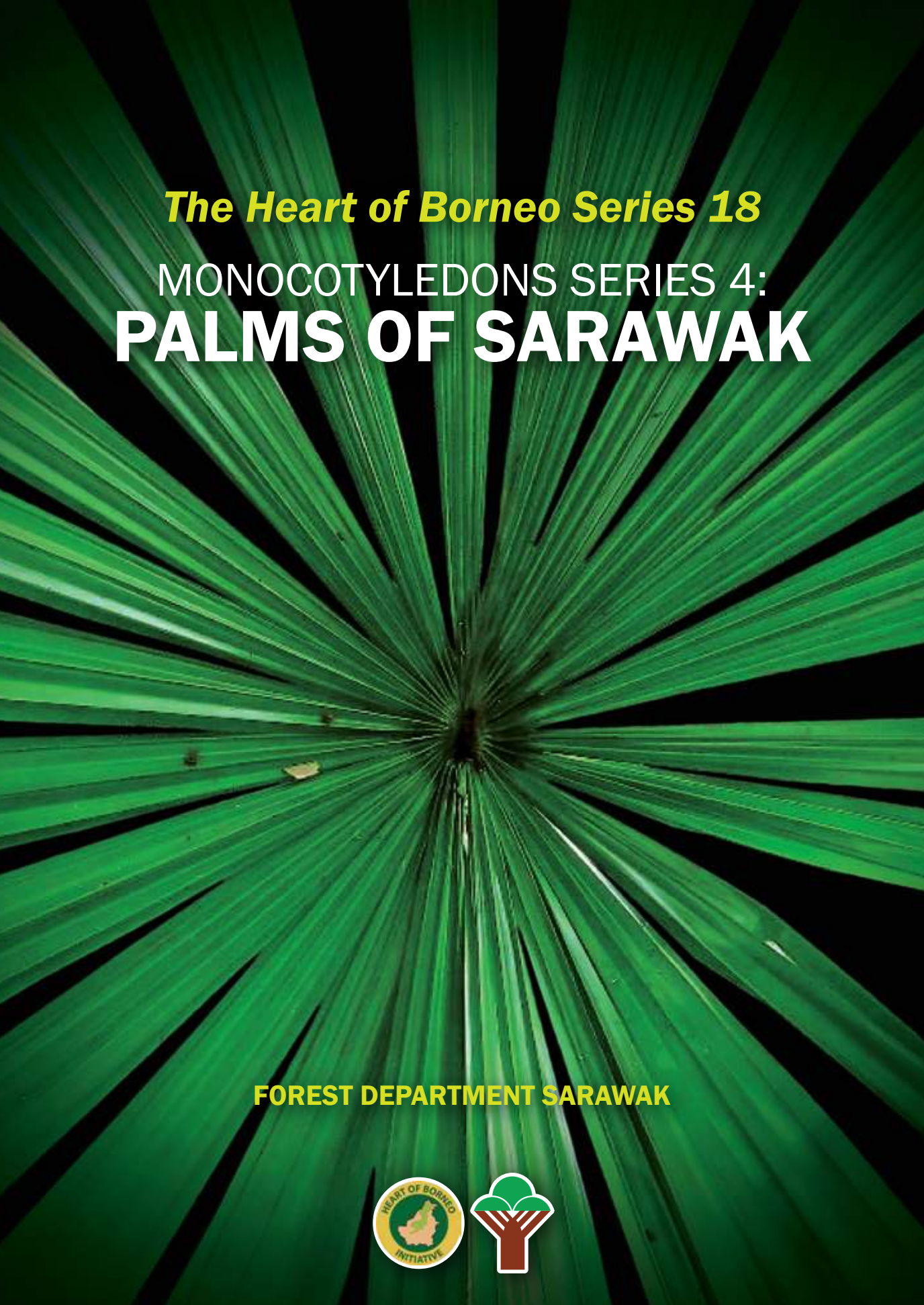

The Heart of Borneo Series 18

MONOCOTYLEDONS SERIES 4:

PALMS OF SARAWAK

FOREST DEPARTMENT SARAWAK

The Heart of Borneo Series 18

MONOCOTYLEDONS SERIES 4: PALMS OF SARAWAK

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FOREWORD

The Heart of Borneo is a transboundary conservation and voluntary effort signed between the governments of Brunei, Indonesia, and Malaysia that was mooted in 2007 to protect an area of about 220,000 km^2 of forested region on Borneo Island for conservation and environmental protection while enhancing sustainable development for the benefits of the stakeholders, including the local communities. The region provides habitat to unique flora and fauna, and one of the key aspects of the initiative is the protection and conservation of such biodiversity.

One astonishing biodiversity in the Heart of Borneo area is palms, and Sarawak is recognized as one of the global hotspots for palms due to a diverse and wide variety of ecological niches. Sarawak harbours more than 210 named native palm species belonging to 25 genera. Yet the documentation of this group of monocotyledons is seriously lacking, especially an up-to-date account, and this publication is timely to fill that gap and serve as a reference point for further work.

Palms in Sarawak and Borneo grow in a wide range of habitats, including mangroves and peat swamps, heath forests, mixed dipterocarp forests, and submontane forests. Because of the wide altitudinal and ecological ranges, not only do we have a huge diversity and variety of palm species, but many of them are also indigenous to Sarawak, if not Borneo, and are therefore vital for conservation.

Despite the publication of this work, many new species of palms still await discovery, including those of the genera Areca and Pinanga in particular. It is hoped that with the publication of this work on palms, it wil l help to catalyse and encourage further work, espec ially with regard to the taxonomy, ecology, and economic botany of palms in Sarawak and Borneo.

DATU HAJI HAMDEN BIN HAJI MOHAMMAD
Director of Forests
SARAWAK

Introduction

The palms are from the perennial flowering plant family Arecaceae or Palmae but are sometimes mistakenly grouped as “Palmaceae”, placed in the monocotyledons, Order Arecales. This family is perhaps the most easily recognized as distinct by their large, compound, evergreen leaves arranged at the top of an unbranched stem. Their growth forms can include stemless plants, climbers, shrubs and trees. There are currently 181 genera and about 2,600 species known. The palms inhabit nearly every type of habitat within their range, most of which are restricted to tropical and subtropical climates, as well as harsh desert environments. The word “palm” does not, however, appear to be palm plants. For instance, “The Sago Plam or “King Sago Palm” is a cycad plant, *Cycas revoluta* Thunb., while the “Travellers Palm” is from the family Strelitziaceae, *Ravenala madagascariensis* Adans.

The palms have provided benefits to humans in the past thousand years ago, and are extensively cultivated. Palm oil (*Elaeis guineensis* Jacq.) for example, is the most significant crop in Indonesia and Malaysia. The palm tree is the source of a wide range of everyday goods and consumables, and many palm species are also commonly utilised in landscaping. Despite their usefulness, there are currently 100 or more palm species that are thought to be endangered. They are due to the overharvesting of them, the destruction of their habitat, the conversion of cleared land to agricultural use and town developments (incl. residential uses).

Borneo is the third largest island in the world after Papua New Guinea and Greenland. This island, which is laid on the Sahul Shelf in the southeast and the Sunda Shelf in the upper half, is quite diverse in terms of its flora and fauna. For instance, Borneo is known as the "orchid island", because of the abundance of orchid species there. The number of species that have been identified is around 3,000 or 10% of the estimated total number of orchid species worldwide. The tree flora is likewise incredibly diverse, with 20% of the total number of trees documented being known to be endemic to the island.

Borneo has the highest reported amount of palm trees in the entire world. As more new species are discovered and reported from Borneo, notably from Kalimantan, Indonesia, the number of species is continually growing. Due to the large number of palm species identified, Kubah National Park (in Sarawak) is regarded as one of the most significant palm sites worldwide. There are now 105 species listed for the park (approx. coverage area: 2,230 ha). Sarawak is home to four subfamilies, including Arecoideae, Calamoideae, Coryphoideae, and Nypoideae (excluding landscape plants from Ceroxylodeae). The following is a list of the tribes and genera found in Sarawak.

The family Arecaceae is divided into five subfamilies as follows:
Only for Tribes and genera recorded in Sarawak.

Subfamily	**Tribe**	**Genus**
Arecoideae	Areceae	*Areca, Crystostachys, Iguanura, Nenga, Oncosperma, Pinanga, Ptychosperma*
	Chamaedoreae	*Cocos, Elaeis*

Calamoideae	Calamaeae	*Calamus, Ceratolobus, Daemonorops, Eleiodoxa, Korthalsia, Metroxylon, Plectocomia, Plectocomiopsis, Salacca, Pogonotium, Retispatha*
	Eugeissoneae	*Eugeissonia*
Ceroxyloideae	Absent in Sarawak	(excl. exotic)
Coryphoideae	Borasseae	*Borassondendron*
	Caryoteae	*Johannesteijsmannia, Licuala, Livistona, Pholidocarpus*
Nypoideae	-	*Nypa*

Economic Importance of Arecaceae

Many palm species are economically important and being exploited by humans in the past hundred years ago.

Food

The pith of *Metroxylon rumphii* (Willd.) Mart. (Sago palm) yields sago of commerce. The sap of *Borassus* yields sugar, which on fermentation gives the alcoholic drink “Toddy”. Fruits of *Phoenix dactylifera* L. are very delicious and eaten throughout the Arab world. The nuts of *Areca catechu* serve as an astringent and are used with betel leaves. The milk of *Cocos nucifera* L. makes a refreshing drink, the endosperm is eaten raw and stored when dry.

Medicinal and Ritual Event

The palms are prominent elements in African and Southeast Asian traditional medicines. Palm oil and coconut oil are used as a medium to blend and make coherent the healing mixture.

In India, the tender leaves of *Calamus travancoricus* Bedd. *ex* Becc. are used to treat biliousness, worms, and dyspepsia.

Fibres

Mesocarps of the drupes of coconut is extensively used for stuffing pillows and sofa sets. The cane of commerce is obtained from *Calamus tenuis* Roxb. and *C. rotang* L. and is used for making mats, baskets and other furniture.

Borassus flabellifer L. – yields palmyra fibres that are used to prepare brushes and brooms. The leaves are used in the manufacture of hand fans, umbrellas, baskets and mats.

Wax and Oil

Most of the palm species used to make wax come from the genera *Ceroxylon* and *Copernicia prunifera* (Mill.) H. Moore. South America is the home of both genera. Resinous wax, which is crucial for the candle and record industries, is generated by the *Ceroxylon* genus (*C. alpinum* Bonpl. *ex* DC, and C. *quindiuense* (H. Karst.) H. Wendl.). While *Copernicia prunifera*, often known as the Carnauba palm or "tree of life," is a native of north-eastern Brazil, it is incredibly beneficial and has a variety of purposes. Unfortunately, Sarawak does not harvest any of the species for wax production.

The *Cocos nucifera* plant yields coconut oil, which is used in cooking, as a hair conditioner, and to make soap.

Ornamentals

Today, palms are prized as aesthetic or decorative plants, whether in a garden or a pot. In tropical and subtropical cities, they are frequently found on the sides of the highways. Several foreign species are common landscape plants in Sarawak, including the *Roystonea regia* (Kunth) O.F. Cook (Royal palm), *Livistona chinensis* (Jacq.) R. Br. ex Mart., *Livistona australis* (R. Br.) Mart. (Fan palm), *Corypha elata* Roxb. (Talipot palm), and *Ptychosperma macathurii* (H. Wendl. *ex* H.J. Veitch) H. Wendl. *ex* Hook f. (Macathur palm). Many dwarf palms, including the Lady's Palm (*Rhapis excels* (Thunb.) A. Henry), Yellow Palm (*Chrysalidocarpus lutescens* (H. Wendl.) Beentje & J. Dransf.), and others, are common interior potted plants.

Few native species, other than *Areca catechu* L. (betel nut) and *Cyrtostachys renda* Bl. (red sealing wax palm), have been utilised as landscape plants, although many of them have excellent decorative potential. Several of the genus' beautiful and highly attractive palm species, like *Johannstejmannia, Licuala,* and *Pinanga,* are neglected because of their extreme sensitivity to environmental changes.

The History – Palms in Sarawak

Odoardo Beccari (1843 – 1920)

Odoardo Beccari was born in Florence, Italy, on 16 November 1843. He completed his undergraduate studies at Universities in Pisa and Bologna before moving to London to attend the Royal Botanic Gardens, Kew. He met several eminent British naturalists there, including Charles Darwin, William Jackson and Joseph Dalton Hooker and James Brooke, the "Rajah of Sarawak" who became good friends. Beccari was then allowed to plan an expedition to the Indonesian Archipelago by James Brooke. Together with Italian naturalist Giacomo Doria, Beccari set off for Sarawak in 1865, where they spent three years gathering plants and animals. Parts of his amazing journey in Borneo are storied in his book, *"Nelle Foreste di Borneo, Viaggi e Recherche di un Naturalista"* (Wandering in the Great Forest of Borneo: Travels and Research of a naturalist in Sarawak - translation), published in 1902.

One of the most spectacular discoveries by Beccari is probably the largest flower in the world – *Amorphophallus titanum*. He discovered this species during his short trip to central Sumatra in 1978, which originally, he named Conophallus. The first specimen of Amorphophalus titanum bloomed at Kew in 1885, sparking wonder and spectacles as thousands of people travelled to see this gigantic flower, a phallic flower with a corpse smell.

In 1878, Beccari returned to Florence, Itali and become a Director of the Florence Botanic Garden. He lived in Italy for the rest of his life, publishing several books and articles on Southeast Asia plants, especially palms. His remarkable contributions to the plant collection for the Malesian region were recognized by many botanists who work on his collections. Many plants and animals were named after him. Plants named after Beccari: *Aglaia beccarii, Bulbophyllum beccarii, Dyobalanops beccarii, Durio beccarianus, Musa beccarii, Myrmecodia beccarii,* etc. Animals named after Beccari: *Acanthopelma beccarii* (tarantula), *Conraua beccarii* (frog), *Draco beccarii* (lizards), *Mormopterus beccarii* (bat), *Scopula beccarii* (moth), etc.

Palm genus named after Odoardo Beccari: *Beccariophoenix madagascariensis*
(photo source: https://en.wikipedia.org/wiki/Beccariophoenix)

John Dransfield

John Dransfield is an honorary fellow and former head of palm research at the Royal Botanic Gardens, Kew. Born in 1945 and went to the University of Cambridge for his B.A., M.A. and Ph. D before working at Kew Gardens. Being an authority on the phylogenetic classification of palms, Dransfield has written or contributed to several books and scientific papers on palms. In 2004, he received a "Linnean Medal" from the Linnean Society of London for his excellent contribution to botany. The genus *Dransfieldia*, a monotypic genus in the palm family, that is endemic to western New Guinea, was given by Baker and Zona to his contemporaries to honour his long study of the family. While *Adonidia dransfieldii*, is palm species native to Sabah.

