ISBN 1823-7975
Conservation Malaysia
A Bulletin Supporting Plant and Animal Conservation in Malaysia Issue No 20 (2015)

Agarwood flowering: Masting or Coincidence?

By: Lau, K.H. (laukh@frim.gov.my)


Eight flowers in an inflorescence in bloom.

It was in mid-February 2014 when close to a dozen *Aquilaria malaccensis* trees, more popularly known as agarwood, started to shed their dark green leaves at the Penang Botanic Gardens. By the end of February, some of these trees had simultaneously developed heavy flushing of leaves and were bearing the definite shape of floral buds, signalling the advent of flowering. A very quick survey of populations in two other sites in Penang revealed the same phenomenon. Almost at the same time, in central Peninsular Malaysia, populations in Perak and Kuala Lumpur (Kamarudin, pers. comm.) also began to flower heavily. Exact location of these populations has been withheld for the fear of poaching.

The flowering episode at the Penang sites was indeed remarkable. About 46% of the total number of observed trees flowered. Such a high number of flowering trees had never been recorded since the beginning of this pilot study in 2011. For a quick comparison, the percentage of trees that flowered between 2011 and 2013 was approximately 6%, 0.7% and 7%, annually. The flowering trees varied in diameter size, with the majority being individuals with diameter of between 20–29 cm. In the Perak population, 47% of the total number of observed trees flowered. This has again surpassed the number of flowering individuals from previous years which only saw 2%, 2% and 12% of trees in flower in 2011, 2012 and 2013, respectively. As expected, trees with diameter between 20–29 cm dominated.

So was agarwood in the Peninsula undergoing a mast flowering this year, or was this merely a coincidence? According to Kelly (1994), masting is the intermittent production of large seed crops by a plant species and is synchronized within a population. In other words, it is the simultaneous flowering of many individuals of a plant species in a particular period of time. There are several factors that could trigger mast flowering one of which, i.e. weather, has been strongly implicated. Annually, January to February is the period during which minimum temperatures are relatively low compared to other months. In addition, the cooler than normal conditions experienced in many parts of the country at the beginning of this year was also partly caused by the strong north-easterly wind arriving from mainland China, thus resulting in less cloud coverage (MMD 2014). It was also during this period at the beginning of February that a dry spell occurred, which lasted for about three months. This drought was believed to have triggered the shedding of leaves and heavy leaf and floral flushes. These were among the obvious weather cues prior to the flowering of agarwood this year. Sakai *et al*. (2006) had postulated

The prolonged drought had caused the lawn in the Penang Botanic Gardens to dry up.

that drought trigger species masting in the aseasonal tropical forests and this hypothesis was supported by Ashton *et al*. (1988) who claimed that a sudden drop in temperature may trigger general flowering. While the current observation focused only on *A. malaccensis*, trees of *Saraca thaipingensis, Mesua sp., Diospyros sp., Syzygium sp., Shorea sp.* and *Dipterocarpus sp.* were also flowering. There were also similar reports that general flowering had occurred in many tree families in several forest reserves in Terengganu, Selangor, Negeri Sembilan and Johor. Appanah (1993) postulated that general flowering can occur at varying intervals of 2 to 10 years in the aseasonal tropical rainforests. In the case of agarwood, this preliminary study appears to indicate that its flowering behaviour is of the masting type thus corroborating the masting phenomenon observed in other tree families throughout the peninsula. This pattern, however, needs to be confirmed and phenological work has to be carried out over a longer term at more locations to ascertain whether agarwood flowering events are triggered by drought.

▲ A tree bearing a large number of semi-mature fruits.

References:

Appanah, S. 1993. Mass flowering of dipterocarp forests in the aseasonal tropics. *Journal of Bioscience* 18(4): 457–474.

Ashton, P.S., Givnish, T.J. & Appanah, S. 1988. Staggered flowering in the Dipterocarpaceae: new insights into floral induction and the evolution of mast fruiting in the aseasonal tropics. *American Naturalist* 132: 44–66.

Kelly, D. 1994. The evolutionary ecology of mast seeding. *Trends in Ecology and Evolution* 9: 465–470.

Malaysian Meteorological Department. Cold weather condition in Malaysia. 23 January 2014.

