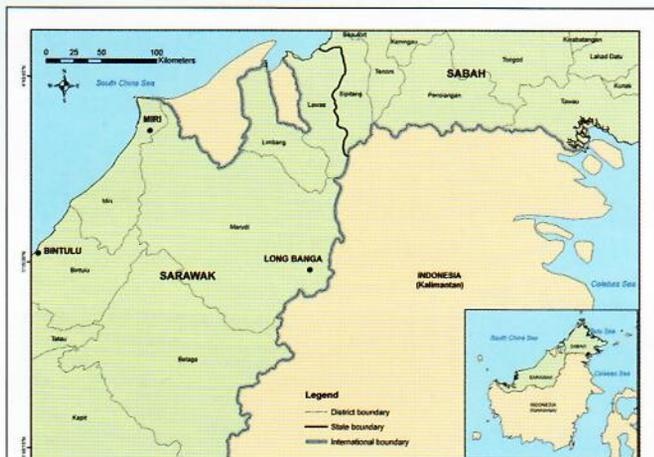


Heart of Borneo: Exploring the Beauty of Long Banga

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The Long Banga Scientific Expedition which was carried out from 20th September to 2nd October 2016, was the fifth of a series of scientific expeditions conducted under the Heart of Borneo (HoB) Initiative Project (organised by the Forest Department of Sarawak) between 2008–2017. “Where the Beat Goes On” was the theme for this expedition in Sarawak which aimed to reveal and document the wealth of Long Banga’s biodiversity. The area had not been botanically explored before, and this expedition provided a great opportunity for collecting rare and new species. Long Banga is located approximately 335 km south-east of Miri, Sarawak, and close to the Malaysian border with Kalimantan, Indonesia. Long Banga can be reached either by logging roads or by air. MASWINGS is the only airline that flies from Miri to Long Banga, twice a week. The expedition site was located at 3.2° N 115.38333° E, near Long Banga village which is a settlement of the Sabans (one of the smallest ethnic groups in Sarawak) and Kenyahs. Another ethnic group, the Penans, live nearby.



The HoB Initiative is a government-led and NGO-supported programme initiated by a joint declaration between Malaysia, Indonesia and Brunei in 2007. Its main objective is to conserve the biodiversity of the area for the benefit of people who rely upon it through a network of protected areas, sustainable forest management and other sustainable land uses.

On this expedition, about 40 four-wheel drive vehicles left in convoy from Miri town at 7.30 a.m. to ensure that we reached the campsite before nightfall. The journey from Miri took about 8 hours’ drive along rugged logging roads and an

uneven, hilly dirt road. When we arrived at the campsite, we were fascinated by the splendid surrounding view of a very serene hilly area and the clean, fresh air.

Long Banga, situated 437–1200 m above sea level, is an area of hill mixed dipterocarp forest, riparian forest, secondary forests and kerangas. The expedition covered the hilly and mountainous terrain. The botany team from FRIM aimed to make a comprehensive collection and divided our team into three groups with different focal interests: trees, ferns and herbs, shrubs and climbers (excluding orchids). Orchids were collected by researchers from Universiti Putra Malaysia, Serdang. Daily, we collected specimens from different sites and trails and had to scramble up the hills to look for flowering and fruiting plants. However, the hard work did not dampen our spirits and every day was an exciting day. Collecting on botanical expeditions often involves an element of luck such as discovering a new species record, endemic, or rare plant. Here we highlight some of the interesting findings (i.e. endemic, rare and probably new species) from the expedition.

We encountered two interesting gingers that are endemic to the lowland rain forests of Borneo. The first one, *Etilingera velutina* (Zingiberaceae) has velvety bracts with pretty and showy, bright pink flowers. The second one, *E. brevilabrum*, normally has distinctive leaves with red blotches on both sides, especially the new leaves. Its flowers are red and tubular with a wide lower labellum and a white patch on the narrow upper lip.

At least 11 species of palms were found during the expedition. Of interest was an unidentified species of *Pinanga*, a clumping palm bearing red fruits at the base of its trunk. Most palm species, especially *Pinanga* spp., were found growing abundantly along the ridges at 1,100 m and higher (which is the transition from upper dipterocarp forest to mossy forest).



Etilingera velutina often grows in wet areas near streams.



Etilingera brevilabrum, one of the lovely flowers with a showy bract.



An unidentified, possibly new, *Pinanga* sp.



The bushy and clumping *Begonia fuscisetosa*, up to 75 cm tall.



