

Pulau Tioman, a lush tropical paradise revisited

By Chew, M.Y. (chew@frim.gov.my), Saw, L.G. & Kamarul, H.M.

For more than half a century ever since it appeared in the 1958 film, *South Pacific*, Pulau (P.) Tioman has been on the international tourist map. Its natural setting as a secluded tropical island covered in pristine vegetation with the mountain as the backdrop provides the attraction. This lush tropical charm was proclaimed by TIME Magazine in the 1970's as one of the world's most beautiful islands. In recent years, however, there has been much infrastructure development, including an airport, marinas, jetties, resorts, etc. There are now concerns that the scale of such developments will erode the very attraction that P. Tioman is famous for.

Located some 32 km off the east coast of Peninsular Malaysia, this predominantly rocky and rugged, pear-shaped island has a variety of natural habitats. The coast is lined with coastal beach stand vegetation on sandy and rocky shores and mangrove swamp vegetation at the river mouths. Inland at lower elevations coastal hill forest develops on rocky substrate. At elevations up to the summit of Gunung (G.) Kajang (1038 m a.s.l), lower montane forest forms. The summit contains its own suite of plant communities.

From the coastal vegetation to a small patch of montane forest atop G. Kajang, the gradient of niches harbours a myriad of plant life forms, including several hyper-endemic species which are restricted to P. Tioman only. Notable examples include *Codonoboea tiomanica* (Gesneriaceae, Fig. 1), *Scaphochlamys sub-biloba* (Zingiberaceae, Fig. 2), the orchid *Coelogyne tiomanensis* (See Orchid Gems on Tioman) and the palm, *Licuala tiomanensis* (Fig. 3). The former two are erect herbs of the shaded forest floor; the orchid is an epiphyte of the lower montane forest, while the palm is a small understory treelet. In addition, *Diospyros insidiosa* (Ebenaceae) and *Endospermum ronaldii* (Euphorbiaceae) are rare, locally endemic trees of the lowland forest.

The total land area of P. Tioman is 13,360 ha, with 8,296 ha (61%) gazetted as Wildlife Reserve since 1984. The remainder is set aside for agriculture and tourism. It is unknown how much human activities have impacted the integrity of the existing forest habitats, especially in sensitive core areas. For example, it is of concern how the unique montane habitat limited to the summit plateau of G. Kajang and transversed by the Paya-Juara trans-island hiking trail has been degraded by trekking activities, or effects of the Tekek-Juara trans-island road and ecotourism activities impact on the population of the enigmatic *Rafflesia cantleyi* (Rafflesiaceae), if these activities continue unchecked. In addition, the fate of the mid-west mangrove belt with old growth *Bruguiera gymnorhiza* and *Rhizophora* spp. (Rhizophoraceae) that was reported to attain magnificent height and girth unusual for Peninsular Malaysia is, to date, unaccounted for.



Fig. 1. *Codonoboea tiomanica* (Gesneriaceae)



Fig. 2. *Scaphochlamys sub-biloba* (Zingiberaceae)

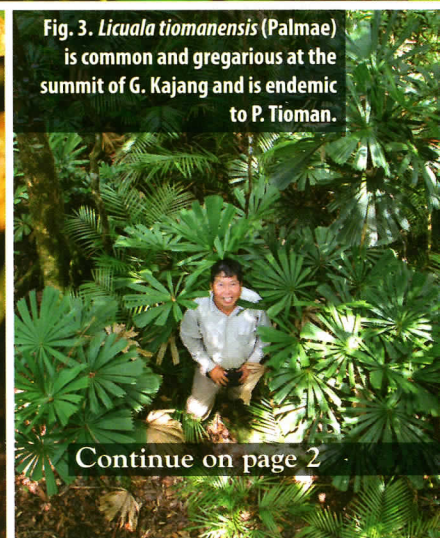


Fig. 3. *Licuala tiomanensis* (Palmae) is common and gregarious at the summit of G. Kajang and is endemic to P. Tioman.