Sakai, S. *et al*. 2006. Irregular droughts trigger mass flowering in aseasonal tropical forests in Asia. *American Journal of Botany* 93(8): 1134–1139.

A Simple Ready-to-Fly Aerial Filming and Photography System as a Plant Survey Tool

Ong Poh Teck (ongpohteck@frim.gov.my)

A drone, also known as an unmanned aerial vehicle (UAV), is perhaps more popularly known for its deployment in military and special operations' applications. In civilian applications, drones are luxury gadgets for hobbyists as well as professional photographers and filmmakers. In recent years, however, drones have become more affordable and increasingly popular for other purposes. Prices range from several thousands to more than tens of thousands of Ringgit Malaysia per unit, depending on the model and the accessories that come with it.

One of the drones that does not require much skill to fly is the quadcopter (a copter with a four rotor system). It comes with an integrated flight mode such as Global Positioning System (GPS) and altimeter which makes it easy to operate even in narrow spaces.

The drone is usually ready-to-fly upon purchase and can easily be assembled. A camera can be installed to take aerial photographs or videos. Usually an action camera is used due to its light weight and small size. To reduce vibration and shake, a gimbal holding the camera and mounted on the drone is highly recommended. A first-person view (FPV) would also be useful for maneuvering the drone as well as allowing the operator to see what is being photographed or filmed.

Drones can be very useful in botanical studies and plant conservation work. They can be used to conduct aerial surveys of the forest to detect man-made disturbances such as logging, quarrying or agriculture. The photographic images are produced in real-time thus allowing decisions to be made in the field by forest managers, law enforcement officials and researchers alike.

An example of a ready-to-fly quadcopter equipped with a gimbal and camera.

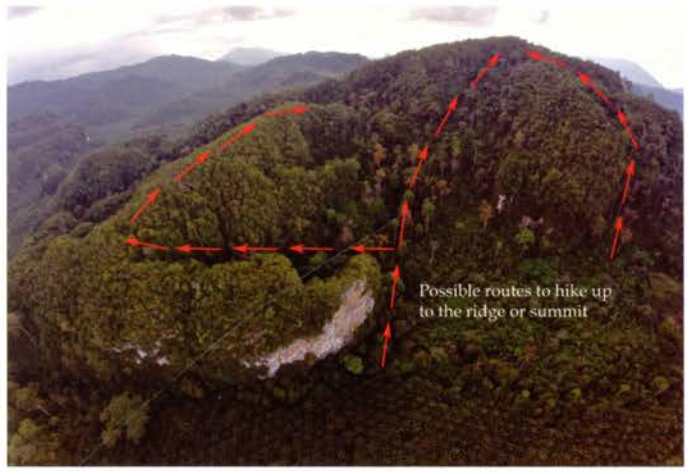
A quadcopter is easy to operate and can be flown even in narrow spaces

▲ Forest disturbance can hardly be seen when photographed from the ground

▲ Aerial view of the crown of *kapur* (*Dryobalanops aromatica*).

A survey of the tree tops enables botanists to observe flowering patterns of canopy species (i.e. whether flowering is observed only in certain species or in certain individuals in a population). A closer view enables the botanist to determine whether the tree is in flower or in fruit. Using a drone also enables botanists to capture photographs of plants growing on very high, steep and dangerous sites.

From a logistical perspective, a drone can be used to identify suitable climbing routes, for example, up a limestone hill where the vertical rock faces prevent most climbers from reaching the top. With the aid of an aerial view, climbers and botanists can determine the most accessible route to the top of the ridge or summit.



▲ An aerial view enables the determination of the safest access route to the summit.

In conclusion, a drone that used to be primarily a hobbyist's gadget can also be a useful plant survey tool when one knows how and what to film or photograph. From the author's experience, a drone is easy to use and useful for the purposes mentioned above. To the best of the author's knowledge, flying a drone in the forest does not require a permit or license. It is hoped that this article will encourage more botanists, forest managers, law enforcers and environmentalists to consider using a drone as a survey tool in the near future.

◀ Homing in for a closer look at a fruiting *kapur* tree.

Diversity of Herpetofauna in the Belum–Temengor Forest Reserves Complex

By: Kaviarasu, M. (kaviarasu@frim.gov.my), Mohd Shahfiz, A., Mohd Rizal, R., Timoh, J.R., Nordiana, F. & Fakrul, I.