The fruit of *Diospyros neurosepala* can be up to 4.5 cm in diameter.



The flowers and leaves of *Magnolia lasia*.



The infructescence of *Syzygium rejangense*.

Bornean forests are known as hotspots for begonias, with almost 200 species recorded (Kiew *et al.*, 2015). About 15–20 species of *Begonia* were discovered during the expedition and most of them are still unidentified. One of the interesting finds was *B. fuscisetosa*, an endemic Bornean species that frequently grows near streams or river banks of lowland mixed dipterocarp forest. It has been recorded from the northeastern part of Sarawak, Sabah, Brunei and Kalimantan. This *Begonia* is characterized by a row of stiff, dark red or brown bristles on the lamina.

Several interesting trees were also encountered. These included *Diospyros neurosepala* (Ebenaceae) which is endemic to Borneo and known only from Sarawak and Kalimantan. This species stands out because the midrib, lateral and intercostal veins are sunken on the upper leaf surface, and the fruit calyx has prominent veins. The fruit is solitary, glabrous and turns bright orange when ripe.

Magnolia lasia (Magnoliaceae), about 15 m tall, is a sub-canopy tree endemic to Sabah, Sarawak and Kalimantan. It is found in primary and secondary rainforest up to 1,200 m. The velvety-hairy, yellow-brown flowers are solitary, on long, hairy stalks.

Syzygium rejangense (Myrtaceae) is endemic to Borneo and widespread in Sabah. In Sarawak, it is recorded from the districts of Belaga, Kapit, Lawas, Limbang, Lubok Antu, Marudi, Miri and Song. It is frequently found along riverbanks below the flood line. The tree is about 10 m tall with spreading branches and has lanceolate leaves. In the juvenile phase, it is rheophytic (adapted to fast-flowing water).

Pternandra cogniauxii (Melastomataceae), known as *puloh*, *pura saie*, *seri-seri* and *timberas burung* in Borneo, is a shrub with broadly rounded, shining green leaves. It grows in both primary and secondary forests. The fruits are very attractive, reddish-maroon, with spine-like appendages. The flowers are usually borne behind the leaves and often on branches.

Pleiospermium latialatum (Rutaceae) is a tree of about 15 m height, endemic to Borneo, but widespread and common in Sabah and Sarawak. The epithet, *latialatum* means having a broad wing, and refers to the petiole. In Sarawak, the species is known as *limo anto* and the leaf has a very strong smell of citrus. The greenish yellow fruit is globose with numerous conspicuous raised oil-glands. The pulp-vesicles are conical and slender with 2 to 3 seeds. During the Long Banga expedition, this species was found in secondary forest along Sungai Puak.

Saurauia (Actinidiaceae) is one of the commonest trees found in the secondary forest of Long Banga, especially near Sungai Puak. Three species were found during the expedition, namely, *S. glabra*, *S. subcordata* and a yet to be identified species.



The fruits of *Pternandra cogniauxii* turn purplish when ripe.



Fruits and leaves of the citrus, *Pleiospermium latialatum*, known as *limo anto* in Sarawak.



Saurauia glabra bears flowers (white) and fruits (green) densely on its branches.



Edible fruits of *Ficus geocharis*.

Baccaurea lanceolata (Phyllanthaceae) is a big tree, about 12 m tall with a bole of 14 cm diameter. It was found on slopes, and only detected from where its fruits had fallen to the ground. The fruit is globose to ellipsoid, 1-4-seeded berry and pale green when fresh. In Borneo, It is known as *asam pauh*, *buah lipau*, *empawang* or *kalampesu* but in Peninsular Malaysia it is known as *asam paung*. This species is used for medicinal purposes, e.g., a drink made from pounded leaves and water is use for treating stomach ache.

The species name of *Ficus geocharis* (Moraceae) means 'earth or ground ornament' in Latin and refers to the fruit which grows from creeping stems on the ground that can be several meters long. This understorey tree is about 4 m tall, has smooth and light brown bark, and produces white latex when injured. Its special characteristics are the asymmetric base of the leaf, the globose fruit with dark red scales, and the creeping infructescences of about 1 m in length. In Borneo it is known as *buah abung* in Kelabit, and *dali*, *entimau*, *timopada* or *kara* in Iban. The fruit is edible, and young shoots are eaten as vegetables.