A palm genus named after John Dransfield: *Dransfieldia micrantha*
(*photo source: https://www.palmpedia.net*)

Arenga hastata

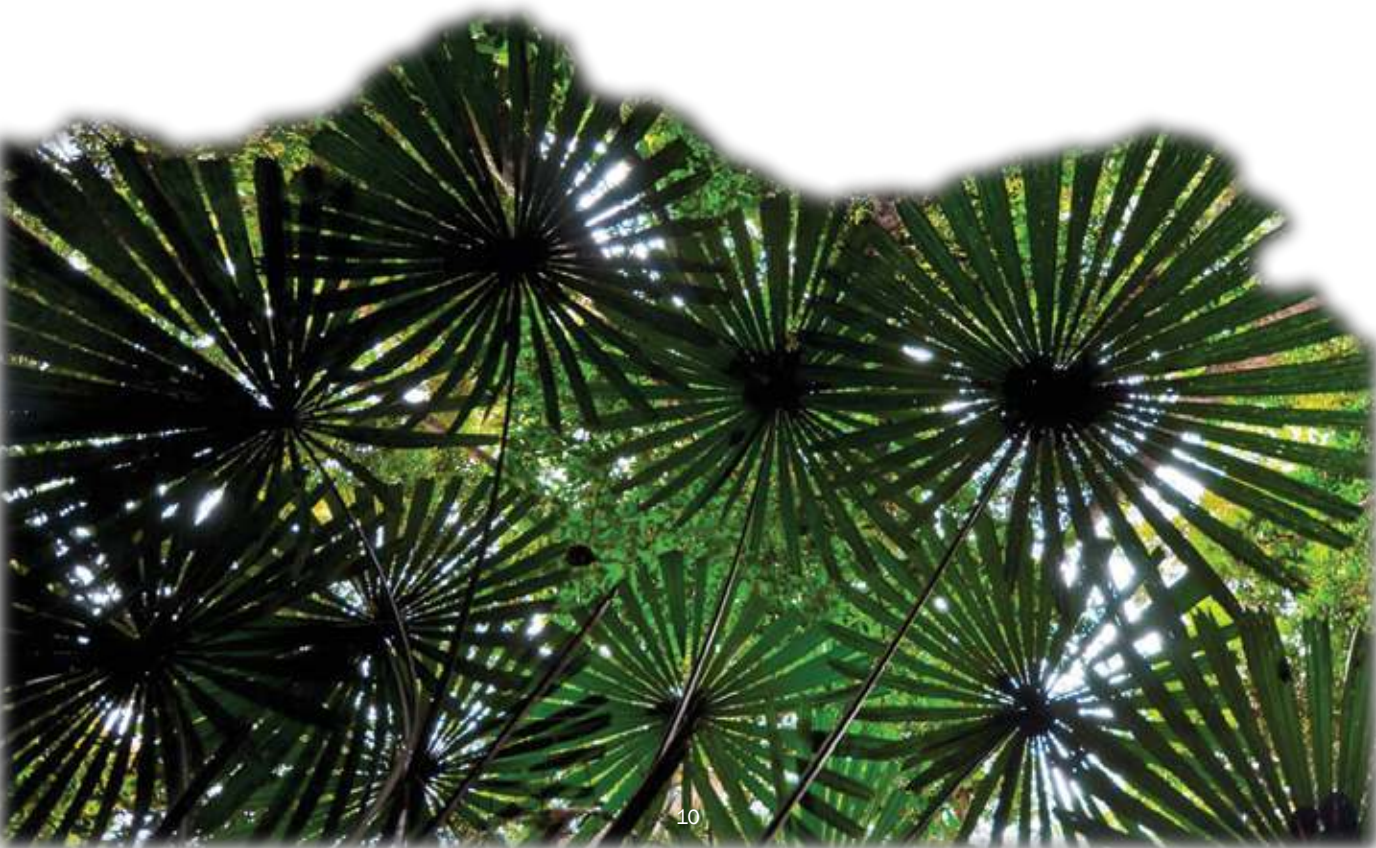
Iguanura elegans

Beccari's collection deposited at Kew *(source: http://apps.kew.org/herbcat/)*

Pinanga tenella

Licuala bidentata

SELECTED SPECIES



Areca ahmadii J. Dransf.

A hyper endemic species, by far only known from the type locality, in the Semengoh Forest Reserve, in lowland mixed dipterocarp forest on gentle slopes by a sluggish stream at about 20 m altitude (Palmpedia, 2020). Acaulescent, solitary palmlet, with a very short trunk, this species was named after Ahmad bin Drahman, a plant collector and former supervisor of the Botanical Research Centre (BRC), who first discovered and collected this beautiful palm.

Areca arundinacea Becc.

Locally known as *Pinang mureng* (Ib.) or *Pineng gu'un* (Mel.), this species is a small understory palm. Solitary or sometimes clustering, stem slender, up to 1–1.2m tall. Crown shaft green to dark green with 5–7 leaves. Inflorescence just below the crown shaft, pendulous, unbranched. Fruits are ellipsoid, pale or light green turned to black when ripe, rachillae green to pinkish red. Common throughout Sarawak, this species grows in moist shaded forests, in the gully, and near a stream or riverbanks. Endemic to Borneo.

***Areca catechu* L.**

Synonym: Areca *nigra* H. Wendl.

This is the true “Pinang” by the local peoples, usually cultivated and planted in home gardens for sweet fruits and used as a source of traditional medicines and essential oils. Also planted as ornamental palms along the roadside. Solitary palm with a slender trunk, green to grey with prominent white leaf scars, typically reaching 10–20 m tall. The crown shaft is prominent with 10–12 leaves on the crown, leaves are simple pinnate. The inflorescence is crowded, and much branched, with panicles borne below the leaves. Flowers are unisexual. Fruits globose or ellipsoid, immature green turning to yellowish or orange when ripe. It is a common palm throughout Sarawak but rarely found in wild.

Areca dransfieldii Heatubun

A small, slender, undergrowth palmlet, clustering (rarely solitary) with aerial branching, sometimes decumbent, stilt roots up to 40 cm. Leaves 5–7 in the crown, pinnate, 100–165 cm long, sheath tubular (15–25 cm long), crown shaft well defined. Known as Pinang nyaring by the locals, this species grows in the primary MDF. The appearance and inflorescence are like *Areca tunku* Dransfield & C.K. Lim, a species recorded from Sumatra and Peninsular Malaysia, but can be distinguished by the clustering habit with aerial branching and sometimes decumbent stems. As a status, this species is considered restricted to Borneo (Brunei Darussalam, Kalimantan and Sarawak).

Areca furcata Becc.

A small solitary or clustering palm and stems up to 1.5 m tall, slender stem about 3–4 cm diam. Leaves 10–12 in the crown, narrow, mostly undivided with bifid apex, crown shaft well defined. Locally known as *Pinang moreng* by the Iban, the species grows in the primary lowland MDF. This species is endemic to Borneo (Sarawak and Kalimantan).

Areca gurita Heatubun

Small palm, clustering, produces many suckers and stems up to 1.5 m tall. The Crown shaft is well defined, up to 30 cm long, leaves 8–14 in the crown, pinnate, about 30–40 cm long. Inflorescence infra foliar, erect, small and compact, to 10 cm long, protandrous, always branching to 1 order; peduncle covered with thick brown indumentum. Immature fruits are white with green at the tip, obovoid with a beak, apical stigmatic remains.

This species is like Areca minuta in habit, leaves and general appearance, however, can be distinguished by the inflorescence structure and flower arrangement. The rachillae of Areca gurita are recurved and resemble octopus's tentacles and the flowers are mostly uniseriate. Endemic to Borneo (Sarawak). Grows in kerangas to montane forest, 80–750 m above sea level. Also recorded on the foothill of limestone (Niah National Park).

Areca insignis (Becc.) J. Dransf. var. *insignis*

Another Bornean endemic palm species. This species is found in the lowland mixed dipterocarp forests but is more common in the kerangas forests. A small palm, solitary, trunk 1–2 m tall. Crown shaft is slightly swollen, greenish yellow to grey with 6–8 leaves. Leaves arching, hold a narrow leaflet that is angled towards the base of the leaf and is longest towards the tips. Recorded throughout Sarawak, from Kuching to Lawas divisions, but never recorded from swampy areas.

Areca jugahpunya J. Dransf.

Small understory palm, acaulescent, underground stem, clustering, about 10–15 shoots per clump, about 1–1.2 m tall. Leaf-sheath greenish-yellow when fresh, drying pale brown. Leaves about 1–2 m long, (or more) with broad leaflets. Inflorescence infra foliar, erect, prophyll not available, peduncle very short, just above the clasping base, bearing 20 stiffs erect rachillae, those at the base forking near the insertion. Immature fruits are fusiform, tipped by massive stigmatic remains.

A unique palm. The inflorescence is remarkably robust, and the staminate flowers are perhaps larger than in any other species of Areca. This species is endemic to Borneo (Sarawak) with a narrow distribution. This rare palm is by far recorded only from the Limbang division.

***Areca kinabaluensis* Furtado**

Synonym: *Areca hallieriana* Becc.

This species was described by C.X. Furtado in 1933 based on a type specimen collected by J. Clemens and M.S. Clemens in 1932 from the type locality, Mount Kinabalu, Sabah. A medium size palm, usually solitary, also forms a small clump. This species in not common in Sarawak, recorded only from the northern east of Sarawak (Lawas and Limbang) at elevations above 1000 m altitudes. Small to medium size palm, solitary and sometimes in a small clump. Slender canes, crown shaft yellowish green with densely brown small dotes. Peduncle short with 10–12 rachillae that bear many fruits. Fruits are globose, with striking red. A beautiful palm with great potential as an indoor decorative plant.

Areca minuta Scheff.

Diminutive and attractive palm species. Solitary and sometimes form small clumps of slender canes that rarely reach over I meter in height. A dwarf palm with tiny stems and glossy leaves with only two pairs of leaflets. The crown shaft slightly swelled, greenish. Inflorescence just below the crown shaft, with unbranched rachillae (3–4 rachillae per inflorescence). Fruits are elongated ellipsoid, immatured green with a lighter colour at the base. This species is one of the common species in the shaded areas in the MDF and particularly near the riverbanks and streams. Also, the most widespread species in the Heart of Borneo project areas, from Kuching to Lawas areas.

Areca subacaulis (Becc.) J. Dransf.

A very distinct species in the genus Areca with a very short trunk (or stemless), leaves are narrow and undivided. The Crown shaft swelled, greenish yellow to greenish-brown, with 10–12 leaves on the crown. Inflorescence just below the crown shaft (it looked like arose from the ground), erect, simple branch. This species is endemic to Sarawak, in very narrow areas (so far only recorded from Matang and Sampadi). Grows in shade areas of mixed dipterocarp forest. A very beautiful palm with great potential as a decorative or garden plant.

Areca triandra* Roxb. Ex Buch.-Ham. var. *triandra

Synonym: *Areca borneensis* Becc.; *Areca nagensis* Griff.

Widely distribute, from Andaman Island, Assam, Bangladesh, Indochina, south and central China, and throughout southeast Asia. A clustered or sometimes solitary, small to medium size, up to 5–7 m tall, often with suckers at the base. Leaves simple pinnate, 120–180 cm long, crown shaft green prominently ringed. Inflorescence monoecious, yellow, formed below the crown shaft. Flower pale yellow with green stalk. Fruit an ellipsoid to ovoid drupe, 2-3 cm long, greenish yellow turned to orange-red when ripe, beaked. Seed with ruminate endosperm.

A common palm throughout Sarawak grows in lowland forests, including peat swamps, limestone, kerangas and mixed dipterocarp forest. This species can acclimate to full sun conditions and water-logged areas. Known as Datea by the Penan people, the fruits of Areca triandra are edible and cabbage is cooked as a vegetable.

Arenga brevipes Becc.

This species is native to the islands of Borneo and the Philippines. Grows on well-drained soil in the primary rainforests. The species epithet name, “brevipes” means short foot, which referring to this species are frequently found with a short trunk. The leaves are large and dark green above with silvery green beneath. The petiole is nearly black to dark brown. The plants are harvested from the wild for local use of its edible buds/piths. This species is not common in Sarawak, as it infrequently appears in inventory records.

***Arenga hastata* (Becc.) Whitmore**

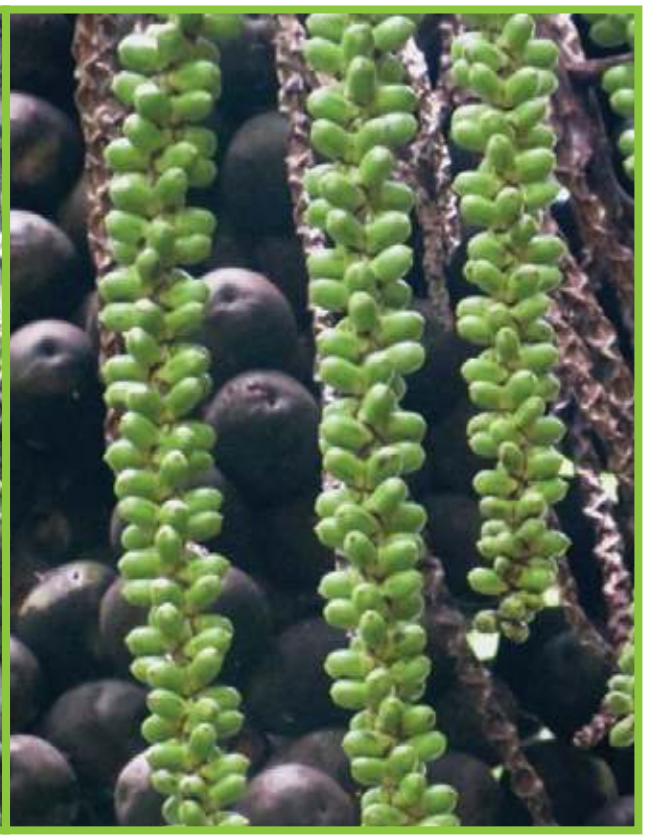
Synonym: *Arenga borneensis* Becc.; *Blancoa borneensis* (Becc.) Kuntze; *Didymosperma hastatum* Becc.