Information on species diversity is vital for any conservation programme in view of Malaysia's current fast pace of development. The Belum–Temengor Forest Reserves (BTFR) complex has not been spared from anthropogenic activities such as logging and development of highways and hydroelectric dams.

Prior to 1994, BTFR was a hotspot puzzle as there was no information on its flora and fauna. At that time, the complex was a restricted military area. Following its de-classification in 1995, many initiatives and programmes were undertaken to explore this little-known forest complex. One of earliest expeditions was conducted by the Malaysian Nature Society in 1995; this gave the first insight to BTFR's enormous wealth of diversity. Many scientific expeditions and programmes have since been carried out.

In terms of amphibians and reptiles, BTFR is home to at least 24 species of amphibians (Kiew *et al.*, 1995), 23 species of snakes (Lim *et al.* 1995a), 21 species of lizards (Diong *et al.*, 1995) and six species of turtles (Lim *et al.* 1995b). In 2000, the list for amphibians was extended to 38 species when the northern part of the Belum Forest, now known as the Royal Belum State Park, was surveyed. Additional surveys at the northern part of Temengor Forest Reserve added 21 more species to the list (Grismer *et al.*, 2004). In 2009, a new species of skink (*Sphenomorphus temengorensis*) was discovered in northern BTFR, becoming the first endemic species to be listed for the complex. More recently, through one of the numerous surveys conducted for the Central Forest Spine project (see Series 19), an additional two amphibian species, *Duttaphrynus melanotictus* and *Hylarana luctuosa*, and two snake species, *Asthenodipsas malaccanus* and *Asthenodipsas leavis* were recorded.

Duttaphrynus melanotictus is one of the common toads found in open areas along river banks.

Asthenodipsas malaccanus is newly recorded for BTFR.

Asthenodipsas leavis feeds mainly on slugs and snails.

Limnonectes laticeps can be easily spotted at the edges of water puddles and in swamp forests.

Megophrys nasuta is well known for its horn-like eyelid which camouflages it from its predators.

To date, the herpetofauna diversity in BTFR stands at 40 species of amphibians and 69 species of reptiles, representing 16% and 14% of the total amphibian and reptiles respectively in Peninsular Malaysia. Some common herpetofauna species that were found in BTFR included *Limnonectes laticeps*, *Megophrys nasuta*, *Hylarana labialis*, *Gonocephalus abbotti*, *Boiga dendrophila* and *Hylarana signata*.

Gonocephalus abbotti is one of several large agamid lizards that can be found in the lowland forests of BTFR.

Hylarana labialis is called White-lipped frog for its white-colored lip.

Boiga dendrophila (Mangrove snake) can be found in mangrove habitats up to hill forests.

Hylarana signata often rests on rocks and tree branches along fast flowing rivers.

Among the herpetofauna species that require immediate conservation attention are turtles and tortoises. *Heosemys spinosa* (Spiny hill turtle), *Manouria emys* (Asian giant tortoise) and *Notochelys platynota* (Malayan flat-shelled turtle) are classified as endangered under the IUCN Red List while *Cuora amboinensis* (Malayan box turtle) and *Amyda cartilaginea* (Asian softshell turtle) are vulnerable. Most of these species are being exploited for their meat and pet trade. The lack of information on their distribution and behaviour is the primary reason for the lack of conservation programmes. Although current information on BTFR's biological diversity is far from adequate to serve as a basis for biodiversity-related conservation programmes, the new discoveries here show that more new species probably remain to be discovered and that a more concerted effort is required.

References

Diong, C.H., Kiew, B.H. & Lim, B.L. 1995. An annotated checklist of the lizard fauna in the Temengor Forest Reserve, Hulu Perak, Malaysia. *Malayan Nature Journal* 48: 353–356.

Grismer, L.L., Sukumaran, J., Grismer, J.L., Youmans, Y.M., Wood, P.L. & Johnson, R. 2004. Report on the Herpetofauna from the Temengor Forest Reserve, Perak, West Malaysia. *Hamadryad* 29(1): 15–32.

