimes in swampy land. The species is lightweight hardwood. The heartwood is yellowish white when freshly cut, but gradually become yellowish brown and slightly more distinct from the sap wood on exposure.
4.	Order: Malvales Family: Dipterocarpaceae Genus: <i>Shorea</i> Species: <i>Shorea pauciflora</i> Local/Common Name (Vernacular): Meranti Nemesu	Terrestrial Well-drained soil, lowland and hill forest Up to 700 m elevation	Used for timber industry. Found especially in riverside habitats. Classified as Endangered in IUCN Red List. Classified as Least Concern in Sarawak Plant Red List. Classified as Least Concern in Malaysia Plant Red List. The species is threatened by habitat loss. An emergent tree in undisturbed mixed dipterocarp forest at elevation up to 900 m. The species is mostly found on hillsides with clay to sandy soils. This tree can grow up to 60 to 220 cm in dia. with stout buttresses up to 4 m high.

Table 1. Cont...

5.	Order: Malvales Family: Dipterocarpaceae Genus: <i>Dipterocarpus</i> Species: <i>Dipterocarpus baudii</i> Local/Common Name (Vernacular): Keruing	Terrestrial Low-lying, well-drained or semi-swampy forests Up to 800 m elevation	Harvested for local use and trade. Yields ole-resin which is used locally for caulking boats and illumination. General construction timber such as carpentry, panelling, etc. Classified as Vulnerable in IUCN Red List. Classified as Least Concern in Malaysia Plant Red List. The species usually located commonly in tropical forest. This emergent tree species grows up to 40 m high with ovate-elliptic leaves up to 250 mm long and has seeds with winged lobes that are 150 to 180 mm long.
6.	Order: Malvales Family: Dipterocarpaceae Genus: <i>Dipterocarpus</i> Species: <i>Dipterocarpus sarawakensis</i> Local/Common Name (Vernacular): Keruing Layang	Terrestrial Alluvial soils, lowland and on hills forest Up to 1600 m elevation	Used for timber industry. Classified as Near Threatened in Sarawak Plant Red List. Classified as Critically Endangered in Malaysia Plant Red List. Classified as Critically Endangered in Peninsular Malaysia Plant Red List. The species is an emergent tree species that can attain heights above 50 m and grows to 1 m in dia. This species has a short petiole with short and dense indumentums, broadly ovate and obtuse leaves with a wavy margin that helps this species is different from the other <i>Dipterocarpus</i> species. This locally abundant tree grows in leached sandy soils on low coastal hills.
7.	Order: Malvales Family: Dipterocarpaceae Genus: <i>Dryobalanops</i> Species: <i>Dryobalanops beccarii</i> Local/Common Name (Vernacular): Kapur Bukit	Terrestrial Sandy soils, on hills and ridges forest Up to 700 m elevation	Used by the Iban for planks, beams, furniture, etc. May last for 15 years in the dry, three to four years if used for boat. Classified as Endangered in IUCN Red List. Classified as Least Concern in Sarawak Plant Red List. Classified as Endangered in Malaysia Plant Red List. Classified as Endangered in Peninsular Malaysia Plant Red List. The species is a large evergreen tree, with a large, globose crown. This species is a large emergent tree and can grow up to 65 m tall. This locally abundant tree grows in leached sandy soil and along the stream. It is a hardwood trees.
8.	Order: Malvales Family: Dipterocarpaceae Genus: <i>Dryobalanops</i> Species: <i>Dryobalanops oblongifolia</i> Local/Common Name (Vernacular): Kapur Kelansau	Terrestrial Poorly drained and on hillsides forest Up to 600 m elevation	The Iban used for planks, beams, etc. It may last for 15 years in the dry but only two years for boats. Classified as Least Concern in IUCN Red List. The species is found in at least one protected area which is KNP but is threatened elsewhere due to habitat loss. It is an emergent tree up to 60 m tall also found in mixed dipterocarp forest on sandy clay soils.

Table 1. Cont...