Continue on page 2



Map 1. Expedition trails at P. Tioman

P. Tioman has at least 388 taxa of trees and 653 taxa of shrubs. The Flora of Peninsular Malaysia project carried out an expedition from 23 Apr to 3 May 2012, aiming to fill the knowledge gap on its flora. The Paya–Juara trail was followed; the Tekek–Juara trans-island road was surveyed for human impacts and how the *Rafflesia cantleyi* population is affected by road development and ecotourism activities (refer Hunting *Rafflesia* in Juara-Paya); Teluk (Tk.) Dalam and Kampung (Kg.) Asah and Kg. Mukut were also visited (Map 1).

Tk. Mentawak to Kg. Paya

This route is in the reverse direction of the popular Paya–Juara hiking trail which traverses the island close to the lower, broadest part. From the east coast, it follows the Sungai (Sg.) Mentawak ravine up to the G. Kajang plateau that acts as one of the main water divides on the island, then down to the west coast tracing ridges that run alongside Sg. Paya.

Tk. Mentawak is an undeveloped bay with typical beach vegetation and low branching trees including *Cynometra ramiflora* and *Intsia bijuga* (Leguminosae). The undulating slopes behind the protective beach front belt is a regenerated secondary forest comprising *Prunus arborea* (Rosaceae), *Saurauia pentapetala* (Actinidaceae), *Vitex pinnata* (Labiatae), *Ziziphus* sp. (Rhamnaceae), tall herbs like *Musa* sp. (Musaceae) and *Amomum testaceum* (Zingiberaceae), thickets of invasive species such as *Clidemia hirta* (Melastomataceae) and native *Elettariopsis burttiana* (Zingiberaceae), with a mix of feral crop species that include rubber *Hevea brasiliensis* (Euphorbiaceae).

About one km inland, the riverbed becomes fairly rocky, reminiscent of upper stretches of rivers in the mainland. The riverine plain, c. 140–200 m a.s.l., although still broad on both banks, is flanked by steep slopes, which form a passage that is about 4 km long and less than 1 km wide, linking Tk. Mentawak to the foothills of G. Kajang. This tunnel-shaped waterway is prone to flashfloods during the year-end monsoon period. The gallery forest is quite similar to the mainland *Saraca* stream forest found in lowland dipterocarp forest, except that the dipterocarp diversity and density is really low here. Only a small population of *Dipterocarpus gracilis* (Dipterocarpaceae) was encountered. Climbers such as *Desmos dasymaschalus* (Annonaceae) and *Merremia peltata* (Convolvulaceae) smother trees along riverine gaps while sun-loving species *Macaranga diepenhorstii* and *Mallotus* spp. (Euphorbiaceae, Figs. 4 & 5) are common. Mosses and lithophytes abound on dry but seasonally inundated stream beds and on rock faces of boulders lining the bank.

The Sg. Ikan Camp (316 m a.s.l.) sits close to the foot of an easterly spur of G. Kajang along Sg. Mentawak, which is now reduced to a small stream. Then onwards the riverine path is studded with boulders and fallen trunks. A steep climb of c. 1 km leads to a saddle that links G. Kajang to a lower stretch of hills that flank almost the entire southern coast. The forest here is lofty with fairly big trees, reminiscent of the coastal hill dipterocarp forest of the mainland, but with a conspicuous absence of *Shorea curtisii* (Dipterocarpaceae), a species that dominates this forest formation in other parts of the Peninsula. The towering emergent trees here are *Alstonia angustiloba* (Apocynaceae), *Camposperma auriculatum* (Anacardiaceae), *Sindora echinocalyx* (Leguminosae). There is also a *Macaranga gigantea*



Fig. 4. *Mallotus leucocalyx* (Euphorbiaceae) is relatively abundant on G. Kajang. Elsewhere it is known from scattered populations in the north.