Kiew, B.H., Diong, C.H. & Lim, B.L. 1995. An annotated checklist of the amphibian fauna in the Temengor Forest Reserve, Hulu Perak, Malaysia. *Malayan Nature Journal* 48: 347–351.

Lim, B.L., Ratnam, L. & Nor Azman, H. 1995a. Snakes examined from the Sungai Singgor area of Temengor Forest Reserve, Hulu Perak, Malaysia. *Malayan Nature Journal* 48: 357–364.

Lim, B.L., Ratnam, L. & Nor Azman, H. 1995b. Turtles from the Sungai Singgor area of Temengor Forest Reserve, Hulu Perak, Malaysia. *Malayan Nature Journal* 48: 365–369.

Jelatang – The Secret Weapon of Pulau Tioman

Chew, M.Y. (chew@frim.gov.my)

The Kampung Tekek–Kampung Juara trans-island road on Pulau Tioman winds across patches of old-growth orchards, *belukar*, bamboo thickets, as well as some relatively pristine primary forest. I was scrambling through the roadside underbrush looking for a flowering *Amischotolype* (Commelinaceae) when suddenly, my right-hand fingers felt as though they had been stung by fire ants. I sprang back in retreat and realised at once that the cause of my pain was not zoonotic but botanical, for in the middle of the scrub where I was rummaging stood a foot-tall sapling of *jelatang putih*[1] (*Dendrocnide sinuata*).

Jelatang belongs to the Urticaceae or nettle family. The family consists of herbs, shrubs, rarely soft-wooded trees and woody scramblers. It is not a dominant family of the typical, tall primary or old secondary forests of Peninsular Malaysia but is mainly found in limestone and montane riverine areas. There are 37 *Dendrocnide* species distributed across India, China, Southeast Asia to Australia and the Pacific Islands. Botanical references for the genus often warn that it is armed with stinging hairs. On the island of Tioman, two species are common, i.e., *D. sinuata* and *D. stimulans.*

Within a minute or so, the smarting pain intensified to a level that touching anything became an act of pure agony. I recollected that our usual guide, Pak Su Ishak, had once mentioned that a folk remedy was used by Tioman descendents. We were provided with 4WD assistance by the Tioman Development Authority (TDA) that particular day, so Pak Su's service was not engaged. When I reached the vehicle that was parked some distance away, I discovered to my great relief that, as long as I rested my hand palm (i.e. distressed) side up, on an adequately padded surface and refrained from any movement, it would hurt much less. The swelling was minimal and localised, and there was almost no visible evidence to attest to my grumbling. As insurance, I popped an anti-histamine pill*.

A stinging hair is a slender silicon and calcium trichome less than 0.5 mm long with a hollow shaft resting on a pedestal-like base, as in *D. meyeniana* (Fu *et al.* 2003). It has a rounded tip of less than 0.02 mm with an abruptly narrowed neck that breaks off upon contact, creating a beveled tip similar to a miniature hypodermic needle. This penetrates the skin and injects its load of noxious cocktail of acetylcholine, histamine, serotonin, moroidin and other possible toxins that have yet to be reported. The first three chemicals are mammalian neuro-transmitters and dubbed super-irritants. Moroidin was reportedly responsible for the "staying power" of the sting that can last for several months (Valkenburg, 2001). Since the human body cannot break down silicon, the hair can be embedded in the skin for up to a year (Hurley, 2000).

Upon hearing my complaint over the phone, Pak Su recommended the folk remedy which entails abrasive rubbing with river sand. It did little to free me from my pain, but strangely it also didn't cause more pain to my already highly sensitised skin. My team mate who had been stung before said that Sabahans would rub the troubled area against the cut bark of the same plant species. Another Tioman local proposed the use of juices from the plant's roots. Hurley (2000) cited the same mythical cure in her article on Australian *Dendrocnide* stinging trees but cautioned that it is a sure way of getting more stings on one's head in the process.

Hurley (2000) showed that the young leaves of *D. moroides* and *D. cordifolia* in Australia are highly nutritious. As defense against mammalian herbivores, immature leaves of

The harmless-looking *jelatang putih* (*Dendrocnide sinuata*) bush at the edge of a secondary forest. Being a weed that colonises forest gaps, it is frequent along forest roads and tracks with sandy soils, from sea level up to 1,400 m altitude and is fairly common on limestones. It can grow up to 10 m tall; in Tioman, only treelets were encountered.