This small *Arenga* species is native to Thailand, Peninsular Malaysia, Sumatra and Borneo. Stem clustered, to 2 m tall. Leaves up to 1 m long (sometimes up to 2 m), ending in a pair of leaflets. Leaflets are broadly and irregularly triangular, borne on a short stalk, without basal ears, regularly arranged and spreading on the same plane, to 5 per side of the rachis. The inflorescence is solitary at each node. Fruits are globose, greenish turned to purple-brown when ripe.

Arenga pinnata (Wurmb) Merr.

A widespread species, distributed in India, Myanmar, Indochina, southern China, Thailand, Peninsular Malaysia, Borneo, Indonesia and the Philippines. This species is often found growing along riverbanks, and secondary and primary forests from low to montane forests (up to 1,400 m). A tall palm, up to 10–20 m tall, leaves pinnate, 20–25 leaves per crown. Flowers are showy, and yellow, coming from among the leaves. Fruits are purple, generally with 3 seeds.

Commonly known as Sugar palm, the flesh mesocarp of fruits usually contains many oxalate crystals making the fruits of this species inedible. A drink, which is locally called tuak ijok and sugar is made from the sweet sap obtained from the peduncle of inflorescence. The apical bud, known as umbut is cooked as a vegetable. The sago or starch can be ground from the trunk pith.



***Calamus fissus* (Bl.) Miq.**

Synonym: *Daemonorops fissa* Bl.; *Daemonorops mattanensis* Becc.; *Daemonorops motleyi* Becc.

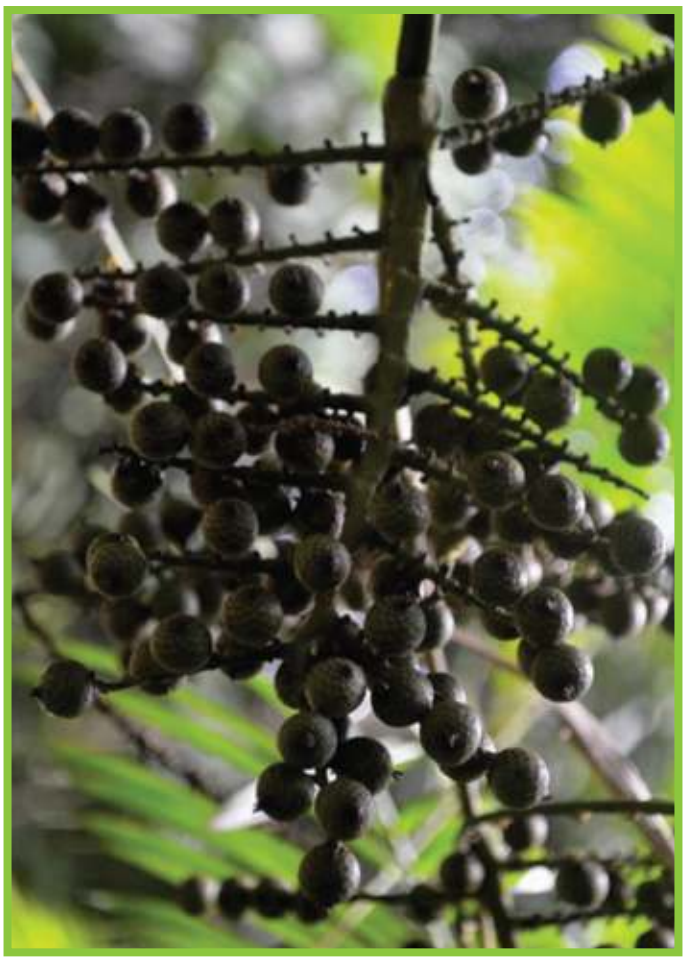
Clustering moderate to robust climbing rattan, climbing high into the forest canopy, up to 30 m long, frequently producing brushes liked. White latex exuding from the cut surface, sheaths dull greenish brown, rather heavily armed with shiny flattened black spines, ocrea inconspicuous. The inflorescence is usually produced in abundance, all inner bracts enclosed within the outermost, the tips of inner bracts included within the beak, bracts usually persisting through splitting longitudinally (the epithet name!). Widespread throughout Sarawak. Common in disturbed lowlands, particularly in secondary forests. This species is easily identified as it is the only species *(Daemonorops)* in Sarawak with an inflorescence in which all the primary bracts are enclosed within the outermost and remain so.

***Calamus korthalsii* (Bl.) Miq.**

Synonym: *Daemonorops korthalsii* Bl.

Clustering moderately robust climbing rattan, climbing to forest canopy up to 15 tall. Sheaths dull green, rather sparsely and evenly armed with black spines to 30 mm, tending to be rather uniform in length, spines around the sheath mouth erect and larger than the rest, but generally rather few; knee conspicuous, armed as the rest of sheath. Inflorescence pendulous. Mature fruits are ovoid to somewhat oblong, covered in 18 vertical rows of pale brown scales.

Endemic to Borneo. This species is widespread throughout the lowlands of Sarawak. Locally known as *Wi karut* (Ib.), *Wi tabungan* (Kay.), *Wae' belengan* (Pen.) and *Wae' balau* (Mel.).



Calamus laevigatus Mart. var. *mucronatus* (Becc.) J. Dransf.

Synonym: *Calamus mucronatus* Becc.

Very slender rattan climbing up to the forest canopy, to about 60 m length; stem without sheaths, about 5–10 mm diam. Sheaths dull dark green with very few triangular spines, knee well developed. Endemic, but widespread throughout Borneo. The canes are harvested for binding purposes. Locally known as *Wi sugi* (Iban).

Calamus lobbianus Becc.

Synonym: *Cornera lobbiana* (Becc.) Furtado

Locally known as *Wi tedong* (Iban) or Wae savit pedun (Penan), this species is commonly found in the lowland MDF of western Sarawak. This species also recorded in Peninsular Malaysia. A solitary stemless or with very short-stemmed rattan. Sheaths dull green, densely armed with slender, long pale green spines. This species easily recognized with its very short stems, leaflets densely chalky-white on the undersurface and the curious zig-zag inflorescences.

Calamus longispatha Becc.

Robust clustering thicket-forming climbing rattan, climbing up to the forest canopy but only about 5–7 m tall. Sheaths bright yellowish green, on young parts densely covered with red-brown indumentum and long yellowish spines, carrying in length, the spines tending to point in different directions, spines around the sheath mouth particularly large, erect, to 16 cm long: knee absent, ocrea irregularly tattering. Inflorescence to 50 cm long, divaricating branches. Mature fruits are relatively small, rounded or ovoid, shortly beaked, and covered in 15 vertical rows of rich brown shiny scales.

Endemic to Borneo. Widespread in coastal areas. Locally known as *Wi ruah* (Ib.), this species produces large cane of medium quality.

Calamus maculatus (J. Dransf.) W.J. Baker

Synonym: *Daemonorops maculata* J. Dransf.

Slender to moderate solitary rattan with stems no longer than 5 meters long. Sheaths bright green when fresh, bearing scattered, straight black spines. Petiole and rachis conspicuously yellow blotched. This species is common in the lowland MDF and in kerangas forests. Endemic to Borneo, but not common. Like *Calamus didymophyllus* (Becc.) Ridl. but can be differentiated by the habit and leaf morphology.

Calamus pycnocarpus (Furtado) J. Dransf.

Synonym: Cornera pycnocarpa Furtado

Solitary or clustering, moderate to robust climbing rattan, climbing up to forest canopy to about 20–25 m tall. Sheaths are bright green with scattered yellowish, black-tipped spines of varying lengths. Inflorescence short. Ripe fruit with conspicuous beak, wide elongate ovoid, covered in 14–18 vertical rows of dull chestnut brown scales with shiny black margins. This species is recorded as endemic to Terengganu (Peninsular Malaysia), and now distribution has extended to Sarawak (a new record!).

Calamus sabut (Becc.) W.J. Baker

Synonym: *Daemonorops sabut* Becc.; *D. annulata* Becc.; *D. turbinata* Becc.; *D. pseudomirabilis* Becc.

Clustering moderate-size climbing rattan, climbing up to forest canopy up to 40 m tall. Sheaths bright green, bearing complete and partial collars to 10 mm, tipped with black and brown horse-hair-like spines; knee conspicuous, usually less heavily armed than the sheaths. Inflorescence pendulous, to 60 cm long, primary bracts densely armed with fine black spines. Mature fruits are ovoid, very short-beaked, and covered with 14–17 vertical rows of yellowish-brown scales.

Native to Peninsular Malaysia and Borneo. Common throughout Sarawak. Locally known as *Wi lepo* (Ib.), *Wi griang* (Kay.), *Wae' duru* (Pen.), *Wae' aram* (Kelab.) and *Wae' gu'un* (Mel.), this species produces good quality cane.

Calamus sabalensis J. Dransf.

Clustering stemless rattan; stem subterranean, very short without sheaths. Knee absents, ocrea thin, about 10 cm long, bearing minute spines scattered or in a row. Flagellum absent. Leaf ecirrate, to 2 m long; leaflets regularly arranged, distant, 10–15 on each side of the rachis, rather thin, narrow linear-lanceolate. Inflorescence up to 1.5 m long, tending to arch of flop along the forest floor. Fruits are rounded, beaked, and covered with red-brown scales.

This species is endemic to Borneo (Sarawak). The species' epithet name is after the type locality, Sabal Forest Reserve (now National Park). The young shoot is cooked as a vegetable and fruits are edible.

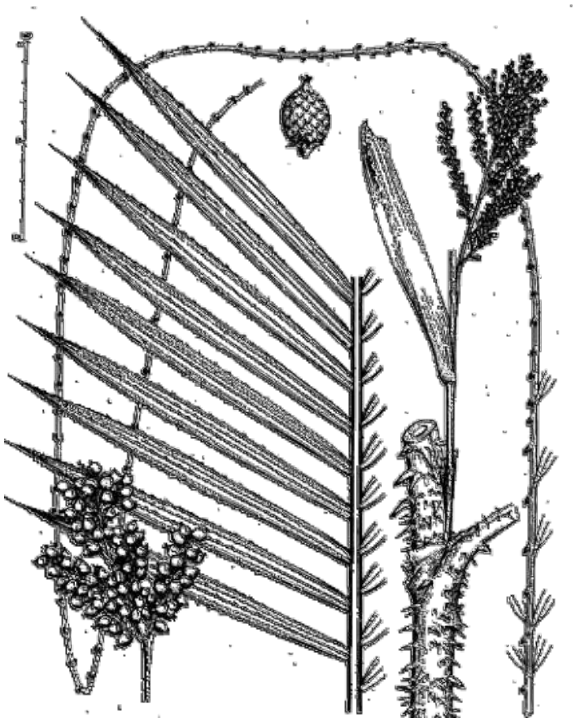


Illustration Source:
From the book, *"The Rattan of Sarawak"*

***Calamus spasiflora* (Becc.) W.J. Baker**

Synonym: *Daemonorops sparsiflora* Becc. var. *sarawakensis* Becc.; *Daemonorops sparsiflora* Becc. var. *crassifolia* Becc.

Slender to moderate robust clustering climbing rattan, climbing to 20 m tall. Sheaths dull to bright green, armed with scattered rather broad-bases, triangular yellowish-brown or green spines, rarely exceed 15 mm long, and brown indumentum; knee conspicuous. Leaflets of about 50 on each side of the rachis, stiff, very narrow, 25 x 1 cm, usually very close and regular, parallel-sided, abruptly and neatly narrowed at the base. Frequently flowering, inflorescence bright reddish-brown at anthesis. Mature fruit rounded, covered with 14–16 vertical rows of dull brown scales.

Vernacularly known as *Wi ruah air* (Ib.), this species is endemic to Borneo. Common throughout Sarawak, from lowland up to 1,000 m elevations, in various types of habitats.

***Caryota mitis* Lour.**

Synonym: *Caryota griffithii* Becc., *Caryota nana* Lind., *Caryota sobolifera* Wall., *Caryota speciosa* Lind.

Clustering fishtail palm, widely distributed in tropical Asia, from India to Southern China and throughout southeast Asia, and now becoming naturalized in many parts of America and Africa. The trunk is greyish, up to 10 m tall, leaves bipinnate, can be up to 3 m long (or sometimes longer), and the light green leaflets are shaped like a fish's tail fin, henceforth its common name. The flowers are purple. Fruits globose or rounded, immature green to dark green turning to dark purple or red when ripe. The mature plants first begin flowering at the top of the stem, then flowering proceeds lower and lower down the stem, and after the last flowering, the stem dies.

In certain countries, such as Cambodia, this species was cultivated mainly as an ornamental plant. This species is common throughout the lowland areas of Sarawak.

***Caryota no* Becc.**

Synonym: *Caryota rhumpiana* var. *borneensis* Becc.

A solitary fishtail palm, brownish grey trunk, up to 20 m tall, with 10–12 leaves on the crown. Leaves pinnately compound, alternately opposed, bipinnate, up to 5 m long (sometimes to 7 m), light green. Inflorescence emerges from the crown, large mop-liked, golden yellow, or bright yellow. Fruit globose, Immature fruit green to dark green turned to dark purple or black. Locally known as barok by the Bidayuh, the leaf midrib (rachis) is used for fishing lines or woven into a basket. This species is endemic to Borneo, and common throughout Sarawak in various types of habitats and from lowlands up to 1,300 m above sea level.

Cocos nucifera L.

Cocos is a monotypic genus, represented by a single species, *Cocos nucifera.* This palm is the most useful plant in the world, and it is often referred to as the "tree of life". Locally known as *Kelapa* or *nyiur* (Mal.) or *benyoh* (Mel.), it provides food, fuel, cosmetics, folk medicine and building materials, among many other uses. The coconut palm has been used by humans for thousands of years ago, and therefore the origin of this valuable species is unsure. Some said, is originally from America and the Pacific, and many believed that it is native to the Southeast Asian region. The *Kelapa* is a large palm, solitary, up to 30 m tall, with pinnate leaves, 4–6 m long. The coconut fruit is a drupe (not a nut) and is considered the largest seed in the world. The exocarp and mesocarp make up the 'husk' of the fruit.

***Cyrtostachys renda* Bl.**

Synonym: *Cyrtostachys lakka* Becc.

Native to southeast Asia (Thailand, Peninsular Malaysia, Sumatra and Borneo), grows in lowland peat swamp forests, particularly in coastal areas. Slender, clustering palm, about 10–15 m tall (- up to 20 m) with attractive shuttle-cock shaped of the crown shaft, scarlet to bright red colour. Known as *lipstick palm* or *Red sealing wax palm*, this species is the most commonly cultivated ornamental palm along the roadsides.