Fig. 5. *Mallotus penangensis* (Euphorbiaceae) is an endemic species distributed throughout Peninsular Malaysia. This particular collection is the first record for an offshore island.

tree (Euphorbiaceae) that reaches an enormous 1 m diameter. Main canopy species include *Baccaurea lanceolata* (Phyllanthaceae, Fig. 6), *Diospyros cauliflora* (Ebenaceae, Fig. 7), *Ficus scortechinii* (Moraceae), *Garcinia malaccensis* and *Kaya lepidota* (Guttiferae), *Gardenia tubifera* (Rubiaceae), *Helicia excelsa* (Proteaceae), *Memecylon minutiflorum* (Memecylaceae), *Nephelium cuspidatum* (Sapindaceae), *Polyalthia sumatrana* (Annonaceae), *Pterospermum lancifolium* (Sterculiaceae), *Syzygium polyanthum* (Myrtaceae), *Vitex vestita* (Labiatae) and *Xanthophyllum affine* (Polygalaceae). Understorey shrubs and herbs are sparse, mainly of shade tolerant species, such as *Arthropodium diversifolium* (Araliaceae), *Clerodendrum villosum* (Labiatae), *Cyrtandra pendula* (Gesneriaceae), *Dracaena maingayi* (Dracaenaceae), *Ixora grandifolia* (Rubiaceae) and *Suregada multiflora* (Euphorbiaceae). The rare endemic palm *Pinanga singaporensis* was found in the moist valley. Both *Nenga macrocarpa* and *N. pumila* var. *polystachya* were also recorded at this elevation.

At slightly over 600 m a.s.l., *Cyathea* sp. (Cyatheaceae) becomes dominant as tree girths reduce and the canopy thins out. Between 746–900 m a.s.l., the ridges are curiously dominated by *Durio singaporensis* (Bombacaceae). This species is not known to exhibit such gregarious behaviour in the mainland. *Lithocarpus wallichianus* (Fagaceae) is a rare tree at this elevation; Fagaceae was not recorded previously in the flora of P. Tioman.

The Tengkok Air Camp (c. 886 m a.s.l.) sits on an exceedingly rocky slope. One of the headwaters of Sg. Mentawak provides the only water source before the summit area; obtaining water required scrambling into a subterranean cave that has a trickling spring, and bathing is an acrobatic affair. Immense boulders are embedded throughout the slope towards the summit. Layers of humus have accumulated on these boulders and support a myriad of lithophytic and epiphytic ferns, orchids, climbing aroids (*Raphidophora* sp. and *Scindapsus* sp.) and other herbaceous plants which attain considerable stature from the rich organic matter. Even shrubby species and small trees make an occasionally rooting.

Trees here have reduced stature, girth and density; nevertheless below 960 m the canopy is relatively closed. The forest floor substrate is fairly peaty and mossy, and supports shrubby species, e.g., *Psychotria ophirensis* (Fig. 8) and *Urophyllum* sp. 9 (Fig. 9) and delicate herbs, e.g., *Codonoboea densifolia* (Gesneriaceae, Fig. 10), *Sonerila erecta* (Melastomataceae, Fig. 11) etc. As the lower montane forest is reached *Licuala tiomanensis* (Palmae) occurs gregariously together with *Daemonorops hystrix*; among typical lower montane species are *Actinodaphne macrophylla* and *Neolitsea zeylanica* (Lauraceae), *Diospyros apiculata* (Ebenaceae), *Euonymous javanicus* (Celastraceae, Fig. 12), *Dacrydium* sp. and *Podocarpus neriifolius* (Podocarpaceae), *Ficus chartacea* (Moraceae), *Medinilla* sp. (Melastomataceae), *Memecylon excelsum* (Memecylaceae), *Syzygium zeylanicum* (Myrtaceae), *Vaccinium viscifolium* (Ericaceae). The G. Kajang summit is a narrow ridge top hardly 100 m long, covered with *Baeckea frutescens*, *Leptospermum flavescens*, *Syzygium lineatum* and *S. rostratum* (Myrtaceae), *Elaeocarpus floribundus*, *E. mastersii* and *E. obtusus* (Elaeocarpaceae), *Garcinia eugeniifolia* (Guttiferae), *Ilex patens* (Aquifoliaceae), *Kibara coriacea* (Monimiaceae), *Myrica esculenta* (Myricaceae), *Oxyspora bullata* (Melastomataceae), *Prunus javanica* (Rosaceae), *Rhododendron jasminiflorum* (Ericaceae) and *Schefflera cephalotes* (Araliaceae). *Plectocomia elongata* (Palmae) towers over the forest canopy (Fig. 13); it has a single flowering and fruiting event and dies after fruiting.