An unassuming sapling of *jelatang putih*, despite being armed to the teeth and ever ready to sting, is not safe from predation by invertebrate herbivores. The leaves are large, 20–65 cm long, 7–35 cm wide, with toothed or wavy margins and long petioles.

Close-up of *jelatang putih* twig and leaf petiole showing the downward pointing stinging hairs. The veins, leaf margin and parts of the lower leaf surface are similarly armed. The upper leaf surface is hairless while mature leaves have generally lost much of their hairs.

A *jelatang merah* (*Dendrocnide stimulans*) at the edge of an overgrown forest trail. This species prefers shadier sites in the primary or secondary forest with sandy to loamy soils, occurring from sea level to 1,200 m. This small tree can reach 7 m tall.

Leaves of *jelatang merah* are much smaller compared to *jelatang putih*, up to 30 cm long and 10 cm wide. The leaf margin is entire and petiole is shorter. Like its cousin, its leaves are eaten by herbivores (note the partially eaten leaf).

Stinging hairs on the dark reddish leaf petioles of a young *jelatang merah*.

A flowering specimen of *jelatang merah* with female inflorescence inserted at the axil of a rosette of mature leaves with maroon-purplish veins. The flowers are much reduced without any showy parts. Trees are either male or female, unlike *jelatang putih* that bears both male and female inflorescences on the same plant.

the Taiwanese *D. meyeniana* are densely covered with stinging hairs, over 1,000 per leaf (Fu *et al.*, 2003). These hairs shed continuously and decrease with age (Hurley, 2000).

Two days before my mishap, our team collected a flowering specimen of another species, *jelatang merah*[2] (*D. stimulans*) from a rocky, relatively shaded slope. According to the locals, this species inflicts a less intense itch than its white cousin. The collector had instantly complained of a severe itching, although I was not bothered by it when handling the specimen. My unfortunate colleague probably had gotten most of the stinging hairs before the specimen was passed on to me. In my case with *jelatang putih*, I encountered fully armoured young leaves.

By the time we got back to our accommodation in the late afternoon, the incessant pain had subsided to an intermittent twinge but I felt a slight throbbing at the axillary lymph

nodes and heart. Hurley (2000) noted that there is no tissue damage despite the pain, however, exposure to hot or cold temperatures would trigger the release of more toxins. This I found out to my dismay when I engaged in the day's wash down. Only later was I informed that Tioman inhabitants would shun water the first day they are stung. I woke up the next day still feeling the pain. Overnight, the news of my misfortune had spread in Kampung Juara. Everyone assured me that the worst would be over within a day, but a mild pain lasted about a week. There is only one death in the oral history of Tioman caused by *jelatang*. Although its accuracy could not be verified, the story is known to most elders.

Many generations ago before motorized boats became common, the islanders of Tioman grew their own hill paddy. During the harvesting seasons, their crops were often raided by marauding pirates from the South China Sea. The islanders had little means of self defense other than machetes and fish spears, and knew too well that they stood little chance when in direct confrontation with the pirates. They resorted to guerilla tactics using whips with *jelatang* tied to their tips and lurked in wait beside riverine paths to ambush the pirates. The pirates, being seamen and caught off guard by the excruciatingly painful whip scores across their faces and bodies, instinctively jumped into the water to attempt escape and relief, not knowing that contact with water actually worsens the pain. One pirate was later found dead, presumably of cardiac arrest or anaphylactic shock. Not knowing what had attacked them, it is said that the pirates eschewed Tioman ever since. To commemorate the victory, the backwater where the pirate died was named *Lubuk Lanun* (Pirate's Pool).

Official records for fatal human encounters with *jelatang* are almost non-existent except for one by a Dutch botanist, H.J. Walker in the 1920s; otherwise tales of dead dogs and horses abound (Hurley, 2000). The urticaceous stings are reportedly non-effective on invertebrate herbivores such as snails and beetles. Several arboreal mammals and at least one wallaby also demonstrate high tolerance to this generally unpalatable genus. Hurley (2000) argued that having stings doesn't really protect the Australian *Dendrocnide* species effectively from herbivore damage, thus adopting fast growth is a better strategy that enables it to rapidly colonise forest gaps.