It is a known fact that the Bornean forests offer much higher species diversity of ferns and lycophytes than Peninsular Malaysia. One of the interesting pteridophytes found during the expedition was *Selliguea oodes* (Polypodiaceae), a tiny fern about 2–4 cm long and 0.8–1.5 cm wide (Bornean specimens), which is found only in the Philippines, Borneo and Sulawesi. It often occurs as a rheophyte in riverbeds but is also found on tree trunks in forest between 600 and 1500m elevation. At Long Banga, several patches of this fern were found on boulders in the river near the base camp. Another fern was *Calymmodon clavifer* (Grammitidaceae) which is only found in montane areas from Sumatra to New Guinea. It usually grows on tree trunks (epiphyte) and sometimes on rocks (lithophyte). Only three populations were found throughout the expedition area where each population consisted of three to five individuals growing together on a boulder. Each boulder was about 1 m length.

All participants spent the evenings taking turns presenting each day's findings in their different fields of study. We also had discussions and shared experiences while at the same time improved research networking.

In total, almost 500 species were extensively collected within 10 working days. A preliminary checklist showed that at least 5–10% of the species found are either endemic or rare to Borneo, with one or two species probably new to science. All specimens are deposited in the Kepong Herbarium (KEP) with duplicates sent to the Sarawak Herbarium (SAR).

All findings from this expedition such as the diversity of flora and fauna, geology, aquatic habitats, sociological aspects and also ecotourism potential, are important elements for the planning of conservation measures for Longa Banga.



Rheophytic fern *Selliguea oodes* growing on boulders in a river. Inset: Spores borne on the underside of the leaf.



Calymmodon clavifer, a fern that grows on tree trunks or rocks.

Acknowledgements

We would like to extend our gratitude to the Ministry of Water, Land and Natural Resources (KATS), the State Government of Sarawak, the Forest Department of Sarawak, the expedition secretariat and participants for their valuable help, and sharing of knowledge and experience. We also thank Ms. Wendy Yong for preparing the map.

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White Parasol: A New Fungus Record for Malaysia

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A pair of mature fruit bodies found under *Hopea odorata*.

This is a report of a new record of *Macrolepiota dolichaula* (Berk. & Broome) Pegler & Rayner for Malaysia. The fungus was found at the Forest Research Institute Malaysia (FRIM) Research Station, Bidor, a man-made forest located in Perak State. This Research Station is located on an ex-tin mining site that had been replanted with various forest tree species since being leased from the Perak State Government in 1996. The area has now been planted with over 40 tropical tree species, with both commercial and/or conservation value(s).

In September 2015, the Station Manager spotted a troop of large, white mushrooms under a 13-year-old *Hopea odorata* stand. *Hopea odorata* is a species of dipterocarp, locally known as *Merawan siput jantan*, and had been planted at Bidor due to its ability to grow in open sandy areas with low soil nutrient content and poor water retention capacity. In May 2018, almost three years after the first observation of the mushrooms, the Station Manager reported a second

encounter, in the same tree stand. Fruiting of the mushrooms was monitored from the 14th to the 16th of May 2018, and during that week the Research Station had received daily showers. The mushrooms were found growing either solitarily or occasionally in small groups under *H. odorata* trees. Fresh specimens of the mushrooms were collected and a morphological description was made based on macro- and micro-morphological characteristics. The species was then identified as *Macrolepiota dolichaula*, a new record for Malaysia.

Macrolepiota dolichaula belongs to the large and very diverse family, Agaricaceae. It has a widespread distribution and has been reported in East Africa, Australia (Pegler & Rayner, 1969), Sri Lanka (Pegler, 1986), Vietnam (Yang, 2000), China (Ge *et al.*, 2010), Pakistan (Faiz *et al.*, 2014) and Thailand (Rizal *et al.*, 2017). This fungus has a medium to large, fleshy white cap, 6–14 cm in diameter, with numerous brown scales becoming dense at the centre. It is egg-shaped when young; the cap



Young specimen of *Macrolepiota dolichaula* emerging through the litter of *Hopea odorata*.

expanding to become convex to plano-convex when mature, with a little bump at the centre (umbo). The gills are white, as is the spore print. The stipe is 16.0–35.3 cm long and 1.0–1.5 cm in diameter, hollow at maturity, with a prominent ring (annulus) near the apex of the stipe. This fungus is commonly known as the White Parasol because it has a white cap and resembles a parasol when fully developed.