On descent by the western spur, the reverse floristic pattern is observed until Sg. Air Orang Putih Camp (c. 625 m a.s.l.) situated along the headwaters of a Sg. Paya tributary. A slight difference is a small patch of *Nepenthes ampullaria*



Fig. 6. *Baccaurea lanceolata* (Phyllanthaceae)



Fig. 7. *Diospyros cauliflora* (Ebenaceae)

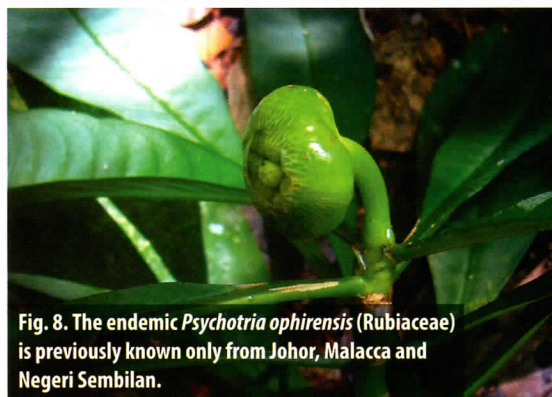


Fig. 8. The endemic *Psychotria ophirensis* (Rubiaceae) is previously known only from Johor, Malacca and Negeri Sembilan.



Fig. 9. According to current records, *Urophyllum* sp. 9 (Rubiaceae) is restricted to the lowland to lower montane forest of Selangor and Pahang including P. Tioman.



Fig. 10. *Codonoboea densifolia* (Gesneriaceae)

and *N. gracilis* (Nepenthaceae) on the lower sister peak of G. Kajang (c. 1019 m a.s.l.) and a sizeable stretch of bamboo thicket at c. 960 m. The stream at this camp has a substantial volume of water cascading down a steep valley, reaching the coast within 2 km, whilst the longer Sg. Mentawak valley is comparatively gentler. *Nauclea officinalis* and *Neolamarckia cadamba* (Rubiaceae) thrive in pockets of soil between boulders, while *Dendrocnide stimulans* is a relatively common sub-canopy tree. The endemic *Antidesma pahangense* (Fig. 14) is an inconspicuous shrub here.

Below Sg. Air Orang Putih Camp, the coastal hill forest is noticeably drier on the western slope. In addition, the trees are of greater grandeur with towering *Intsia palembanica* (Leguminosae), *Sindora echinocalyx* (Leguminosae) and a gigantic *Ficus* sp. A majestic *Koompassia excelsa* (Leguminosae) is visible from the sea as one approaches Paya. A large population of *Arenga westerhoutii* (Palmae) dominates the middle strata, a feature that is also observed in the mainland coastal hill and hill dipterocarp forests with well-drained soils.

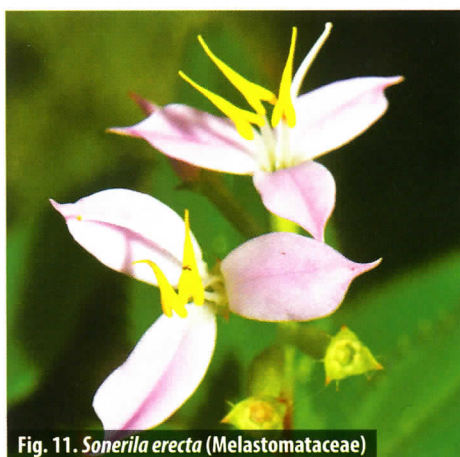


Fig. 11. *Sonerila erecta* (Melastomataceae)