The most highly recommended first-aid to date is one discovered by a James Cook University student in Australia who used a hair-removal wax strip made of modified pine resin, vegetable oil and paraffin wax. The method was proven successful and had been written into a Queensland ambulance journal (Hurley, 2000). In the absence of such a specialised item, one could attempt to remove as much of the barbed filaments as possible with sticky cellophane tape, followed by doses of anti-histamine or anti-inflammatory medication to relieve local irritation.

[1]also known as *jelatang gajah* in Tioman.The other vernacular name used in Malaysia is *pelutus*.
[2]Local name in Tioman; other vernacular names used in Malaysia are *jelatang gajah, jelatang api* and *daun gatal.*
*The antihistamine pills are hospital prescribed because the author is allergy prone, and does not imply self-medication.

Acknowledgements

The author would like to thank Dr. Ahmad Khaldun Ismail (UKM Department of Emergency Medicine) and Dr. Ruth Kiew for their invaluable comments on the article.

Suggested reading

Fu, H.Y. *et al* 2003. Comparative study on the stinging trichomes and some related epidermal structures in the leaves of *Dendrocnide meyeniana, Girardinia diversifolia* and *Urtica thunbergiana. Taiwania* 48(4): 213–223.

Hurley, M. 2000. Selective Stingers. *Ecos* 105: 18–23.

Valkenburg, van J.L.C.H. 2001. *Dendrocnide* Miq. In: Valkenburg, van J.L.C.H. & Bunyapraphatsara, N. (eds.) Plant Resources of South-East Asia, 12(2): Medicinal and Poisonous Plants 2. Backhuys Publishers, Leiden. Pp. 217–220.

Tinospora baenzigeri Forman (Menispermaceae)

Kew Bull. 36 (1981) 399, fig. 3D-G, Fl. Malesiana 1, 10 (1986) 195, Fl. Thailand 5 (1991) 364. Type: Thailand Kerr 12345 (holotype K, isotype BM).

Malaysian specimen: Malaysia, Perak, Kuala Kangsar, Gunung Kanthan, *Tan & Kiew FRI 78127,* 27 Nov 2013 (BKF, K, KEP, SING). Growing on fence outside a tapioca factory and in the canopy of wayside trees.

Slender, twining woody climber to 4 m tall, old stems with scattered pustular lenticels. Leaves glabrous, petioles 2–5.5 cm long; lamina broadly ovate, 5.5–9.5 x 5–8.5 cm, thinly membranous, base deeply cordate, apex acuminate, venation palmate-pinnate with 2 pairs of veins at base of midrib and 2 pairs in upper half of midrib, with domatia on the under surface in the axils of the veins. Inflorescences racemose. Flowers with 6 petals. Infructescences pendent, 17–29 cm long, lateral branches 0.5–1.2 cm long terminating in 1–3 fruits. Drupes broadly ellipsoidal, stylar scar terminal, pericarp ripening light orange and finally bright scarlet, endocarp thinly bony, surface papillose to almost smooth.

Acronym of herbaria:
BM = Natural History Museum, London
BKF = Forestry Herbarium, Bangkok
K = Royal Botanic Gardens Kew, London
KEP = Forest Research Institute Malaysia
SING = Singapore Botanic Gardens

Tinospora baenzigeri most resembles *T. crispa* (locally known as *seruntun*) but differs in its stems not being prominently warty and in having domatia on the lower leaf surface. Unlike *seruntun*, it is not used medicinally.