Most species of *Macrolepiota* are known to be edible, for example, the well-known *M. procera*, *M. excoriata*, *M. africana*, *M. gracilentia* and *M. detersa*. *Macrolepiota dolichaula* is also edible and is consumed in Africa (Kenya and Malawi) (Boa, 2004), China (Ge *et al.*, 2010), India (Kumari & Atri, 2014) and Thailand (Rizal *et al.*, 2015). It is known to be a good source of nutrients, high in carbohydrates, protein and fibre, but with low lipid content (Kumari & Atri, 2014; Rizal *et al.*, 2015). It also contains various vitamins with significant amounts of retinol (vitamin A), thiamine (vitamin B1), riboflavin (vitamin B2) and ascorbic acid (vitamin C) (Atri *et al.*, 2012). Furthermore, *M. dolichaula* contains fucogalactan which is proven to have antioxidant properties and immune-enhancing activity (Samanta *et al.*, 2015). However, there are some species of *Macrolepiota* that are poisonous, such as *M. venenata*.

It is interesting to find this fungus growing on an ex-tin mine site, in acidic soil with an average pH of 5. According to Vellinga (2014) and Rizal *et al.* (2017), *Macrolepiotoid* fungi prefer to grow in slightly alkaline to neutral forest soil with high pH of 6.5 to 7.8.

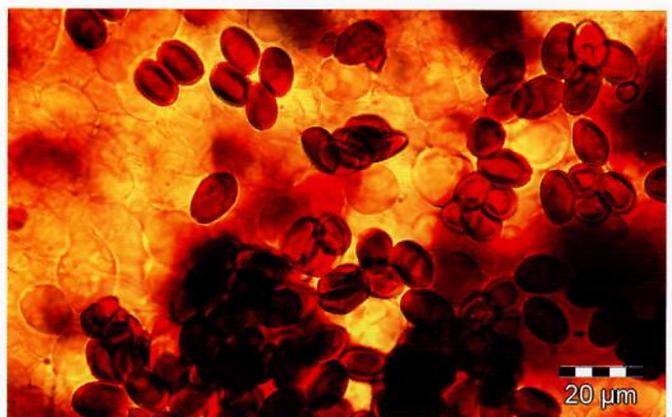
Further phylogenetic analyses on our collections of *Macrolepiota dolichaula* are currently on-going.



The gills are crowded, white to cream, not attached to the stipe. A drooping ring is attached near the apex of the stipe.

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Basidiospores are hyaline, turning reddish brown in Melzer's reagent

First Sightings of Bornean Black Oriole *Oriolus hosii* at Ravenscourt FMU, Lawas, Sarawak

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Bornean Black Oriole sighted at Ravenscourt FMU.

A survey was conducted as part of the High Conservation Value (HCV) assessment for the Ravenscourt Forest Management Unit (FMU) in Lawas, Sarawak (4°00.975'N, 115°29.363'E) for HCV attributes number 1.2 – ERT (Endangered, Rare and Threatened) species and 1.4, Endemic species. The Ravenscourt FMU is a logged-over forest mostly covered by hill and mixed dipterocarp, riparian, kerangas and lower montane (1500m) forests. At higher elevations, mosses on the forest floor and tree trunks can be found in the mossy lower montane forest. The area is adjacent to several Totally Protected Areas (TPA), namely, Pulong Tau, proposed Batu Iran, proposed Batu Buli, and Kayan-Mentarang (in Kalimantan) National Parks.

During the survey, one individual of Bornean Black Oriole, *Oriolus hosii* was sighted 2 m from the old feeder road, almost on the 45° slopes (1000 m a.s.l), perching and foraging from tree to tree. The oriole did not seem to be intimidated by our presence. No nest was sighted in the area. The bird had been sighted a few days earlier during the assessment at Coupe 5A of the Ravenscourt FMU, neighbouring Coupe 8A, perching on a Rhu Bukit, *Gymnostoma sumatranum* (Ling Chea Yiing, pers. comm.). Ling, the botanist for the flora HCV assessment team, managed to take a photo before the bird flew away minutes after it was sighted. We were not able to determine whether it was the same bird or a different individual. We are hoping that it was a different individual from the one sighted at Coupe 8A. These sightings are the first for the species in the Ravenscourt FMU.

Little is known about the bird's foraging behaviour because of a lack of studies since Charles Hose collected the first specimen from Mt. Dulit in 1893 (Hose, 1893). Other sightings have been recorded in Batu Lawi during the International Tropical Timber Organisation (ITTO) survey in 1991 (unpublished report), and at Payeh Maga, both during the Payeh Maga Heart of Borneo (HoB) survey in 2010 (unpublished report) and by members of the Oriental Bird Club of the UK in 2011 (Anon., 2011). Both Batu Lawi and Payeh Maga are located in Lawas, not far from Ravenscourt and have similar habitat for the species.