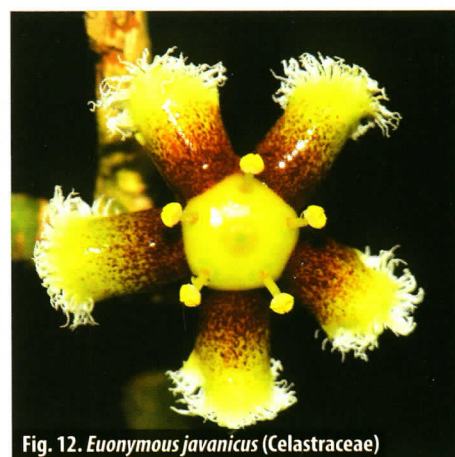


Fig. 12. *Euonymus javanicus* (Celastraceae)

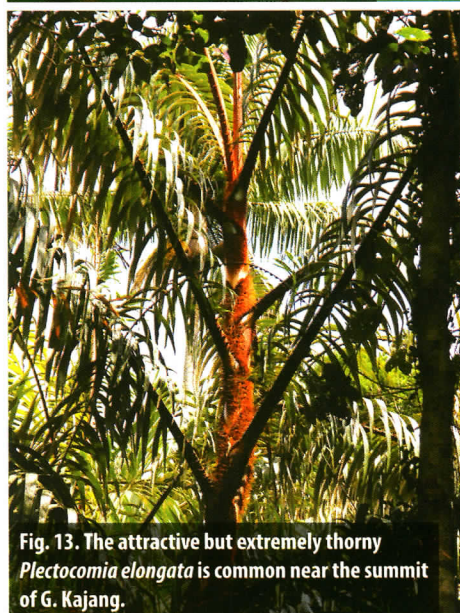


Fig. 13. The attractive but extremely thorny *Plectocomia elongata* is common near the summit of G. Kajang.



Fig. 14. *Antidesma pahangense* (Phyllanthaceae) is an endemic shrub of the hill and montane forests in Pahang, Johor and Perak.

Closer to Kg. Paya, the terrain is almost entirely flat with thick sandy soil along the banks of Sg. Paya that broadens, deepens and meanders for almost half a kilometer. Upon reaching the sea-front resort area, there is an immediate change from a cool, fully canopied forest to an open landscape dotted with exotic species, with a sparse variety of local species.

Overall, the entire trail away from the coastal area is relatively pristine. Visually, the campsites are not affected by soil compaction, neither has the small montane forest area suffered noticeable soil erosion from heavy trampling. The coastal vegetation is, however, irreversibly affected, whereby the old growth mangrove forest has been entirely cleared to develop a resort, golf course and marina. It is hoped that the Tioman Development Authority will undertake more stringent environmental planning when future amenity development is planned for the island.

Short excursions to other parts of the island

The Tekek–Juara trail is a traditional path used by villagers traversing the island. On the west coast it traces roughly Sg. Ayer Besar, reaching a low, c. 300 m a.s.l. saddle between Bukit (Bt.) Parang Panjang and Bt. Rokam to the south within 2 km from the sea, before crossing into the valley of Sg. Boharu towards Kg. Juara. The Tekek–Juara road runs roughly parallel to the old trail but was built higher up, following ridges and slopes. The valley lower down with its *Rafflesia* and populations of other herbaceous species is relatively unaffected. The ridge top and lower slopes are interspersed with pioneer and secondary species, elements of coastal hill forest, actively farmed or abandoned orchards and rubber plantations. A *Vanilla griffithii* (Orchidaceae) in full bloom and the white torch ginger *Etlingera elatior* var. *alba* (Zingiberaceae) were collected from secondary forest among local orchards.

Tk. Dalam is a largely inaccessible bay at low tides due to the extensive coral flats and shallow waters. The landscape is interspersed with narrow strips of sandy beaches. The rocky cliffs have a profusion of scrambling bushes, with coastal hill forest occurring almost immediately behind. The sheltered bay also supports a small population of *Rhizophora stylosa*, and beach vegetation thrives above the high tide line. One naturalised population of a non-native species *Aleurites moluccana* (Euphorbiaceae) occurs here. Invasive species are more conspicuous in other populated beaches.