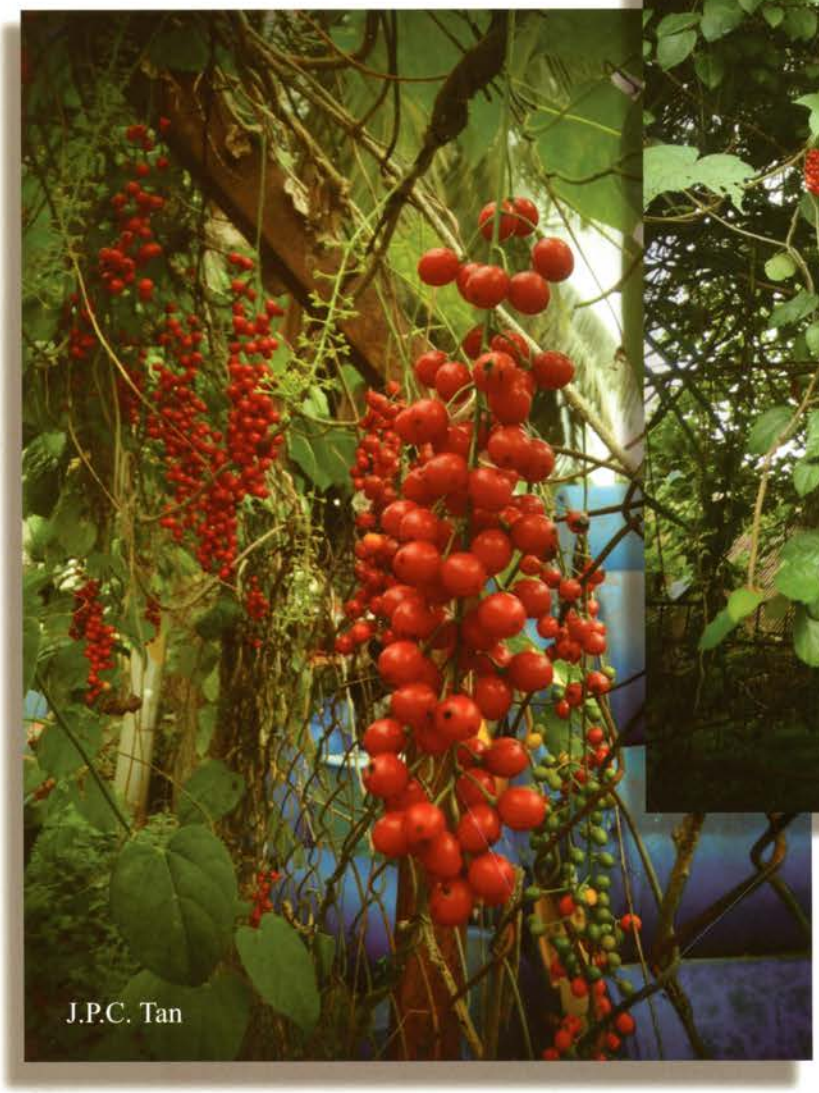
Distribution. Forman (1991) recorded *T. baenzigeri* as endemic in Thailand. In Peninsular Malaysia, at present it is known from the plant collected close to Gunung Kanthan near Kuala Kangsar, Perak.

Ecology. Dr. H. Bänziger, entomologist, discovered this species in Thailand, while studying the host plants of the pest moth, *Othreis fullonia*, that attacks longan and citrus fruits. Together with *T. crispa* it is common in open or disturbed areas up to 400 m altitude. In Thailand it produces leaves in April-May at the beginning of the rainy season, leaves fall in October to November and flowering begins on the bare stems in the dry season in mid-December and continues until mid-February. In Perak, it was in full leaf and ripe fruit at the end of November.

Conservation status. At present categorised as Rare. It is likely overlooked because it is conspicuous only when in fruit. Growing on marginal land, it may be more common.

New Plant Record

Climbing habit of *Tinospora baenzigeri*.



Pendent fruiting racemes of *Tinospora baenzigeri*.

Acknowledgements. I thank Dr. Somran Sudee, Forest Herbarium Bangkok, for confirming the identification of this species; J.P.C. Tan, FRIM for the photographs and the Ministry of Natural Resources and Environment for funding the Flora of Peninsular Malaysia project, of which this is a part.

RUTH KIEW ruth@frim.gov.my
Forest Research Institute Malaysia, 52109 Kepong, Selangor.

Articles should be sent to The Editor, Conservation Malaysia Bulletin, Forest Research Institute Malaysia, 52109 Kepong, Selangor D.E. (attn: Dr. Lillian Chua, lilian@frim.gov.my). Conservation Malaysia is distributed free of charge upon request. We welcome any contribution or feedback. Send contributions or address comments and queries to the editor. Past issues are available at http://www.chm.frim.gov.my. Funded by the Ministry of Natural Resources and Environment. Editorial team: Dr. Lee Su See, Dr. Saw Leng Guan and Dr. Lillian Chua.