Eleiodoxa conferta (Griff.) Burret

Eleiodoxa is a monotypic genus, solely represented by only one species, *Eleiodoxa conferta,* and locally known as *Asam payak, Asam kelubi* (Mal.), *Maram* (Ib.) or *Baun* (Mel.). Native to southeast Asia, distributed from southern Thailand, Peninsular Malaysia, Sumatra and Borneo. This species is a water-loving species, typically found in a freshwater swamp or water-logged area in open spaces. Often forming large colonies. The trunk is very short, underground, clustering and forms dense thickets. Leaves up to 3–4 m long, armed with whorls 5–7 cm long spines. The inflorescence emerges at ground level, bearing either male or female flowers, the latter forming scaly, red or yellowish-brown fruits with one seed.

The sour fruits are harvested and used to make *sambal*, or as a food flavour in *umai* or *masak asam.*

Eugeissona insignis Becc.

Vernacularly known as *Pijatau,* this species is endemic to Borneo. This species has stilt roots about 1–3 m long (longer than *Eugeissona utilis*), but usually a shorter stem, up to 9–12 m tall. Inflorescence 6–10 m tall, flowers 8–9 cm long. Fruit ellipsoid, about 6 cm in diameter. This species is frequently found on the steep slopes and cliffs of coastal forests, up to 700 m above sea level. A common species throughout Sarawak, particularly along the coastal zones from Kuching to Miri divisions. Similar to *Eugeissona utilis,* this species is also harvested for starch (sago) and cabbage as a vegetable. The stilt roots are useful for making walking sticks and umbrella handles.

Eugeissona utilis Becc.

Known as the wild sago palm of Borneo or locally called *Pantu* or *Rumbia bukit,* this species is endemic to Borneo, and non-descript and undistinguished palm until it flowers and fruits when it is changed into one of Borneo's most outstanding palms. This palm usually grows in clumps (rarely solitary) and each stems flower only once (this is called hapaxanthic) before dying. The plants are frequently found with large stilt-root, spiny trunks and leaves, forming the largest cluster, up to 20 m tal l. The local peoples (especially Penan) obtained starch from the pith of the stems and used it to make sago. The terminal bud or *umbut* is harvested and cooked as a vegetable.

Iguanura borneensis Scheff.

Solitary or clustering, dainty little palm in the understory tropical forests, up to 1 m tall (not more than 2 m), with 8–10 leaves on the crown. Leaves are entire with bifid apex, or sparsely divided, paddle shaped. Inflorescence from the leaf axile, within the crown, but no longer than the leaves, solitary or branched, to 2 orders. Fruit ellipsoid, surface smooth, immature white.

This species is endemic to Borneo. Grows on the alluvial soils, in the lowland mixed dipterocarp forest, up to an altitude of 800 m above sea level. Frequently found on gentle slopes with good drainage. A beautiful species with great potential for potted plants (indoor) or as a garden plant.

Iguanura curvata Kiew

A small palm from the understory of wet lowland mixed dipterocarp forest with a thin, cane-like stem and a small spreading crown, with sparsely pinnate leaves. Palm with stem 1.2–1.5 m tall (sometimes taller up to 3 m), leaf sheath tough and fibrous, with densely rusty-tomentose. Inflorescences are borne among the leaves, projecting beyond the leaf sheaths. Fruit elongates, green turning white and ripening red. This species is so far only recorded from Sarawak, lowland mixed dipterocarp forest, and also on the foothill of limestones. The species' epithet name refers to the curvature of the fruit.

Iguanura elegans Becc.

One of the most attractive *Iguanura* species from Sarawak. A small understory palm with two types of leaves, large undivided, paddle-shaped notched and split-leaf form. Solitary or clustering, up to 1–1.2 m in height. Inflorescence from leaf sheaths, not longer than leaf, simple or branched. The fruits are ellipsoid, immature whitish turned to pinkish-red when ripe. The species is endemic to Sarawak, restricted to the northwest of Sarawak, in wet places, particularly on the limestone foothill and boulders.

Iguanura melinauensis Kiew

Iguanura melinauensis is the only species in the genus recorded from Mulu National Park. A common palm in the moist forest floor in mixed dipterocarp forest and foothill of limestone, also in the deep shaded valley, and damp places along the streams and rivers. Solitary, acaulescent palm, small-sized, 1.5–2 m tall with 10–12 leaves in crown. Fruits are globose, smooth, and immature fruits are whitish and turn black when fully ripe. The species' epithet name refers to the type locality, Sungai Melianau (one of the main rivers in the Mulu National Park).

Iguanura minor Kiew

A small solitary palm (infrequently found as a cluster), about 1–2 m tall (sometimes up to 4 m). The crown shaft swelled, about 10–15 cm long with 8–10 leaves. Leaves marcescent, petiole about 4–10 cm long, leaves large oval-shaped with narrow leaf base, or divided 2–7 pairs of narrow, parallel-sided segments each with an elongated apex. Inflorescence among the leaves, unbranched. Previously, this Sarawak's endemic species were recorded from a single location, Gunung Pueh National Park. A recent survey added another two locations, Dered Krian National Park and Bungo Range National Park for this attractive decorative palm.

Iguanura myochodoides Kiew

A small palm with short stem, 50–110 cm tall, crownshaft about 30 cm long. Leaves are abscissing, leaf sheath 8 – 12 cm long, petiole 10 – 14 cm long, lamina 25 – 40 cm long, divided into 3 – 4 pairs of wide parallel sided segments. Inflorescence among the leaves, peduncle 12 – 25 cm long. This rare species can be found in deep shaded primary forests in Kuching and Samarahan Divisions.

Iguanura palmuncula Becc. var. *palmuncula*

A small palm, stem covered within the persistent leaf sheaths with crowded crown, 8–12 leaves. Leaves about 40–50 cm long, divided into 2–4 pairs of segments or sometimes simple undivided, oval-rounded shaped. Inflorescence branched among leaves, never longer than leaf, emerging from the leaf sheaths, rachillae 2–6. This species is one of many palms described by Odoardo Beccari from Borneo. Described based on a sample collected from Matang, this species is endemic to Sarawak. Two varieties have been recorded, namely *palmuncula* and *magna.*

Iguanura sanderiana Ridl.

A small attractive, understory palm with large, undivided, paddle-shaped leaves with prominent ridges. Solitary or clustering, slender trunk, up to 1 m in height. The crown shaft swelled, with 6–10 leaves. Inflorescence just below the crown shaft. Fruits are globose, immature whitish turned to reddish when ripe, fleshy, with one seed. This species is endemic to Borneo (Sarawak), recorded from the Kuching division, a very rare and threatened species due to the conversion of natural habitat.

Johannesteijsmannia altifrons (Rchb. f. & Zoll.) H.E. Moore

This species is native to southeast Asia and distribute in southern Thailand, Peninsular Malaysia, Sumatra and Borneo. Vernacularly known as *Palma ekor buaya,* is one of the protected palms in Sarawak under the Sarawak Wildlife Protection Ordinance. This species is the only species in the genus found in Sarawak, whereas the other three species are very endemic to Peninsular Malaysia.

Johannesteijsmannia altifrons is solitary acaulescent palm. Stem subterranean, with 20 – 30 leaves in the crown, can grow up to 3–6 m tall, trunkless with large, simple, undivided leaves that can be up to 6 m in length, coming directly from the underground rootstock. These large, leathery, diamond-shaped leaves are frilled along their length and have serrated margins. Inflorescences erect at first, eventually pendent, branched to the third order; peduncle 30–50 cm long. The flowers cream coloured and pointed in the bud. Fruits are 4–5 cm in diameter, corky warts. The leaves are used by the Penan as materials to build a hut.

Korthalsia cheb Becc.

Robust clustering and branching climbing rattan, climbing up to the forest canopy to about 40 m high. Sheaths bright green, unarmed except for a few short spines, bearing caducous brown scales, but completely covered by ocrea of the preceding leaf; ocrea very large and conspicuous. Leaves large, diamond shaped. Ripe fruits are somewhat oblong, covered in 18 vertical rows of straw-coloured scales.

Locally known as *Wae' duru* (Pen.) and *Rua* (Bid.), this species is endemic to Borneo. It occurs in hill-mixed dipterocarp forests at altitudes up to 800 m above sea level, usually in humid valleys.

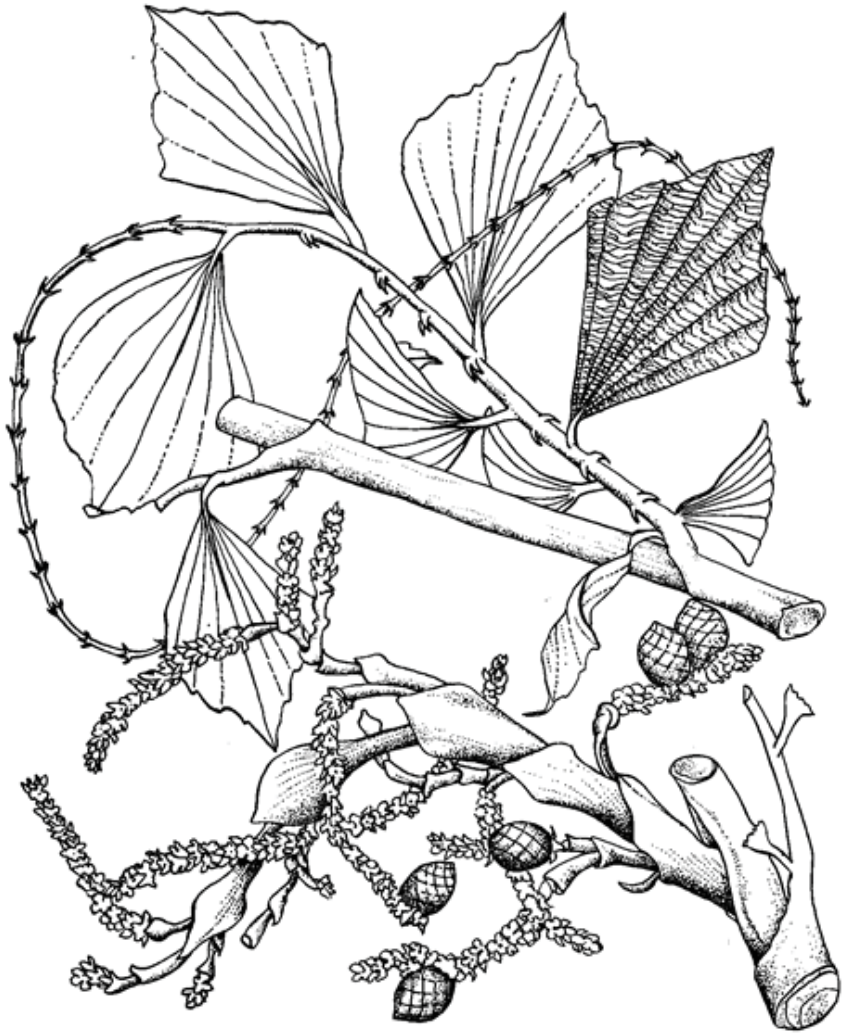
Korthalsia echinometra Becc.

Moderately robust clustering and branching climbing rattan, climbing to the forest canopy up to 40 m. Sheaths are bright green, sparsely armed, almost completely covered by the ocreas; ocrea to 10 x 5 cm, grossly swollen, densely covered with long black spines. The inflorescence is to c. 60 cm long with up to 15 rachillae. Mature fruits are ovoid and covered with reddish-brown scales.

This species is native to the southern part of Peninsular Malaysia, Sumatra and Borneo. Common and widespread, throughout Sarawak, in lowland and hill dipterocarp forests up to 1,000 m above sea level. *Korthalsia echinometra* is the most sought-after rattan for split, used in basket weaving. Locally known as *Wi wisro* (Ib.).

Korthalsia jala J. Dransf.

A robust clustering and branching rattan, climbing high into the forest canopy with stem up to 60 m long. This species is the easiest species to identify and unmistakable rattan, very distinctive with ocrea very large and conspicuous, expanded, funnel-shaped, net-like (the epithet name of species, *jala – casting net*), enclosing the stem. Inflorescence long, up to 75 cm, branched. This species is endemic to Borneo, and occur in mixed dipterocarp forest, from lowland to altitudes 400 m above sea level. Known as *Wi dahanan* by the Iban, this species is frequently harvested for making furniture.



Korthalsia paucijuga Becc.

Clustering slender rattan with climbing stem into the forest canopy up to 20 m. Leaf-sheaths dull greenish brown, bearing very few short triangular spines, or unarmed and with abundant deciduous black scales; ocrea tightly sheathing, usually very short. Inflorescence produced from topmost, c. 3 nodes, bracts somewhat magnified. Fruits are rounded or top-shaped, with a short beak, covered with yellow-brown, darker-tipped scales. Also known as *Wae' gu'un* by the Melanau, this rattan species is closed related to *Korthalsia rigida,* but differs by the number of leaflets (3–4), sessile, and this species is appearing to be common in the peat swamp forest and at low elevations.

Korthalsia rigida Bl.

Locally known as *Wi dahan* (Ib.), *Wae' gu'un* (Mel.) and *Wae' seleda* by the Penan, this species is one of the common *Korthalsia*, found throughout Sarawak, from lowland to altitudes 900 m above sea level. A clustering rattan, frequently branching in the canopy, climbing into the forest canopy, up to 50 m long. This species is distinct by having a dull green sheath that is densely covered with persistent grey indumentum and deciduous chocolate-coloured scales and sparsely armed with triangular spines. The inflorescence is produced from the topmost up to 12 nodes, highly branched, long up to 80 cm, bearing about 8 partial inflorescences on each side, each with 10 rachillae. Fruit rounded, dark green to dull brown scales.

***Korthalsia robusta* Bl.**

Synonym: *Korthalsia squarossa* Becc.; *Korthalsia macrocarpa* Becc.

A robust clustering and branching rattan, climbing up to 30 m (or more). Ocrea very conspicuous, pale brown, diverging from the stem at an acute angle, the margin tending to enrol, armed with black spines. Inflorescence congested at the stem tip, forming a large club-like mass, bracts large, conspicuous triangular. Mature fruits with mid-brown scales with darker intramarginal bands and straw-coloured margins. Known as *Wi asas* (Ib.) or *Wae' perah* (Pen.), this species is widespread throughout the lowlands of Sarawak.

***Licuala bidentata* Becc.**

Synonym: *Licuala furcata* Becc.