9.	Order: Malpighiales Family: Euphorbiaceae Genus: <i>Endospermum</i> Species: <i>Endospermum diadenum</i> Local/Common Name (Vernacular): Terbulan	Terrestrial Lowland forest Up to 1000 m elevation	Good for firewood. Classified as Not Evaluated in Malaysia Plant Red List. The species is a mid-canopy tree with a diffused, domed shaped crown. It can grow up to 36 m tall. The surface of the bark is smooth, becomes wrinkled to scaly in patches and grey fawn while the inner bark is thick and cream with orange flecks. This species grows in open places of undisturbed mixed dipterocarp and kerangas forest.
10.	Order: Malpighiales Family: Ixonanthaceae Genus: <i>Ixonanthes</i> Species: <i>Ixonanthes icosandra</i> Local/Common Name (Vernacular): Pagar Anak Inggi Burong	Terrestrial On slopes and ridges forest Up to 900 m elevation	The Iban use for building boats. It may last for about one to half years. Classified as Not Evaluated in Malaysia Plant Red List. The species is an evergreen tree with a large, spreading, moderately dense crown which can grow up to 35 m tall. The deeply fluted bole can be 50 cm in dia., usually with buttresses. The heartwood is white or reddish brown with the sapwood is white, pinkish white, honey-coloured, yellow, or brown with distinct lamination.
11.	Order: Fabales Family: Fabaceae Genus: <i>Koompassia</i> Species: <i>Koompassia malaccensis</i> Local/Common Name (Vernacular): Kempas Menggris	Terrestrial Swamp forest Up to 600 m elevation	Used for heavy construction because it is heavy hardwood timber. Classified as Least Concern in IUCN Red List. Classified as Not Evaluated in Malaysia Plant Red List. The species can grow up to 60 m tall. This species is protected in Sarawak under Wildlife Protection Bill of 1990. This species is emergent tree in freshwater peat swamp forest and also found in sub-montane forest. It also tends to be an orangish brown with an overall mahogany like appearance. This tree is durable regarding decay resistance and heavy wood timber.
12.	Order: Rosales Family: Cannabaceae Genus: <i>Gironniera</i> Species: <i>Gironniera nervosa</i> Local/Common Name (Vernacular): Medang Kasap Puloh	Terrestrial Alluvial soils, on hillsides and ridges forest Up to 500 m elevation	Used for timber industry. May last for five years if kept dry. Classified as Not Evaluated in Malaysia Plant Red List. The species usually located commonly in lowland primary and secondary evergreen forest. This evergreen tree can grow up to 40 m tall and the straight bowl can be up to 64 cm in dia., sometimes with buttresses. This tree also produced fruit which is a yellow, orange or red drupe around 5 to 10 mm long and 3 to 6 mm wide, and it is edible.

Based on Table 1, there are 12 timber-related plants species that had been observed and documented during the study. The first species is *Shorea albida* Sym (Figure 3, A). This species can range in size from a sub-canopy tree around 20 m to an emergent tree up to 75 m tall with a vast, diffuse canopy. The straight cylindrical bole can be 50 to 250 cm in diameter as for the larger trees with large buttresses up to 4 m high. This large timber tree is usually found in North-West Borneo which includes Sarawak, Brunei and Kalimantan. The peat-swamp forest habitats where the tree grows are seriously threatened as regeneration is reported to be non-existent. The plant is classified as endangered in the IUCN Red List of Threatened Species (Ashton, 2004; Corlett & Primack, 2005; Ismaili *et al.*, 2016; IUCN, 2017; Pakhriazad & Mohd Hasmadi, 2010; Soepadmo & Wong, 1995).

Shorea rugosa (Figure 3, B) can be found in Borneo and the Philippines. This species grows on hills in lowland mixed dipterocarp forest. This huge tree has elliptical, papery, wavy leaves that measured up to 16 cm long and 7 cm wide. The bark can be almost as smooth as on young trees. However, when the trees ages, furrows develop, which deepens as time passed. The inner bark is light brown to yellowish and has a slightly stringy texture. This species is classified as critically endangered in IUCN Red List of Threatened Species (Abang Bohari, 2015; Ashton, 2004; Corlett & Primack, 2005; IUCN, 2017; Meekiong *et al.*, 2012; Pakhriazad & Mohd Hasmadi, 2010; Soepadmo & Wong, 1995).

Shorea dealbata (Figure 3, C) can grow up to 30 m tall. This species can be found in Malaysia and Indonesia which grows frequently in kerangas forest and sometimes in swampy land. This species is classified as critically endangered in the IUCN Red List of Threatened Species. The species is lightweight hardwood. The heartwood is yellowish-white when freshly cut, but gradually become yellowish-brown and slightly more distinct from the sapwood on exposure (Abang Bohari, 2015; Ashton, 2004; Corlett & Primack, 2005; IUCN, 2017; Pakhriazad & Mohd Hasmadi, 2010; Soepadmo & Wong, 1995).

Shorea pauciflora is a species found in Sumatra, Peninsular Malaysia and Singapore (Figure 3, D). It is threatened by habitat loss. This is an emergent tree in undisturbed mixed dipterocarp forest at elevation up to 900 m. The species is mostly found on hillsides with clay to sandy soils. This tree can grow up to 60 to 220 cm in dia. with stout buttresses up to 4 m high (Ashton, 2004; Corlett & Primack, 2005; Meekiong *et al.*, 2012; Pakhriazad & Mohd Hasmadi, 2010; Soepadmo & Wong, 1995; Vincent, 2002).

Dipterocarpus baudii has been recorded from Malaysia, Myanmar, Cambodia, Thailand and Vietnam (Figure 3, E). This tree is located commonly in the tropical forest. This emergent tree species grows up to 40 m high with ovate-elliptic leaves up to 250 mm long and has seeds with winged lobes that are 150 to 180 mm long (Abang Bohari, 2015; Ashton, 2004; Corlett & Primack, 2005; Soepadmo & Wong, 1995).