The **Kg. Asah** waterfall trail up Sg. Asah is relatively pristine with lowland to coastal forest. However, the beach front area is degraded with sedges, grasses and other invasive, escaped garden plants. Small patches of mangroves are re-colonising the coral flat.

When viewed from the sea, almost the entire sea front slopes behind **Kg. Mukut** shows altered vegetation with many coconut trees. Above the steep foothills with vegetation that appears pristine, are the twin leucogranite outcrops of Nenek Si Mukut and Batu Sirau. Pantai Pasir Gerenggan fairs better with scrubby beach vegetation on raised, broken coral flats with coastal hill forest right behind.

Reconnaissance around the island and some final observations

The brief round-island reconnaissance produced only photographic evidence but yielded a few important insights. Most noticeably, almost the entire western and south-western coastlines which possess a beach front have been developed to provide lodgings of various grades. Some buildings are constructed behind the beach front tree line or on graded slopes; other less aesthetically pleasant ones, stood starkly on rocky or earth slopes or sandy beach devoid of trees and other native vegetation. The mid-western mangrove belt has been replaced by a multitude of resorts, jetties, golf course and other structures. The northern and eastern coastlines, other than Tk. Juara, are fairly to extremely rugged with sheer cliffs and promontories abound. The few existing bays and beach fronts are fringed by coral reefs, e.g., Tk. Dalam. These relatively inaccessible beach fronts are the outlets of rivulets and many harbour small patches of mangroves.

Six endemic palm species were recorded—*Calamus tanakadatei*, *Daemonorops macrophylla* and *D. sepal*; a small population of *Pinanga singaporensis* near Sg. Ikan camp and *P. paradoxa* and *Licuala tiomanensis* at the summit of G. Kajang. The first five are recorded for the first time from P. Tioman, as are 16 others, i.e. one lowland palm, *Arenga westerhoutii*, many rattans from the lowland and lower slopes, including *Calamus castaneus*, *C. ornatus*, *C. javensis*, *C. aff. longispathus*, *C. cf. scipionum*, *Daemonorops kunstleri*, *Korthalsia laciniosa*, *K. rostrata*, *Myrialepis paradoxa* and *Plectocomiopsis geminiflora*, one palm and two rattans from mid elevation, namely *Nenga pumila* var. *polystachya*, *Daemonorops didymophylla*, *D. geniculata*, *D. hystrix* and *Plectocomia elongata* that are common in the summit area.

For trees and shrubs, specimens from 86 taxa that were flowering or fruiting were obtained, in addition to 389 sterile vouchers. Of these, 12 families, i.e., Actinidiaceae, Dracaenaceae, Fagaceae, Maesaceae, Magnoliaceae, Memecylaceae, Monimiaceae, Myricaceae, Nyssaceae, Pentaphylacaceae, Phyllanthaceae & Stemonuraceae and more than 60% of the adequately identified species turned out to be the first records for the island. A handful of voucher specimens remain difficult to identify as they differ from the typical character-range recorded for mainland Peninsular Malaysian species or bear overlapping yet highly variable vegetative characters. A number of species distributed in Thailand, Myanmar, Sumatra, Borneo and Java are also found in P. Tioman, but inexplicably skip the mainland peninsula. All of the locally endemic herbs and palms had been re-collected, while two rare trees, namely *Diospyros insidiosa* from Kg. Juara and *Endospermum ronaldii* from “Sedagong”, an untraceable locality, were not found. The high number of new records for trees, shrubs and palms indicates that further surveys are needed to fully document the tree flora diversity and uniqueness of this island. On the other hand, the orchid flora is relatively poor with slightly more than a dozen species recorded (refer Orchid Gems on Tioman). Nonetheless, several species, e.g. *Bulbophyllum spissum*, *B. virescens*, *Schoenorchis secundiflora* and *Vanilla griffithii*, are recorded for the first time on P. Tioman.