Solitary, mostly acaulescent (sometimes with stem up to 2 m tall). Leaf-blade peltate-orbicular, 50–90 cm across, papery-leathery, segments 11–15 (sometimes up to 39), all about the same width. Inflorescences erect, often longer than leaves, arching from the crown, up to 200 cm long, branching into 2 orders. Fruit globose, glabrous, smooth, immature green turned to orange when ripe. This species is endemic to Borneo. Sarawak is recorded only from the Kuching division and is often found in the kerangas forest.

Licuala bintuluensis Becc.

Solitary, acaulescent, rarely stemmed palm. Leaf-blade semi-orbicular to peltate-orbicular, 60–200 cm across, leathery, segments 5–19, wedge-shaped, central segment simple, sessile to petiolulate, sometimes pinnate (3-segmented). Inflorescence within the crown, erect often slightly shorter than the petiole, branched into 2 orders. Fruits are glabrous, globose, surface cracking to corky-warty, immature dark green turning to orange to red when ripe, with soft mesocarp.

Endemic to Borneo (Brunei and Sarawak). This species grows in lowlands from the coast to an altitude of 100 m above sea level, frequently found in periodically flooded alluvial plains or forest areas with swampy habitats. Locally known as *Gernis* or *Biru* by the Iban.

Licuala borneensis Becc.

Solitary to cluster small fan palm, acaulescent to short-stemmed, with 8–12 fronds in a crown. Leaf-blade semi-orbicular, up to 70 cm across, papery-leathery, with 3 – 5 segments; central segment, simple, sessile, wider than the laterals. Inflorescence within the crown, erect to curving slightly away from the shoot, shorter than the petiole. Flower solitary seated on slightly raised tubercles, spirally arranged throughout rachillae. Fruits are ellipsoid and pinkish.

This species is endemic to Borneo (Brunei and Sarawak). In Sarawak, this rare fan palm has so far been recorded only from the northeast (Bintulu and Miri divisions). Grows in lowland mixed dipterocarp forest, on loam soils and on the foothill of limestone (Niah National Park).

Licuala cordata Becc.

Solitary or in a cluster with short-stemmed palm to 1 m tall. Crown with 11–18 leaves. Leaf-blade orbicular-flabellate, coriaceous, shiny on the upper surface when fresh, 105–125 x 90–110 cm. Inflorescence within the crown, erect, shorter to about the length of the frond, 50–110 cm long, slightly curved, branched to 2 orders. There are three species of *Licuala* in Borneo that have such leaf-blades: *L. cordata, L. micholitzii* and *L. orbicularis.* This species can be differentiated from the others two, by the leaf blades overlapping at their base. Two varieties are recognized, *cordata* and *ashtonii*, and both are endemic to Borneo.

Licuala densiflora Becc.

Solitary palm, about 60–90 cm high. Leaf-blade semi-orbicular, coriaceous, 25–30 cm across, with 4–7 segments. Inflorescence within the crown, shorter than the petiole, curving outwards, branch to 1 order. The flower is solitary, tightly spirally arranged, persisting on the rachilla even after anthesis or when fruiting. Fruits are ellipsoid, red, and maturing white. This species is like *Licuala cameronensis* Saw in Peninsular in densely packed flowers but has a quite different orientation of the rachillae and fruit shape. This species is a narrow endemic, restricted to a small area southwest of Sarawak.

Licuala flammula Saw

Solitary fan palm, up to 2 m tall. Crown crowded, with 15–24 leaves. Leaf-blade peltate-orbicular, about 75–90 cm across, papery-leathery, with 16–24 segments, central segment entire, sessile, slightly larger than lateral segments. Inflorescence within the crown, curving outwards from the crown. Fruits are ellipsoid, glabrous, surface smooth, and immature white turned to pale pink when ripe. This species is the only dioecious species known from Borneo (Saw, 2012). Endemic to the northwest of Borneo (Sarawak), and recorded only from two localities, Bako National Park and Gunung Pueh National Park.

Licuala kuchingensis Saw

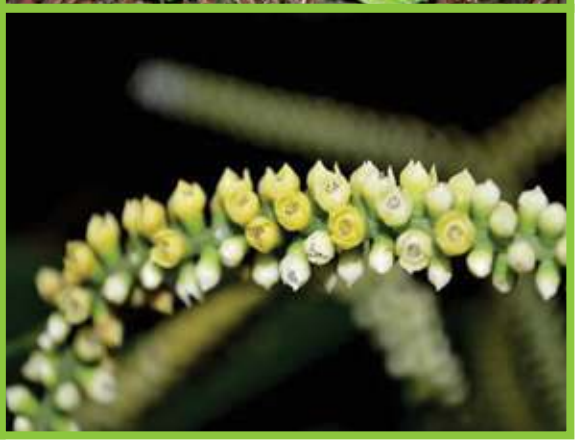
Solitary or clustering fan palm, up to 1.5 m tall. Leaf-blade semi-orbicular, about 50 cm across, papery leathery, with 5–7 segments. Inflorescence within the crown, erect, shorter than the petiole. Flowers solitary seated on raised tubercles, spirally arranged throughout rachillae. Fruit ovoid, surface smooth. This species is endemic to Borneo (Sarawak), restricted in the Kuching division. Commonly found in the moist and damp forest of limestone foothills and boulders where the soils are deeper. Listed as Critically Endangered (CR).

Licuala mattanensis Becc. var. *mattanensis*

Solitary, small palm to 2 m tall (occasionally more than 3 m), crown with 18–20 leaves. Leaf-blade small to medium, peltate-orbicular, 25–60 cm across, papery-leathery, dark green when fresh. Inflorescence within the crown, curving outwards from the stem, up 50 cm long, spike or very rarely branched. Flower solitary, seated on a distinct floral stalk, tightly spirally arranged throughout the rachilla. Fruits are glabrous and fusiform, often all 3 ovules developing in a flower, smooth, scarlet to red when young turning yellowish and reddish-brown when fully ripe. This variety is endemic to the southwest of Sarawak (Kuching and Serian divisions), in lowland forests. This species is threatened by habitat loss and plant hunters due to good demand in the markets.

Licuala orbicularis Becc.

Solitary to clustering, acaulescent to very short-stemmed palm, crown with 7–8 leaves. Leaf-blade suborbicular-flabellate, entire, widely cuneate at the base, coriaceous, 50–70 x 55–75 cm. Inflorescence within the crown, erect, shorter to about the length of the frond, slightly curved and branched to 2 orders. Fruits globose, c. 1 cm diameter, surface smooth, immature fruits green. This species is endemic to the Southwest of Sarawak (Kuching and Serian divisions). It is rather common and often dominates the forest floor of the mixed dipterocarp forest, particularly in moist valley and hill slopes. Also found in kerangas forest, at elevations between 20–550 m above sea level.



***Licuala paludosa* Griff.**

Synonym: *Licuala amplifrons* Miq.; *Licuala paniculata* Ridl.; *Licuala aurantica* Hodel

The plants frequently form a cluster of medium to large colonial, medium-sized palms, about 7–8 m tall (or more) and 5–6 cm in diameter. Leaves 9–10 in the crown; leaf-blade medium-sized, peltate-orbicular, segments 6–12 (up to 25), all almost same size, lateral segments 2–6 costulate, 42–85 x 3.5–11 cm; central segment slightly larger than the rest, bifid into two 7–9 costulate lobes. Inflorescence erects to patent, longer than leaves, extending beyond the crown. Flowers solitary to groups of 2–3, sessile. Fruits are globose, glabrous, dark green, and ripening orange to red.

This species is mainly found in the peat swamp forest and sometimes also in the lowland and kerangas forests between sea level to about 900 m above sea level. Widely distributed in Southeast Asia (Indochina, Thailand, Sumatra, Peninsular Malaysia and Borneo). In Sarawak, this species is found in the peat swamp forest in Maludam National Park. The young leaf blades are used to wrap food (e.g. gelatinous rice). The epithet name means swamp, referring to where it is commonly found.

Licuala petiolulata Becc.

An endemic palm to Borneo. Widely distributed in Sarawak and Brunei, but not common in Kalimantan and Sabah. Grows in various habitats, from lowland to sub-montane forest, up to 800 m altitudes, commonly in kerangas and mixed dipterocarp forests. Locally known as *'biru'* or *'katen'* by the Iban, the fronds are usually used for thatching as temporary shelters. The fruits are edible, and the cabbages are cooked as a vegetable.

A solitary, acaulescent to short-stemmed palm, up to 2 m tall. Crown with 18–20 leaves. Leaf-blade peltate-orbicular in outline, central segment simple, distinctly petiolulate. Inflorescence within the crown, erect, shorter than fronds. Fruits are ovoid, surface smooth, immature green and turned orange when ripe.

Licuala pilosa Saw

Solitary, acaulescent palm. Leaf-blade semi-orbicular in outline, chartaceous, drying pale-green, brown on the adaxial surface. Inflorescence within the crown, erect, almost as long as the frond. Flowers solitary, spirally arranged, sessile on minutely bracteolate. Calyx vase-shaped, covered by scattered, stiff, fine golden-brown hairs. Young fruits are globose, green, and covered with scattered fine stiff golden-brown hairs.

This species has similar characteristics to *Licuala triphylla* by having a hairy ovary but is distinguished by the latter being smaller in size with inflorescence branched to 2 orders. *Licuala pilosa* is endemic to Sarawak and known so far from the type specimen, Niah National Park. The species epithet name means covered with hairs, referring to the hairy ovary.

Licuala rheophytica Saw

Clustering, acaulescent palmlet, with a short subterranean trunk. Crown with 18–20 fronds. Leaf-blade wedge-shaped, papery leathery. Inflorescence within the crown, bent from the shoot and pendulous, exhibits the inflorescence outside the crown during anthesis. Fruit ellipsoid, smooth surface, immature green and turning to orange-red when ripe.

This species is endemic to Borneo, restricted to a small area, in the Lanjak Entimau Wildlife Sanctuary (and probably on the other side as well, Taman Nasional Betung Karihun of Indonesia). The awesome species has great potential as an ornamental or decorative plant.

Licuala sarawakensis Becc.

Solitary, acaulescent to very short-stemmed fan palm, crown with 7–10 leaves. Leaf-blade 2/3 orbicular in outline, chartaceous, drying grey-green, glaucous on the lower surface, 5–7 segments, central segment simple, not petiolulate, larger than lateral. Inflorescence within the crown, erect, shorter than frond. The flower is solitary, spirally arranged, and not very closely packed. Fruits globose, c. 1 cm across, smooth surface, immature green, turned orange when ripe.

This species is endemic to Sarawak with narrow distribution. It is restricted to the Kuching division, in fragmented lowland dipterocarp and kerangas forests. Critically endangered due to habitat loss.

Licuala triphylla Griff.

Synonym: *Licuala ternata* Griff. ex Mart.; *L. pygmaea* Merril; *L. triphylla* var. *integrifolia* Ridl.; *L. filiformis* Hodel; *L. stenophylla* Hodel

Solitary small, acaulescent palm. Stem subterranean with very short internodes, leaves 6–10 in crown. Leaf-blade chartaceous, segments 3–10, central segment larger than rest. Inflorescence patent, shorter than leaves, 15–40 cm long, branched into 2 orders. Fruits are globose, glabrous, green, ripening orange. This species is one of the most common *Licuala* in Peninsular Malaysia, however, previously in Borneo only recorded from Sabah and Kalimantan.

Metroxylon sagu Rottb.

The true sago palm is native to tropical southeast Asia, Indonesia, Papua New Guinea and Malaysia (also in the Philippines and Southern Thailand). Locally known as *Balau* or *Mulong* by the Melanau peoples, this palm is of commercial importance as it is the main source of sago, a starch obtained from the trunk. Important crop and Sarawak have the largest sago plantation in the world. Informally, there are two varieties identified by the locals based on the presence of prickles or thorny on the trunk and midribs.

(left) the sago logs are ready to be sold (right) harvesting leaves for making roofing materials – atap mulong (below) matured sago palms in the Sungai Talau Sago Trial Plot, Dalat (Mukah division).

Nenga pumilla (Mart.) H. Wendl. var. *pachystachys*

Locally known as *Pinang gajah, Nenga pumilla* var. *pachystachys* is widely distributed in southern Thailand, Peninsular Malaysia, Sumatra and Borneo, and is the only taxa in the genus recorded from Sarawak. Widely distributed throughout Sarawak in the mixed dipterocarp forest, particularly in the moist valley and wet places near the streams and rivers. The trunk is solitary or clusters about 2–4 m tall (rarely more than 5 m tall). The stems are ringed by distinct leaf scars and frequently supported by stilt roots. Leaf-sheaths and midrib greenish yellow. Immature fruit green with yellow at the apex, turning orange and black when fully ripe.

Nypa fruticans Wurmb.

A native palm species to the coastlines and estuarine habitats, and the only palm adapted to the mangrove biome of many tropical and pacific ocean countries. Known as Nipa or mangrove palm, this species is one of the important underutilized fruit of Malaysia. Almost every part of the plant is being utilized, e.g. leaves are used for making roofing material, and inflorescences are extracted to get the sap for making salt or drinking tonic. The fruits are edible. *Nypa* is a monotypic genus, solely represented by a single species. The trunk or stem is short or very short and grows under the mud, only the leaves are projected upwards. The epithet means, with large bunches of edible fruits.

Oncosperma horridum (Griff.) Scheff.

A widespread species in Southeast Asia, from Thailand, Peninsular Malaysia, Sumatra, Sulawesi, the Philippines and Borneo. Vernacularly known as *Nibung bukit* or *bayas* in Malaysia and Indonesia, this species is found in lowland rainforests, and up to elevations 1,000 m above sea level. The stem is slender and armed with sharp spines on the trunk and leaf stalks (thus the specific name of *horridum*). Occasionally solitary or clustering, this species reaches up to 20 m tall. The inflorescence is large and yellow below the leaves. Flowers are monoecious and spirally arranged. Fruits are ovate, green changing brown and turning black when fully ripe.

The stems are often used in construction and young shoots are cooked as a vegetable.

Oncosperma tigillarium (Jack) Ridl.

Distributed throughout southeast Asia (from Thailand, Peninsular Malaysia, Sumatra, Java and Borneo) and Indochina. This species is generally confined to the forest below 50 m above sea level, in near-coastal areas or water bodies. In certain areas, this species also can be adapted to the high salinity of mangrove forests. *Oncosperma tigillarium* or the true *Nibong* is an invasive species. This species is a very attractive cespitose palm with droopy leaves and an intensively spiny trunk. Solitary or frequent clustering, up to 25 m in height. Crown shaft light green leaves 2–4 m long. Inflorescence ramified and thorny, among the leaves, yellow with flowers of both sexes placed in the typical triad. The *Nibong* provides useful timber and light construction such as for *kelong*. The *upak nibong* (young crown shaft) is cooked as a vegetable. Common throughout Sarawak.