The Bornean Black Oriole is a montane bird of subtropical or tropical montane forest. Its distinct black colour with

Illustrated photo of Bornean Black Oriole (Source: Wikipedia)

red belly patch was clearly seen during the sighting. Its high pitched call is very unique. It is one of the species from the Oriolidae family that is rarely seen or observed, and is endemic to Borneo. The Bornean Black Oriole is listed as Near Threatened (NT) in the IUCN Red List (Ver. 3.1) (2016), due to habitat loss caused by unsustainable land use activities. In Sarawak, the species is very scarce and restricted to montane forest at 900-2000 m, and has been historically recorded from Mt. Kalulong, Mt. Mulu, Mt. Dulit, the Usun Apau Plateau, Mt. Derian, Mt. Murud Kecil, Batang Patap, Ulu Sabai and Tutoh. It is also known from East Kalimantan, Indonesia (Kayan Mentaran National Park), close to the border with Sarawak (Orenstein *et al.*, 2010). There are no records of the species from Sabah and Brunei (Phillips, 2016). Despite being endemic to Borneo, the species is not protected either under Sarawak law (Wild Life Protection Ordinance, 1998) or in other parts of Borneo, probably due to data deficiency.

To enhance the management and conservation of the species, more studies need to be conducted to understand its current distribution, abundance, habitat requirements and tolerance to land use changes. This will also determine the importance of the bird to the ecosystem, especially in the areas where it is found.

Acknowledgements

I would like to thank SARAWAK FORESTRY Corporation (SFC) and Ravenscourt Sdn. Bhd. for conducting the study on fauna in the area. I also thank the Ravenscourt Camp manager and his staff for providing logistics, accommodation, and valuable information. My gratitude also goes to the fauna team members and Ling Chea Yiing for sharing information on sightings of the Bornean Black Oriole. Lastly, I would like to extend my gratitude to all the SFC team members who participated in the study.

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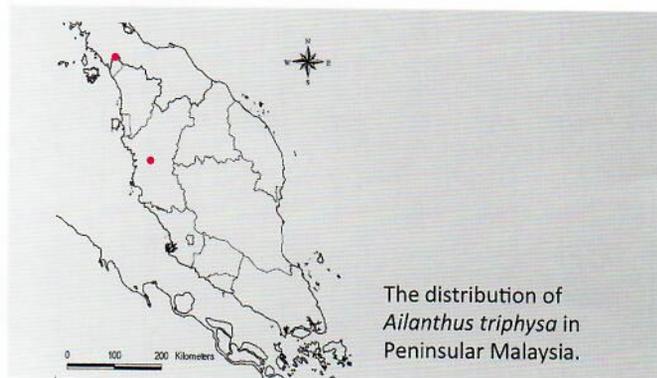
Ailanthus triphysa (Simaroubaceae), the third collection of a rare tree from Peninsular Malaysia

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Ailanthus triphysa is widely distributed from India, Sri Lanka, Myanmar, Thailand, Vietnam, Malesia (except Sarawak) to Australia (Queensland and New South Wales). However, in Peninsular Malaysia it was known from only two collections, until the team from the Flora of Peninsular Malaysia project found it and made recent new collections. We searched the literature and also the collections in the Singapore Herbarium (SING), University of Malaya Herbarium (KLU) and Universiti Kebangsaan Malaysia Herbarium (UKMB), and we found that it was cultivated in 1901 at the Waterfall Botanical Garden, near the Chetty Temple in Penang. The first wild specimen was collected in November 1936, at Kenas, Perak, by C.F. Symington, a forest botanist and expert on the Dipterocarpaceae. Initially the specimens were identified as *Amoora* sp. (Meliaceae) by Symington but they were later corrected to *Ailanthus triphysa* by K.M. Kochummen. In March 1969, S. Chelliah (an Assistant Research Officer at the Forest Research Institute, Kepong) made the second collection in the Mata Ayer Forest Reserve, Perlis.