The Rompin Local Plan Draft has designated the entire western and southern coast as well as Kg. Juara and its surroundings for development. The *Rafflesia* population along the Tekek–Juara trans-island trail falls in the development zone, but is blissfully spared at the moment. There were more than 200,000 tourists to P. Tioman in 2005. A 2009 survey showed that 24% of the tourists visited the island for its natural environment, while 15% visited mainly for jungle trekking. In view of such preferences, it is hoped that the pristine coasts and insular forest reserves are strictly protected so that these natural attractions remain intact. However, most residents are pro-development and are largely unaware of the potential adverse effects of rampant and unregulated development on the environment. Community-based awareness programmes are vital to ensure that the natural and pristine landscapes are conserved for the sustainability of socio-economic benefits.

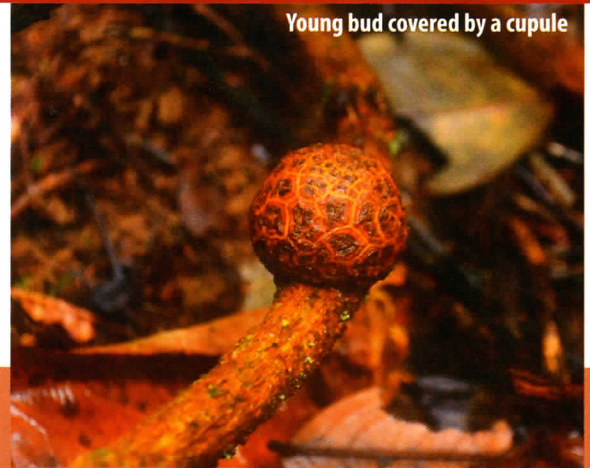
Acknowledgements

Many thanks to Dr. Ruth Kiew for her comments, to Kamarudin Saleh and the late Chan Yee Chong for plant identification, Tioman Development Authority (TDA) & Karat Adventure for the logistic support, and Siti-Munirah, M.Y. for contribution of photographs.

Hunting *Rafflesia* in Juara-Paya

By Siti-Munirah, M.Y. (sitimunirah@frim.gov.my)

P. Tioman is the only island in Malaysia where *Rafflesia* is found and it is the southernmost location for the genus in the Peninsula. Early records of the species on the island include Henderson (1930) at Sedagong (300 m above sea level (a.s.l.) (David *et al.*, 1977), a specimen collected by Kadim & Nur from Sg. Ayer Besar and a recent record by Mahdini (2006). In this survey, eight populations showing different life stages were found along Juara-Paya, at G. Nenek Si Mukut and along the Kg Tekek-Kg Juara trail.



Young bud covered by a cupule

The lucky day—3rd May 2012

We finally spied a fresh bloom and it was immediately apparent the species was *Rafflesia cantleyi*, which is endemic to Peninsular Malaysia. There were plenty of old floral and fruit scars on its host, *Tetrastigma* sp. (Vitaceae) in addition to a newly emerging bud.



Buds nesting in its *Tetrastigma* host

Conservation effort and awareness

Like elsewhere, local guides frequently conduct *Rafflesia* tours. They are eager to assist conservation efforts and regularly send information and photos (the following pictures) of its various life stages. This age-old networking method fuels their passion and willingness to contribute towards conservation.

To ensure tourism remains sustainable, the local council should support efforts to maintain the forest ecosystem on the island. This includes identifying buffer and conservation zones and providing financial support to upgrade trails and facilities.

The following pictures (A–D) are courtesy of Mr. Razelan, M.S. (Various life stages of the flower. Note that the vine, not the tree, is the host plant *Tetrastigma*).

Flower



26 July 2012

3 August 2012

A

C

B

D

1 August 2012

8 August 2012



With Salmah & Razelan



With Imin & Mohd-Hairul

Do not miss snapping your photos with *Rafflesia*

Unless you're a regular *Rafflesia* hunter like me, encountering a *Rafflesia* is probably an opportunity of your lifetime.