Pinanga angustisecta Becc.

Solitary, stem erect, unbranched, up to 4 m tall. The Crown shaft elongates about 30–80 cm long, slightly swollen, with about 10–12 leaves in the crown. Leaf (excluding leaf sheath) is about 2.2–2.5 m long (or longer), pinnate with narrow leaflet (the epithet name refers to). Inflorescence just below the crown shaft, erect, with 6–8 braches. Fruit elliptic.

This species is endemic to Borneo. Grows in the moist, wet gullies in the mixed dipterocarp forest or gentle slopes near the streams or riverbanks. Rare palm in Sarawak, recorded from Limbang and Lawas divisions.

Pinanga chaiana J. Dransf.

Solitary, stem erect, unbranched, up to 5 m tall. The Crown shaft elongates about 40–50 cm long, only slightly wider than the stem, with about 7 leaves in the crown. Leaf (including leaf sheath) is about 1.5–1.8 m long, lamina entire except for a deep apical split, 130 x 40 cm. Inflorescence infra foliar, pendulous, to about 20 cm long, with 3–7 crowded parallel branches. Fruits are spindle-shaped, immature greenish.

This palm is endemic to Borneo, and distribute throughout Sarawak, from Kuching to Lawas division, in shade areas of mixed dipterocarp forest and also on the boulders and foothill of the limestone hill. This species is named after Paul Chai, the Sarawak's Forest botanist, who collected the type specimen.

Pinanga crassipes Becc.

A small species (sometimes up to 2–3 m tall), with a short or very short but thick trunk, with pinnate leathery leaves. This shade-loving understory palm is native to Borneo and is probably one of the best and most colourful palms. Young plants have heavily blotched and mottled. The fruits are ellipsoid, red or reddish-pink and turn black at maturity. Recorded throughout Sarawak, from Kuching to Lawas divisions, in the lowland mixed dipterocarp forest, altitude from 30 to 600 m above sea level. Sometimes also found in the kerangas forest, near the streams or riverbanks. The epithet species name means "*thick foot*", referring to the thick trunk.

Pinanga cucullata J. Dransf.

A small palm in the lowland MDF and Kerangas forests of Sarawak. Frequently found as solitary, but the older plants usually with palmlets on the rhizomes or stolons. The stem erects, never exceed more than 1 meter tall. Crown with 6–8 leaves, the sheaths forming an elongate crown shaft. This species is distinctive from others by the cucullate bifid leaves of almost succulent textures.

Pinanga jambusana C.K. Lim

This species grows in damp leaf litter near streams within a limestone labyrinthine enclave, riparian. The plant is solitary, suckering profusely, thus multiplying. The fruits are indeed distinctive, being blue (that is why we gave a code to it as *"Pinang biru"*), unusual so far for the genus. The colony may estimate to have approx. 100 plants in the type locality (considered save, as the type locality in the protected area, Dered Krian National Park. The species epithet is based on the type locality.

Pinanga limbangensis C.K. Lim

Solitary dwarf palm, stem c. 1 cm diameter. Leaves 8–9 at the crown, pinnate, 30 x 27 cm, with up to 9 pairs of leaflets, opposite; leaflets divaricate, subtending at right angles to rachis. Inflorescence infra foliar, rachillae 3 to 4, yellow-green or brown, sometimes red. Flowers distichous. Fruits are globular, cream when unripe and ripening black.

The seedling leaves are entire, like *Pinanga limosa* Ridl. and juvenile reminiscent of *Pinanga subintegra* var. *intermedia Furtado* ex C.K. Lim.

Pinanga limbangensis is indeed a most attractive diminutive species, with its coriaceous divaricate leaflets which are whitish abaxially. Distribution of this species from the central part of Sarawak, Kapit to Limbang division.

Pinanga cf. malaiana Scheff.

Clustering palm (usually small clumps) to about 6–8 m tall. Leaves spreading, equally spaced, equally broad leaflets with two main nerves. Crown shaft prominent, fawn flushed pinkish. Inflorescence pendulous, with 2–5 stouts flattened reddish rachilla. Fruits in two orders, globose, greenish turning yellow, reddish-orange and purple-black when fully ripe. Native to southeast Asia, from Thailand, Peninsular Malaysia, Sumatra and Borneo. Known as "Malaya sealing wax palm", this species is not common in Sarawak, although it can be found from Kuching to Limbang divisions. The status of this species, however is still uncertain.

Pinanga mooreana J. Dransf.

Clustering, unarmed, monoecious palm. Stem with basal suckers forming rather close clumps, robust, about 6–8 m tall. Crown shaft swelled, dull purplish brown, leaves 6–8 in the crown. Inflorescence infrafoliar, pendulous. Immature fruits are greenish, turning yellowish then orange, and finally, deep purplish-black when fully ripe.

This species is endemic to Borneo (Sarawak), previously only recorded from Bintulu and Miri divisions. Recently recorded from the Lanjak Entimau Wildlife Sanctuary during the Heart of Borneo scientific expedition in 2008. *Pinanga mooreana* seems to be confined to lowland forests on alluvial soils, and in kerangas forest.

Pinanga ridleyana Becc. ex Furtado

Small, solitary palm about 30–50 cm tall (rarely more than 1.5 m). Crown shaft slightly swollen, pale greenish yellow with 8 – 10 leaves in crown. Leaves shiny, entirely bifid. Inflorescence infra foliar, pendulous, always with 3 reddish rachillas (sometimes 5). Immature fruits are reddish with greenish.

This species was described by Beccari based on Ridley's collection, but he died before he could be published it. The manuscript was edited by Martelli and published in 1934 and transferred by Furtado into the genus *Pinanga* (Palmpedia, 2020). This species is endemic to Borneo (Sarawak), widely distributed in Sarawak, from Kuching to Lawas divisions, in the moist lowland mixed dipterocarp forest, but not common.

Pinanga rupestris Becc.

Diminutive clustering palm, short-stemmed that rarely exceed more than 60 cm tall. Stem base producing aerial roots and dense cluster of sucker shoots. Erect or more usually pendulous from crevices in sandstone rock faces. Crown with about 6 leaves, the leaf sheaths forming an elongate crown shaft.

This species, by far recorded in a very limited distribution and considered as hyper endemic to Bako National Park, Sarawak.

Pinanga simplicifrons (Miq.) Becc. ssp. *simplicifrons*

A widespread species in Southeast Asia, from Thailand, Peninsular Malaysia, Sumatra and Borneo. Grows in the lowland mixed dipterocarp forest, on wet shade places, particularly near the water bodies. Small palm, clumping up to 20 shoots per clump (or more), about 1–1.5 m tall. Leaves pinnate or undivided; sheaths greenish brown, persisting. Inflorescence pendulous, covered with persisting prophyll and bursting thought the persisting leaf sheaths; rachillae 1–2, zigzag. Fruit ovoid, often curved, red.

There two subspecies have been recognised: subspecies *simplicifrons* (common throughout – with undivided leaves) and subspecies *pinnata* (in Peninsular Malaysia – with pinnate leaves). This species is very ornamental but needs regular maintenance to clear the dried leaves as the sheaths are persisting on the trunk.

Pinanga tenella (H. Wendl.) Scheff. var. _tenuissima_ (Becc.) J. Dransf.

Synonym: *Ptychosperma tenella* H. Wendl.; *Pinanga calamifrons* Becc.; *P. calamifrons* Becc. Var. *tenuissima* Becc.

A grass-liked palm, *Pinanga tenella* is one of the extraordinary rheophyte species, confined to rocks on banks of rivers throughout Borneo. Besides *Pinanga tenella,* there is another rheophyte *Pinanga* species in Sarawak, *Pinanga rivularis.* They are looked remarkably similar but can be distinguished by the characters of the flowers.

Clustering, with a slender trunk, the leaves are very narrow but tough-textured leaflets (probably an adaptation of resistance to water flow), up 60–80 cm in height (rarely more than 1 m tall), crown shaft slightly swollen, pale green to yellowish.

Pinanga variegata Becc.

A small palm, solitary or clustering, about 1–1.2 m tall. The crown shaft is slightly swollen and green, with 6–8 leaves. Leaves large paddle-shaped with bifid apex or split, slightly corrugated or sometimes heavily corrugated. Inflorescence just below the crown shaft, solitary or simple branched of 2–3. Fruit globose, smooth, immature green turned to whitish when ripe. This species is endemic to Borneo (Sarawak), in lowland mixed dipterocarp forest, occasionally found in wet places near streams or riverbanks. Common throughout Sarawak, from Kuching to Lawas divisions. An attractive palm, with the potential to be a decorative or shade garden plant.

Pinanga veitchii H. Wendl. ex Veitch

This species is endemic to Borneo. A dwarf understory palm grows solitary or frequently in clumps and develops slender trunks which rarely exceed more than 1.8 m in height. The leaves are thick, leathery and deeply notched. The most distinct characteristic of this species is the leaves of the seedlings and young shoots, which are mottled in a camouflage pattern of purple-brown and pale green. As the plants get taller, this characteristic decreases and tall plants have plain green leaves.

Common throughout Sarawak, in a moist valley and wet places near the streams and rivers of mixed dipterocarp forest and in kerangas forest.

Plectocomia elongata Mart. ex Bl.

Synonym: *Plectocomia griffithii* Becc.

Robust, solitary climbing rattan, up to 50 m long; stem without sheaths near the base, upper part with sheaths. Sheaths are dark green and armed with horizontal or oblique combs of golden brown or deep reddish-brown spines. Inflorescence produced from the top, bearing crowded pendulous branches, bracts chestnut brown. Not common in Sabah and Sarawak, but abundant in Peninsular Malaysia, Sumatra and Java.

***Plectocomiopsis geminiflora* (Griff.) Becc.**

Synonym: *Calamus geminiflorus* Griff.

Clustering, moderate to robust climbing rattan, climbing to forest canopy up to 30 m high (or more), forming rather dense thickets. Sheaths are dull green with persistent grey tomentum and scattered caducous reddish-brown scales, and abundant scattered golden-yellow spines. Knee absents, ocrea not well developed except on juvenile shoots, were irregular, oblique and tattering. Inflorescence up to 15 is produced simultaneously. Ripe fruit oblate scales chestnut brown colour.

Locally known as *Wi matar* or most popularly *upak lalih*, the bitter cabbages are often harvested and sold in village markets. The canes are used for coarse basket ware and cordage. This species is widely distributed in southeast Asia, common in the lowland mixed dipterocarp forest, throughout Sarawak.

Plectocomiopsis mira J. Dransf.

Moderately robust climbing rattan, climbing high to the forest canopy up to 40 m. Sheaths rich bright green, with a thin covering of silvery grey indumentum and very sparse spines or unarmed; knee absent, ocrea very conspicuous, orange-yellow, truncate, horizontal not tattering. The inflorescence is produced simultaneously from the topmost, 5–10 nodes, male and female cursorily similar, but the male more finely branched. Fruits are oblate, with scales of bright orange-brown colour.

Also known as *Wi matar* or *upik lalih,* this species is also harvested for cabbages and cane. This species is common, can be found throughout Sarawak, and grows in lowland and hill dipterocarp forests on a variety of soils.

Pholidocarpus majadum Becc.

This native giant fan palm is commonly found in the peat swamp forests in Borneo. The plants usually with long boldly striped petioles, yellow and dark green, and are armed with ferocious spines. Solitary, up to 15 m tall (sometimes reach to 20 m). Related to the genus *Livistona*, but easily distinguished by its large scaly seeds. *Pholidocarpus* is a small genus with about six species in Southeast Asia, and *P. majadum* is endemic to Borneo.

Salacca affinis Griff.

An acaulescent clumping palm, with a short or very short trunk, underground, with long erect leaves (2.5–3 m long) and very spiny petiole. The leaflets are born om clusters along the rachis. This species is native to Peninsular Malaysia, Sumatra and Borneo. Vernacularly known as *"Ridan"* by the Iban and Bidayuh or *"Mujan"* by the Melanau peoples, this species ethnically is very useful in their daily life. The leaf rachis is the cheapest fishing rod for the locals, and the leaves are also used as a temporary roofing material. The splendid, spindle-shaped and snakeskin-clad fruits are borne close to the centre of each plant, and reddish or bright pale red colours are edible. The fruits are slightly sour, but at the same time sweet, juicy and aromatic. Common throughout Sarawak from lowland to elevations 1,000 m above sea level, in wide ranges of habitats, but most common in the moist, wet swampy areas.

Salacca dransfieldiana Mogea

Small, clumping or clustering palm, up to 30 shoots, about 1.5 m tall with a very short stem. Leaves all flabellate, c. 1.3 m long, with sparsely yellow spines: lamina dark green above, with white indumentum below, sheath about 20 cm long, above the base gradually channelled. Young leaves are pinkish. Staminate inflorescence bursting through leaf sheath, to 10 cm, staminate flowers cream-tinged pink. This species is a dwarf version of Salacca *magnifica* and is endemic to Borneo. Extremely rare palm and the species is dioecious, meaning that male and female flowers are on different individuals.

Salacca vermicularis Becc.

Borneo Island is home to this species (Sarawak and Kalimantan). *Salacca vermicularis,* which is like *Salacca affinis* in that it has a dense array of spikes along its petioles, can be distinguished by its fruits. *Vermicularis,* a word from Latin that means "worm," refers to rachillae that resemble worms. When the florets are gone, the remaining spikelet looks a lot like a worm.

A large stemless clustering palm with light brown-red petioles, this species is frequently found in shaded and wet places in lowland forests. The fruits locally known as *Mujan* by the Melanau, with sweet and sour taste, are edbile.

***Salacca zalacca* (Gaertn.) Voss**

Synonym: *Salacca edulis* Reinw.

Locally known as *Salak* in Malay language, is one of the common palm species planted in the Southeast Asia region. Also sometimes called as the snake fruit due to its scaly skin. The plant grows as extremely spiny, could grow up to 6 m height and leaves are about 10 m long, large, and pinnate with shiny and dark green long petioles with spine and leaflets.

This species usually found grows on moist and well-drained soil with high organic matter content. The fruits are drupe oval, or spindle shaped, with a distinct apex. The ripe fruit pulps are crunchy soft with sweet taste added to a distinct and pleasant aroma.