During our field trip in February 2018 to Bukit Mata Ayer, Perlis, near the Malaysia-Thailand border, we found only one tree of *A. triphysa* at the base of one of the isolated limestone hills. It was the dry season, and one of us spotted the tree in flower. It is a tall tree with a cylindrical bole that can be seen from afar because it is head and shoulders above the other surrounding trees. At first, we suspected the tree was *Tongkat Ali*, (*Eurycoma longifolia*) which also belongs to the family Simaroubaceae, but after further observation, it was confirmed as *Ailanthus*. This is the third record for Malaysia and the first specimen collected with flowers.

Worldwide, *A. triphysa* is classified as Least Concern (LC) following the International Union for Conservation of Nature (IUCN) categories because it is globally widespread, but in Peninsular Malaysia where it is regionally assessed, it is



The bark surface is slightly fissured and the sapwood is cream to pale peach in colour.



Ailanthus triphysa near the roadside. We almost mistook it for a very large *Tongkat Ali* tree. (Photo by Imin K.)

Uses

In Indo-China, resin collected from the bark of *A. triphysa* is used for incense production, while the bark and leaves are used as a general or postpartum tonic. In the Philippines, one local community uses the wood to produce wooden shoes, while in India, the wood is used for making catamarans, knife handles and spear shafts. According to Burkill (1966), in Sri Lanka, tea boxes were made from the wood. In Peninsular Malaysia, no uses of the wood are recorded since it is rare and hard to find.



The large and crowded leaf scars on the twig surface are one of the characteristics of the genus (Nootboom, 1972).



The pinnate leaf with a terminal leaflet and the crescent-shaped leaflet with asymmetric base distinguishes it from other genera/species in the family. (Photo by Cheah Y.H.)



The petioles are covered with dense, matted, woolly red to brown hairs while the rachis of the inflorescence has white hairs.

Inset: The flower in full bloom.

classified as Vulnerable (VU). This is because it is rare in Peninsular Malaysia, known from just two localities, neither of which is located within the network of totally protected areas. In addition, the tree grows in disturbed lowland forest, near the roadside, in a habitat vulnerable to disturbance. This illustrates the importance of regional conservation assessments which draws attention to species that are locally rare in Malaysia, such as *Ailanthus*, although they may be common and widespread elsewhere. Conservationists can be alerted by such information to take appropriate action to prevent local extinction of the species.

In July 2018, we returned to investigate its population size. Apart from the tall tree, we found one 4 m tall sapling growing next to this mother tree. We predict that trees of this species are scattered in the surrounding area since its samara-type of fruit can be dispersed far from the mother tree. We observed a few tall trees with features resembling *A. triphysa*, such as the greyish bark, growing on steep terrain. However, we did not collect specimens for verification due to restricted accessibility and time constraints.

To ensure the survival of *A. triphysa*, *in situ* conservation is recommended, for example, periodic monitoring, to safeguard the future of this population. Relevant authorities, such as Jabatan Perhutanan Negeri Perlis need to be notified of its presence in this area and further searching for other trees in the area is highly recommended. *Ex situ* conservation by growing seeds, stem cuttings or seedlings in nurseries, is also needed.

Diagnostic characters of *Ailanthus triphysa*

The name *Ailanthus*, is derived from the Amboinense word, *aylanto* which means tree pointing to the sky or to heaven. That is why it is called tree-of-heaven in English. The epithet, *triphysa* is made of two words, *tri-* and *-physis*, referring to the 3-partite calyx tube. The asymmetrical leaf base with numerous glands at the margins and the ripe red to maroon fruit or samara are diagnostic characters that distinguish it from the other species in the family.

Ailanthus triphysa is light tolerant and grows under a wide range of environmental conditions, from tropical rain forest to seasonal forest and from lowlands to 600 m altitude. Although the species is light demanding, its seedlings need partial shade for better growth (van Valkenburg, 2011).

It is a medium to large tree, up to 45 m high. The bark is greyish to greenish brown and slightly fissured. The twigs are reddish with a circular leaf scar. It has velvety smooth hairs on the petiole and rachis. The leaves are pinnate with leaflets in pairs (jugate), and each leaf has 6–30 pairs of leaflets. The lower leaf surface is densely covered with transparent hairs. *Ailanthus triphysa* has an axillary panicle with unisexual flowers. In Peninsular Malaysia, it has been recorded to flower in February while elsewhere it is recorded to flower throughout the year (Nootboom, 1972).

Acknowledgements

We thank the FRIM Botany team for helping to collect the specimen. We also thank the Perlis Forestry Department and Polis Di Raja Malaysia (unit Pasukan Gerakan Am Perlis) for permission to carry out botanical collecting in the limestone forest close to the Malaysia-Thai border.

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