Dipterocarpus sarawakensis is an emergent tree species that can attain heights above 50 m and grows to 1 m in dia. (Figure 3, F). This species has a short petiole with short and dense indumentums, broadly ovate and obtuse leaves with a wavy margin that helps distinguish this species from the other *Dipterocarpus* species. It is commonly found in Peninsular Malaysia and Borneo including Sarawak, Brunei and Kalimantan. This locally abundant tree grows in leached sandy soils on low coastal hills. This species is listed critically endangered in the Malaysia Plant Red List due to habitat degradation (Abang Bohari, 2015; Ashton, 2004; Corlett & Primack, 2005; IUCN, 2017; Meekiong *et al.*, 2012; Soepadmo & Wong, 1995; Vincent, 2002).

Dryobalanops beccarii is a large evergreen tree, with a large, globose crown (Figure 3, G). This species is a large emergent tree and can grow up to 65 m tall. This locally abundant tree grows in leached sandy soil and along the stream. It is commonly found in Peninsular Malaysia and Indonesia. It is a hardwood tree. This tree has been classified as endangered in the Malaysia Plant Red List (Ashton, 2004; Demies *et al.*, 2008; IUCN, 2017; Pakhriazad & Mohd Hasmadi, 2010; Soepadmo & Wong, 1995; Vincent, 2002).

Dryobalanops oblongifolia is native to regions of Southeast Asia and Maritime Southeast Asia (Figure 3, H). It is found in at least one protected area which is KNP but is threatened elsewhere due to habitat loss. It is an emergent tree up to 60 m tall also found in mixed dipterocarp forest on sandy clay soils (Ashton, 2004; Demies *et al.*, 2008; Lateef *et al.*, 2016; Soepadmo & Wong, 1995; Vincent, 2002).

Endospermum diadenum can only be found in Malaysia, Thailand and Indonesia (Figure 3, I). This tree is a mid-canopy tree with a diffused, domed-shaped crown. It can grow up to 36 m tall. The surface of the bark is smooth, becomes wrinkled to scaly in patches and grey fawn while the inner bark is thick and creamy with orange flecks. This species grows in open places of undisturbed mixed dipterocarp and kerangas forest (Appanah & Turnbull, 1998; Ashton, 2004; Meekiong *et al.*, 2012; Soepadmo & Wong, 1995; Vincent, 2002).

Ixonanthes icosandra is an evergreen tree with a large, spreading, moderately dense crown which can grow up to 35 m tall (Figure 3, J). It is commonly found in Southeast Asia which includes Malaysia, Thailand, Indonesia and Philippines. The deeply fluted bole can be 50 cm in diameter, usually with buttresses. The heartwood is white or reddish-brown with the sapwood is white, pinkish-white, honey-coloured, yellow, or brown with distinct lamination (Abang Bohari, 2015; Ashton, 2004; Soepadmo & Wong, 1995; Vincent, 2002).

Koompassia malaccensis can grow up to 60 m tall (Figure 3, K). It is also found in Malaysia, Brunei, Indonesia, Singapore and Thailand. This species is protected in Sarawak under the Wildlife Protection Bill of 1990. The plant is classified as the least concern as well as critically endangered in the IUCN Red List of Threatened Species. This species is an emergent tree in freshwater peat swamp forest and also found in sub-montane forest. It also tends to be an orange-brown with an overall mahogany like appearance. This tree is durable regarding decay resistance and heavy wood timber (Appanah & Turnbull, 1998; Ashton, 2004; Cedergren *et al.*, 2002; Demies *et al.*, 2008; IUCN, 2017; Roszaini & Salmiah, 2015; Sarawak Government Gazette, 1998; Soepadmo & Wong, 1995; Vincent, 2002).

Finally, the *Gironniera nervosa* can also be found in Peninsular Malaysia, Borneo, Thailand, Sumatra, Moluccas and New Guinea (Figure 3, L). This tree is located commonly in lowland primary and secondary evergreen forest. This evergreen tree can grow up to 40 m tall and the straight bowe can be up to 64 cm in diameter, sometimes with buttresses. This tree also produces fruit which is a yellow, orange or red drupe around 5 to 10 mm long and 3 to 6 mm wide, and it is edible (Abang Bohari, 2015; Ashton, 2004; Soepadmo & Wong, 1995; Vincent, 2002).

CONCLUSION

Along the Waterfall Trail at Kubah National Park, 12 timber-related plants species were observed and documented including *Shorea albida* Sym, *Shorea rugosa*, *Shorea dealbata*, *Shorea pauciflora*, *Dipterocarpus baudii*, *Dipterocarpus sarawakensis*, *Dryobalanops beccarii*, *Dryobalanops oblongifolia*, *Endospermum diadenum*, *Ixonanthes icosandra*, *Koompassia malaccensis* and *Gironniera nervosa*. The most dominant timber family is Dipterocarpaceae in which *Shorea* is the most dominant genus.

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