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***Areca* L.**

A. abdulrahmanii J. Dransf.

A. ahmadii J. Dransf.

A. andersonii J. Dransf.

A. arundinacea Becc.

A. bakeri Heatubun

A. brachypoda J. Dransf.

A. catechu L.

A. chaiana J. Dransf.

A. dayung J. Dransf.

A. dransfieldii Heatubun

A. furcata Becc.

A. gurita Heatubun

A. insignis (Becc.) J. Dransf. var. *insignis* [synonym: *Gigliolia insignis* Becc.]

A. insignis (Becc.) J. Dransf. var. *moorei* (J. Dransf.) J. Dransf.

A. jugahpunya J. Dransf.

A. kinabaluensis Furtado

A. klingkangensis J. Dransf.

A. minuta Scheff. [synonym: *A. hewittii* Furtado*; A. amdjahi* Furtado]

A. subacaulis (Becc.) J. Dransf. [synonym: *Gigliolia subacaulis* Becc.]

A. triandra Roxb. Var. *bancana* Scheff. [synonym: *A. borneensis* Becc.]

***Arenga* Labill.**

A. brevipes Becc.

A. hastata (Becc.) Whitmore [synonym: *A. borneensis* (Becc.) J. Dransf.]

A. pinnata (Wurmb) Merr.

A. undulatifolia Becc.

Borassodendron J. Dransf.

B. borneense J. Dransf.

Calamus L.

C. acanthochlamys J. J. Dransf.

C. amplijugus J. Dransf.

C. ashtonii J. Dransf.

C. bacularis Becc.

*C. blumei B*ecc. [synonym: *C. penibukanensis* Furtado; *C. slootenii* Furtado]

C. caesius Bl.

C. comptus J. Dransf.

C. conirostris Becc. [synonym: *C. brachystchys* Becc.]

C. conjugatus Furtado

C. convallium J. Dransf.

C. corrugatus Becc.

C. crassifolius J. Dransf.

C. diepenhorstii Miq.

C. divaricatus Becc. var. *divaricatus*

C. divaricatus Becc. var. *contrarius J. Dransf.*

C. erinaceus (Becc.) J. Dransf. [synonym: *C. aquatilis* Ridl.]

C. erioacanthus Becc.

C. flabellatus Becc. [synonym: *C. flabelloides* Furtado]

C. gibbsianus Becc.

C. gonospermus Becc.

C. hallierianus (Becc. *ex.* K. Heyne) W. J. Baker
[synonym: *Daemonorops hallierianus* Becc. *ex* K. Heyne]

C. hispidulus Becc.

C. hypertricosus Becc.

C. javensis Bl. [synonym: *C. filiformis* Becc.]

C. kiahii Furtado

C. laevigatus Mart. var. *laevigatus* [synonym: *C. retrophyllus* Becc.]

C. laevigatus Mart. var. *mucronatus* (Becc.) J. Dransf.
[synonym: *Calamus mucronatus* Becc.]

C. lambirensis J. Dransf.

C. leloi J. Dransf.

C. lobbianus Becc. [synonym: *Cornera lobbiana* (Becc.) Furtado]

C. marginatus (Bl.) Mart. [synonym: *C. regularis* Burret]

C. mattanensis Becc. [synonym: *C. ferrugineus* Becc.]

C. muricatus Becc. [synonym: *C. sphaeruliferus* Becc.]

C. myriacanthus Becc. [synonym: *C. hewittianus* Becc.; *C. jaherianus* Becc.]

C. nanodendron J. Dransf.

C. nematospadix Becc.

C. nielsenii J. Dransf.

C. optimus Becc. [synonym: *C. stramineus* Furtado]

C. ornatus Bl.

C. oxyleyanus T. & B. *ex* Miq.

C. pandanosmus Furtado

C. paspalanthus Becc.

C. paulii J. Dransf.

C. pilosellus Becc.

C. poensis Becc.

C. pogonacanthus Becc.

C. pseudoulur Becc.

C. psilocladus J. Dransf.

C. pygmaeus Becc.

C. ruvidus Becc.

C. sabalensis J. Dransf.

C. sarawakensis Becc. [synonym: *C. scabrifolius* Becc.]

C. scipionum Lour.

C. semoi Becc.

C. sordidus J. Dransf.

C. tenompokensis Furtado [synonym: *C. nanus* Burret]

C. zonatus Becc.

Caryota L.

C. mitis Lour.

C. no Becc.

Ceratolobus Bl. *ex* J.A. & J.H. Schultes

C. concolor Bl.

C. discolor Becc.

C. subangulatus (Miq.) Becc. [synonym: *Calamus subangulatus sensu* Becc.]

Cyrtostachys Bl.

C. renda Bl. [synonym: *C. lakka* Becc.]

Daemonorops Bl. *ex* J.A. & J.H. Schultes

D. acamptostachys Becc.

D. asteracantha Becc.

D. atra J. Dransf.

D. collarifera Becc. [synonym: *D. acanthobola* Becc.]

D. cristata Becc.

D. didymophylla Becc. [synonym: *D. mattanensis* Becc.; *D. motleyi* Becc.]

D. draco (Willd.) Bl. [synonym: *Calamus draco* Willd.]

D. fissus Bl.

D. formicaria Becc.

D. hystrix (Griff.) Mart. var. *exulans* Becc.

D. ingens J. Dransf.

D. korthalsii Bl.

D. longipes (Griff.) Mart. [synonym: *Calamus longipes* Griff.*; D. virescens* Becc.]

D. longispatha Becc.

D. longistipes Burret [synonym: *D. elongata* Bl. var. *montana* Becc. *ex* L.S. Gibbs]

D. maculata J. Dransf.

D. micracanthus (Griff.) Becc. [synonym: *Calamus micracanthus* Griff.*; D. draconcella* Becc.]

D. microstachys Becc.

D. oblata J. Dransf.

D. oxycarpus Becc.

D. periacantha Miq. [synonym: *D. dissitophylla* Becc.; *D. florida* Becc.]

D. sabut Becc. [synonym: *D. annulata* Becc.; *D. pseudomirabilis* Becc.; *D. turbinata* Becc.]

D. scapigera Becc. [synonym: *D. lasiospatha* Furtado]

D. sparsiflora Becc.

D. spectabilis Becc.

D. ruptilis Becc. var. *acaulescens* J. Dransf.

D. unijuga J. Dransf.

**Based on the current classification (via molecular evidence), all the Daemonorops species now transferred to the genus Calamus.*

Eugeissona Griff.

E. insignis Becc.

E. minor Becc.

E. utilis Becc.

Iguanura Bl.

I. ambigua Becc.

I. chaiana Kiew

I. curvata Kiew

I. elegans Becc.

I. geonomiformis Mart.

I. Melinauensis Kiew

I. minor Kiew

I. myochodoides Kiew

I. palmuncula Becc. var. *palmuncula*

I. sanderiana Ridl.

***Johannesteijsmannia* J. Dransf.**

J. altifrons (Reichb. f. et Zoll.) H.E. Moore

***Korthalsia* Bl.**

K. angustifolia Bl.

K. cheb Becc.

K. debilis Bl.

K. echinometra Becc.

K. ferox Becc.

K. flagellaris Miq.

K. furcata Becc.

K. hispida Becc.

K. jala J. Dransf.

K. paucijuga Becc.

K. rigida Bl.

K. robusta Bl. [synonym: *K. squarrosa* Becc.; *K. macrocarpa* Becc.]

K. rostrata Bl. [synonym: *K. scaphigera* Griff. *ex* Mart.]

***Licuala* Thunb.**

L. atrovirens Saw

L. bidentata Becc.

L. bintuluensis Becc.

L. borneensis Becc.

L. chaiana Saw

L. collina Saw

L. cordata Becc. var. *cordata*

L. cordata Becc. var. *ashtonii* Saw

L. densiflora Becc.

L. elliptica Saw

L. exigua Saw

L. flammula Saw

L. furcata Becc.

L. glabra Griff. [synonym: *L. arbuscula* Becc.; *L. longipenduculata* Ridl.]

L. intermedia Saw

L. kuchingensis Saw

L. lanata J. Dransf.

L. leucocarpa Saw

L. maculata Saw

L. mattanensis Becc. var. *mattanensis*

L. mattanensis Becc. var. *paucisecta* Becc.

L. micholitzii Ridl. var. *micholitzii*

L. micholitzii Ridl. var. *leena* Saw

L. miriensis Saw

L. mukahensis Saw

L. orbicularis Becc. [Synonym: *L. veitchii* W. Wats. *nom. tant.*]

L. paludosa Griff. [Synonym: *L. amplifrons* Miq.; *L. paniculata* Ridl.; *L. aurantiaca* Hodel]

L. petiolulata Becc. [Synonym: *L. petiolulata* Becc. var. *kenepaiensis* Becc.]

L. pilosa Saw

L. pseudovalida Saw

L. punctulata Saw

L. rheophytica Saw

L. rubiginosa Saw

L. sarawakensis Becc.

L. spathellifera Becc.

L. spicata Becc.

L. spinosa Wurmb.

L. valida Becc. [synonym: *L. olivifera* Becc.; *L. paludosa* Griff. Var. *winkleriana* Becc.]

L. yiiana Saw

Livistona

L. exigua J. Dransf.

***Metroxylon* Rottb.**

M. sagu Rottb.

***Nenga* H. Wendl. & Drude**

N. pumilla (Mart.) H. Wendl.

***Oncosperma* Bl.**

O. horridum Scheff.

***Pholidocarpus* Bl. *ex* J.A. & J.H. Schultes**

P. maiadum Becc.

***Pinanga* Bl.**

P. albescens Becc. *ex* H. Wendl.

P. angustisecta Becc.

P. aristata (Burret) J. Dransf.

P. auriculata Becc. var. *auriculata*

P. bifidovariegata Mogea

P. brevipes Becc.

P. capitata Becc. *ex* Gibbs var. *capitata* [synonym: *P. gibbsiana* Becc.]

P. capitata Becc. *ex* Gibbs var. *divaricata* J. Dransf.

P. chaiana J. Dransf.

P. crassipes Becc.

P. cucullata J. Dransf.

P. dumetosa J. Dransf.

P. jambusana C.K. Lim

P. keahi Furtado

P. lepidota Rendle [synonym: *P. baramensis* Furtado]

P. ligulata Becc.

P. limbangensis C.K. Lim

P. limosa Ridl.

P. minuta Furtado

P. mirabilis Becc.

P. mooreana J. Dransf.

P. pachyphylla J. Dransf.

P. patula Bl.

P. pilosa (Burret) J. Dransf.

P. ridleyana Becc. *ex* Furtado

P. rivularis Becc.

P. rupestris Becc.

P. salicifolia Bl. [synonym: *P. canina* Becc.]

P. sessilifolia Furtado [synonym: *P. albescens* Becc. *ex* H. Wendl. Var. *sarawakensis* Becc.]

P. simplicifrons (Miq.) Becc.

P. tenella (H. Wendl.) Scheff. var. *tenella* [synonym: *P. calamifrons* Becc.]

P. tenella (H. Wendl.) Scheff. var. *tenuissima* (Becc.) J. Dransf. [synonym: *P. calamifrons* Becc. var. *tenuissima* Becc.]

P. ternacinervis J. Dransf.

P. tomentella Becc.

P. trichoneura Becc.

P. variegata Becc. var. *variegata*

P. variegata Becc. var. *hallieriana* Becc.

P. veitchii H. Wendl.

P. yassinii J. Dransf.

Plectocomia Mart. *ex* Bl.

P. mulleri Bl. [synonym: *Plectocomia minor* Ridl.]

P. elongata Mart. *ex* Bl. [synonym: *P. griffithii* Becc.]

***Plectocomiopsis* Becc. *ex* Hook. f.**

P. geminiflora (Griff.) Becc. *ex* Hook. f. [synonym: *Calamus geminiflorus* Griff.]

P. mira J. Dransf.

P. triquestra (Becc.) J. Dransf. [synonym: *Calamus triqueter* Becc.]

***Pogonotium* J. Dransf.**

P. divaricatum J. Dransf.

P. moorei J. Dransf.

P. ursinum (Becc.) J. Dransf.

***Retispatha* J. Dransf.**

R. dumentosa J. Dransf.

***Salacca* Reinw.**

S. affinis Griff. Var. *affinis*

S. affinis Griff. Var. *borneensis* (Becc.) Mogea

S. dransfieldiana Mogea

S. magnifica Mogea

S. rupicola J. Dransf.

S. sarawakensis

S. vermicularis Becc.

Vernacular names / Common names of palms in Sarawak

Aping (Ib.) – *Arenga undulatifolia* Becc.

Apong (Mal.) – *Nypa fruticans* Wurmb

Asam kelubi (Mal.) – *Eleiodoxa conferta* (Griff.) Burret

Balau (Mel.) – *Metroxylon sagu* Rottb.

Baun (Mel.) – *Eleiodoxa conferta* (Griff.) Burret

Bidang (Ib.) – *Borassodendron borneense* J. Dransf.

Biro (Pun.) – *Licuala collina* Saw

Biroo (Selako) – *Licuala orbicularis* Becc.

Biruh (Ib.) – *Licuala petiolulata* Becc.

Daon iseing (Mel.) – *Licuala mukahensis* Saw

Datei (Pen.) – *Areca minuta* Scheff.; *Pinanga lepidota* Burret

Daun biru (Ib.) – *Licuala atrovirens* Saw

Daun plat (Ib.) – *Licuala atrovirens* Saw

Elart-birker (Mur.) – *Licuala rubiginosa* Saw

Enjuok (Dus.) – *Areca minuta* Scheff.

Germah (Ib.) – *Licuala petiolulata* Becc.

Gernis (Ib.) – *Licuala bintuluensis* Becc.; *Licuala rubiginosa* Saw

Ilad (Lun Baw.) – *Licuala collina* Saw

Itot (Pun.) – *Licuala rubiginosa* Saw

Jakah (Pen.) – *Arenga undulatifolia* Becc.

Jaong (Ib.) – *Pholidocarpus maiadum* Becc.

Katen (Ib.) – *Licuala petiolulata* Becc.

Kelawit wea' (Kelab.) – *Daemonorops longistipes* Burret

Keplar (Ib.) – *Daemonorops ingens* J. Dransf.

Maram (Ib.) – *Eleiodoxa conferta* (Griff.) Burret

Mudor (Ib.) – *Caryota mitis* Lour.

Mulong (Mel.) – *Metroxylon sagu* Rottb.