Acknowledgements

I would like to thank local guides Paksu Sahak, Pak Lan, Kak Salmah and Lembaga Pulau Tioman, PERHILITAN for their assistance.

References

- Henderson. M. R., 1930. Notes on the Flora of Pulau Tioman and neighbouring islands Garden's Bull., 5:80-93.
- David, W.L. et al., 1977. The Natural History of Pulau Tioman. Merlin Samudra Tioman Sdn. Bhd., Malaysia. 69 pp.
- Mahdini, J. 2006. Taburan dan pemuliharaan *Rafflesia* di Pulau Tioman, Pahang. Tesis Sarjana Muda Sains (Kepujian). Pusat Sains Sekitaran dan Sumber Alam, Universiti Kebangsaan Malaysia.

FRIM launches the country's first iBook on Biodiversity



By Aslina, B. (aslina@frim.gov.my)

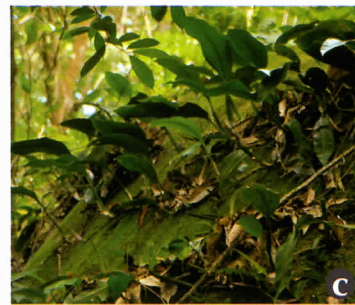
The Forest Research Institute Malaysia (FRIM) recently launched a mobile application called MyCHM i-Newsletter. This application is the first iBook on biodiversity in Malaysia, available for free download from the Apple iBookstore, Android application or through MyCHM website at www.chm.frim.gov.my. MyCHM i-Newsletter is a multi-touch book that includes interactive animations, built-in videos, thumbnail index, etc., which makes reading more fun and intuitive, and can be read anytime, anywhere. This application provides scientific information in an easy-to-use interface and is expected to enhance public awareness and appreciation of the country's rich biodiversity. Funded by the Ministry of Natural Resources and Environment, it was launched by the Minister Dato' Sri Douglas Uggah Embas on 18 December 2012 in conjunction with the opening of MyBioD Seminar 2012 in Kuala Lumpur.



The Minister launching the MyCHM i-Newsletter at the opening of MyBioD Seminar.

Orchid Gems on Tioman

By Ong, P.T. (ongpohteck@frim.gov.my)



P. Tioman is not particularly rich in orchids. The following is a sample of some of the more interesting species that we were fortunate to find in flower:

a) *Appendicula pendula* is fairly common in P. Tioman. It has a pendulous inflorescence (hence the specific name 'pendula') producing many yellowish-purple flowers in succession over a long period of time.

b) *Bulbophyllum spissum*. In Peninsular Malaysia, it occurs only on Tioman. Elsewhere it is found in Sumatra, Borneo and Sulawesi. *B. spissum* is a small epiphyte, usually growing on twigs and producing a single yellow flower.

c) *Bulbophyllum virescens* usually grows on mossy boulders. Its very showy flowers are foul-smelling to attract its pollinator.

d) *Calanthe triplicata*. Although this species is found in many parts of the peninsula, it is not so common on P. Tioman. *C. triplicata* produces many elegant white flowers and is a hit with orchid growers.

e) *Coelogyne tiomanensis* is endemic to P. Tioman. It is now difficult to find the individuals due to over-collection as the species is popular among growers and is fairly easy to grow in cultivation.

f) *Podochilus microphyllus* is a tiny plant that produces microscopic-sized flowers measuring only about 2 mm wide by 3 mm high. They are fairly abundant in P. Tioman, growing mostly as lithophytes on mossy boulders.

g) *Dendrobium linguella* produces 4–8 scented mauve flowers at a time. It usually flowers when the plant is leafless.

h) *Schoenorchis secundiflora* is an epiphytic orchid, usually found growing on tree branches or twigs. Its pendulous inflorescence is decorated with many purplish-white to yellow flowers.

Paphiopedilum on P. Tioman will soon be a species of the past. The famed slipper orchids have dwindled rapidly in numbers and, on this expedition, after a relentless effort, only a handful were found. Leaf samples were collected for DNA analysis.