Mujan (Mel.) – *Salacca affinis* Griff.

Nibong (Mal.) – *Oncosperma horridum* (Griff.) Scheff.

Nipah (Mal.) – Nypa fruticans Wurmb

Nyakau (Pen.) – *Areca minuta* Scheff.

Palas (Mal.) – *Licuala petiolulata* Becc.

Palma ekor buaya (Mal.) - *Johannesteijsmannia altifrons* (Rchb. f. & Zoll.) H.E. Moore

Pantu (Ib.) – *Eugeissonia insignis* Becc.

Pelat (Ib.) – *Licuala borneensis* Becc.

Pinang ayat (Ib.) – *Pinanga mooreana* J. Dransf.

Pinang biru (Mal.) – *Pinanga jambusana* C.K. Lim

Pinang gajah (Mal.) - *Nenga pumilla* (Mart.) H. Wendl.

Pinang jugah (Mal.) – *Pinanga jugahpunya* J. Dransf.

Pinang laka (Ib.) – *Pinanga lepidota* Rendle

Pinang lakka (Mal.) – *Cyrtostachys renda* Bl.

Pinang limbang (Mal.) – *Pinanga limbangensis* C.K. Lim

Pinang mureng (Ib.) – *Areca triandra* Roxb.

Pinang muring (Ib.) – *Pinanga dumetosa* J. Dransf.

Pinang pelandok (Ib.) – *Pinanga aristata* Becc.

Pinang raja (Mal.) – *Cyrtostachys renda* Bl.

Pinang surok pelandok (Ib.) – *Areca minuta* Scheff.

Pinang tudong pelandok (Ib.) – *Iguanura curvata* Kiew

Pokok sagu (Mal.) – *Metroxylon sagu* Rottb.

Raring (Dus.) – *Cyrtostachys renda* Bl.

Ridan (Ib.) – *Salacca affinis* Griff.

Rotan sega (Mal.) – *Calamus caesius* Bl.

Rotan semambu (Mal.) – *Calamus scipionum* Lour.

Rua (Bid.) – *Korthalsia cheb* Becc.

Savit pedun (Pen.) – *Calamus conirostris* Becc.

Sepelat (Pen.) – *Daemonorops ingens* J. Dransf.

Seruing (Kay.) – *Daemonorops ingens* J. Dransf.

Silat (Mal. – Brunei) – *Licuala bintuluensis* Becc.

Tahai (Pen.) – *Calamus conirostris* Becc.

Tudung pelandok (Ib.) – *Areca subacaulis* J. Dransf.

Tubu (Kelab.) – *Areca minuta* Scheff.

Ubud bera (Kelab.) – *Pinanga lepidota* Rendle

Uwei (Kelab.) – *Daemonorops longistipes* Burret

Wae' aram (Kelab.) – *Daemonorops sabut* Becc.

Wae' bumum tepun (Pen.) – *Calamus javensis* Bl.

Wae' duru (Pen.) – *Korthalsia cheb* Becc.; *Daemonorops sabut* Becc.

Wae; duru (Pen.) – *Ceratolobus discolor* Becc.

Wae' gu'un (Mel.) – *Korthalsia rigida* Bl.

Wae' inang (Pen.) – *Calamus optimus* Becc.

Wae' jaging (Pen.) – *Calamus paspalanthus* Becc.

Wae' janan paya (Pen.) – *Calamus convallium* J. Dransf.

Wae' keluwung paya (Pen.) – *Calamus kiahii* Furtado

Wae' koko (Pen.) – *Calamus sordidus* J. Dransf.

Wae' koko paya (Pen.) – *Calamus tenopokensis* Furtado

Wae' mitai (Pen.) – *Calamus marginatus* (Bl.) Mart.

Wae' pana (Pen.) – *Calamus gonospermus* Becc.

Wae' paya (Pen.) – *Daemonorops asteracantha* Becc.

Wae' perah (Pen.) – *Korthalsia robusta* Bl.

Wae' savit kup (Pen.) – *Calamus blumei* Becc.

Wae' savit paya (Pen.) – *Calamus hispidulus* Becc.

Wae' savit pedun (Pen.) – *Calamus conirostris* Becc.

Wae savit pedun (Pen.) – *Calamus lobbianus* Becc.

Wae' savit pedun paya (Pen.) – *Calamus leloi* J. Dransf.

Wae' savit tetong (Pen.) – *Calamus pogonacanthus* Becc. *ex* Winkler

Wae' savit usun (Pen.) – *Calamus divaricatus* Becc. var. *divaricatus*

Wae' sawit belengan (Pen.) – *Daemonorops korthalsii* Bl.

Wae' sawit madok (Pen.) – *Daemonorops periacantha* Miq.

Wae' seleda (Pen.) – *Korthalsia rigida* Bl.; *Korthalsia debilis* Bl.

Wai kuran (Kelab.) – *Calamus conirostris* Becc.

Wei dara (Lun Baw.) – *Daemonorops longistipes* Burret

Wei leluduh (Lun Baw.) – *Calamus convallium* J. Dransf.

Wei rabun (Kelab.) – *Calamus javensis* Bl.

Wi anak (Ib.) – *Calamus javensis* Bl.; *Calamus zonatus* Becc.

Wi anak (Ib.) – *Calamus pygmaeus* Becc.

Wi asas (Ib.) – *Korthalsia robusta* Bl.; *Korthalsia hispida* Becc.

Wi baloboh (Ib.) – *Daemonorops ingens* J. Dransf.

Wi banying (Selako) – *Calamus pandanosmus* Furtado

Wi batu (Selako) – *Calamus gonospermus* Becc.; *Calamus javensis* Bl.

Wi bayau (Ib.) – *Calamus flabellatus* Becc.

Wi benut (Bid.) – *Calamus javensis* Bl.

Wi buluh (Ib.) – *Calamus erioacanthus* Becc.

Wi bukon bo (Kay.) – *Calamus blumei* Becc.; *Ceratolobus concolor* Bl.

Wi bukop (Ib.) – *Calamus sarawakensis* Becc.

Wi buru (Ib.) – *Calamus caesius* Bl.

Wi chit (Ib.) – *Korthalsia rostrata* Bl.

Wi dahan (Ib.) – *Korthalsia rigida* Bl.

Wi dahanan (Ib.) – *Korthalsia jala* J. Dransf.

Wi danan (Ib.) – *Korthalsia flagellaris* Miq.

Wi danan tai manok (Ib.) – *Ceratolobus concolor* Bl.

Wi danum (Ib.) – *Calamus conirostris* Becc.

Wi duduk (Ib.) – *Daemonorops microstachys* Becc.

Wi duduk (Ib.) – *Daemonorops acamptostachys* Becc.

Wi duduk (Ib.) – *Daemonorops ruptilis* Becc. var. *acaulescens* J. Dransf.

Wi empunok (Ib.) – *Daemonorops cristata* Becc.

Wi empunok (Ib.) – *Daemonorops periacantha* Miq.

Wi empunok ruai (Ib.) – *Daemonorops scapigera* Becc.

Wi griang (Ib.) – *Daemonorops formicaria* Becc.

Wi griang (Kay.) - – *Daemonorops sabut* Becc.

Wi jalai (Kay.) – *Calamus laevigatus* Mart. var. *laevigatus*

Wi jalayan (Ib.) – *Calamus ornatus* Bl.

Wi janggut (Ib.) – *Ceratolobus subangulatus* (Miq.) Becc.

Wi jaunungan (Selako) – *Korthalsia rigida* Bl.

Wi jerenang (Ib.) – *Daemonorops didymophylla* Becc.

Wi jerenang (Ib.) - *Daemonorops micracantha* (Griff.) Becc.

Wi karut (Ib.) – *Daemonorops korthalsii* Bl.

Wi karut (Ib.) – *Daemonorops longipes* (Griff.) Mart.

Wi kijang (Ib.) – *Calamus blumei* Becc.

Wi kijang (Ib.) – *Ceratolobus discolor* Becc.; *Ceratolobus concolor* Bl.

Wi labu (Ib.) – *Daemonorops atra* J. Dransf.

Wi labu (Ib.) - *Daemonorops formicaria* Becc.

Wi lembah (Ib.) – *Calamus pseudoulur* Becc.

Wi letik (Ib.) – *Calamus caesius* Bl.

Wi lepo (Ib.) – *Daemonorops sabut* Becc.

Wi ligur (Kay.) – *Calamus conirostris* Becc.

Wi matahari (Ib.) – *Calamus marginatus* (Bl.) Mart.

Wi matar (Ib.) – *Plectocomiopsis geminiflora* (Griff.) Becc.

Wi matar (Ib.) – *Plectocomiopsis mira* J. Dransf.

Wi ondo (Selako) - *Daemonorops draco* (Willd.) Bl.

Wi pagau (Ib.) – *Calamus zonatus* Becc.

Wi pak lovo (Kay.) – *Korthalsia rostrata* Bl.

Wi patong (Ib.) – *Calamus divaricatus* Becc. var. *divaricatus*

Wi peladas (Ib.) – *Calamus javensis* Bl.

Wi ruah air (Ib.) – *Daemonorops sparsiflora* Becc.

Wi segak (Ib.) – *Calamus optimus* Becc.

Wi sego (Ib.) – *Calamus optimus* Becc.

Wi semut (Ib.) – *Korthalsia hispida* Becc.

Wi sero (Ib.) – *Calamus convallium* J. Dransf.

Wi singkau (Ib.) – *Calamus paspalanthus* Becc.

Wi sugi (Ib.) – *Calamus laevigatus* Mart. var. *laevigatus*

Wi sugi (Ib.) – *Calamus laevigatus* Mart. var. *mucronatus*

Wi tabungan (Ib.) – *Daemonorops korthalsii* Bl.

Wi takong (Ib.) – *Calamus flabellatus* Becc.

Wi tapah (Ib.) – *Calamus pseudoulur* Becc.

Wi tautuk (Selako) – *Calamus flabellatus* Becc.

Wi tedong (Ib.) – *Daemonorops oxycarpa* Becc.; *Calamus lobbianus* Becc.

Wi tibu (Ib.) – *Calamus erinaceus* (Becc.) J. Dransf.

Wi tingkaw (Ib.) – *Calamus paspalanthus* Becc.

Wi tulang (Ib.) – *Calamus myriacanthus* Becc.; *Calamus bacularis* Becc.

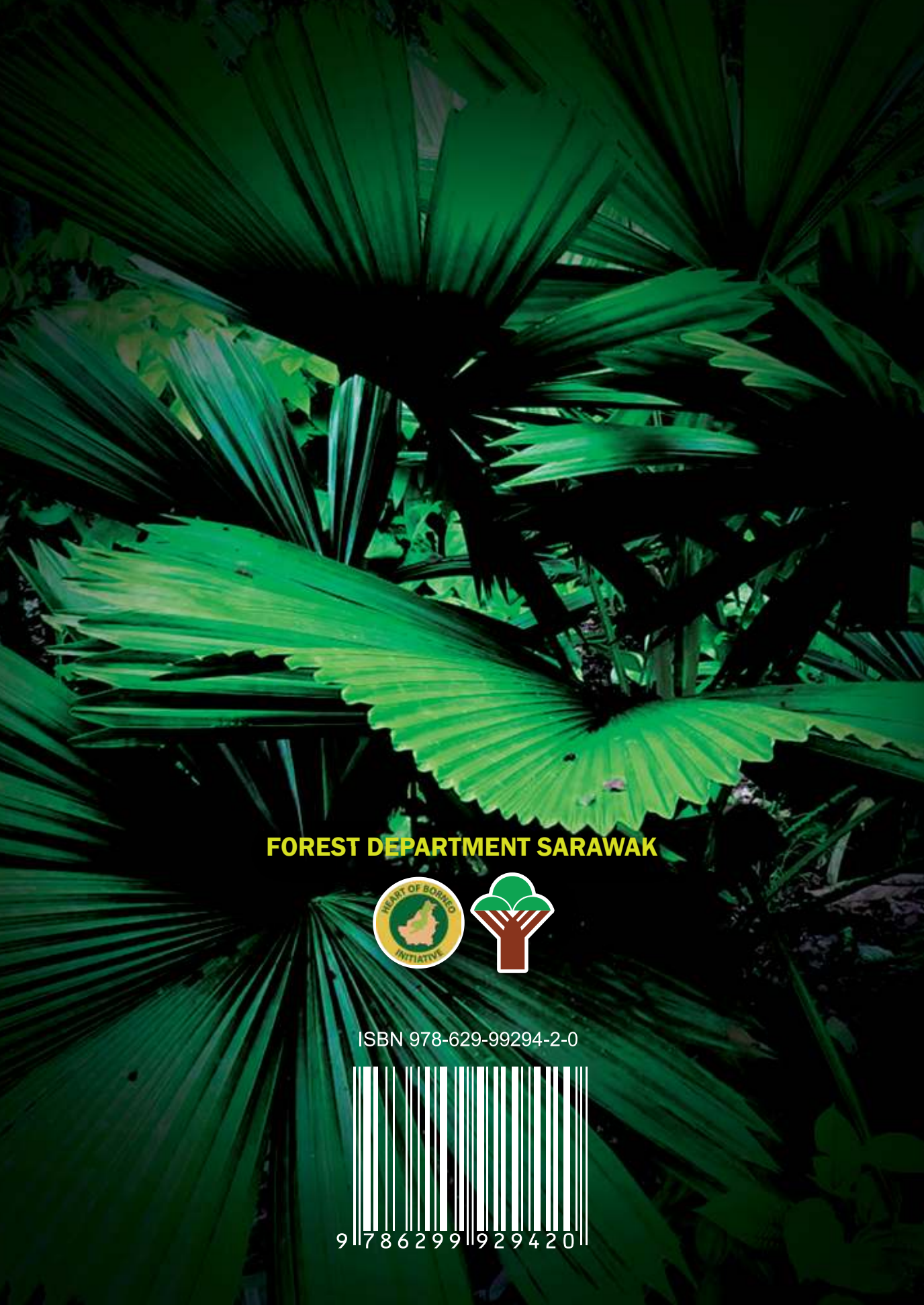
Wi tulang (Ib.) – *Calamus acanthochlamys* J. Dransf.

Wi tunggal (Ib.) – *Calamus comptus* J. Dransf.

Wi tut (Ib.) – *Calamus pogonacanthus* Becc. *ex* H. Wendl.

Wi tut (Ib.) – *Calamus semoi* Becc.

Wi wisro (Ib.) – *Korthalsia echinometra* Becc.



FOREST DEPARTMENT SARAWAK

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