ISBN 1823-7975
Conservation Malaysia
A Bulletin Supporting Plant and Animal Conservation in Malaysia
Issue No 27 (2018)

Saving Our Last Jewel

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Malaysia is well known as one of the top 17 mega-biodiversity countries in the world (Von Rintelen *et al*., 2017). However, despite being a country with such rich biodiversity of flora and fauna, Malaysia is about to lose a precious jewel, the Sumatran rhinoceros (*Dicerorhinus sumatrensis*). Our country once had two species of rhinos, but with the Javan rhinoceros (*Rhinoceros sondaicus*) in Borneo officially declared extinct in 2007 (Cranbrook & Piper, 2007), there is now only one living rhino species left for us to treasure, namely, the Sumatran rhino. The severe decline of the Sumatran rhino population is also of global concern as it is listed as Critically Endangered (CR) under the IUCN Red List of Threatened Species (Strien *et al*., 2008). Recent data from governments, researchers and NGOs show that the global population of Sumatran rhino could be as low as 216 individuals, a decline from c. 320 estimated in 1995 (Ahmad Zafir *et al*., 2011).

The Sumatran rhinoceros is the smallest and hairiest rhinoceros compared to the other four species in the world, namely, Javan rhinoceros, White rhinoceros (*Ceratotherium simum*), Black rhinoceros (*Diceros bicornis*) and Indian rhinoceros (*Rhinoceros unicornis*) (Save The Rhino International, 2017). The Sumatran rhinoceros is divided into two subspecies where *D. sumatrensis sumatrensis* is confined to Sumatra and Peninsular Malaysia while *D. sumatrensis harrissoni* is endemic to Borneo (Ahmad Zafir *et al*., 2011). It is believed that the Sumatran rhinoceros is the closest living relative of the extinct woolly rhinos (Borneo Rhino Alliance, 2016a) which were once distributed throughout South-East Asia up to the foothills of the Himalayas (Corbett & Hill, 1992). Unfortunately, the Sumatran rhino is currently extremely rare and restricted to isolated parts of Indonesia and Malaysia only (Ahmad Zafir *et al*., 2011).

The Sumatran rhinoceros is a member of the family Rhinocerotidae from the order Perissodactyla ("odd-toed" ungulates). Most people often confuse rhino tracks with those of the Malayan Tapir (*Tapirus indicus*) and many also believe that tapirs are actually young rhinos (Flynn & Abdullah, 1984). Thus, it is very important to confirm any rhino report through field surveys. The Sumatran rhino differs from the tapir by its larger body size and different number of toes – the Sumatran rhino has three toes on each foot while the tapir has four toes on its front feet and three toes on the hind feet, and different body colour pattern. The Sumatran rhino is generally dark brown while the tapir is generally black and white in colour. The Sumatran rhino also differs from other species of rhinos because of its thick skin and body which is covered extensively by sparse hairs. There are two main folds of skin on its body and several smaller folds of skin on its hind legs. This species is the

only Asian rhino with two horns, a front horn which is relatively narrow and about 250-300 mm long in males but smaller in females, and a short rear horn, rarely more than 100 mm long.

The Sumatran rhino was formerly recorded in a variety of forest types, from tropical rainforest to montane moss forest and occasionally at forest margins and in secondary forest (Nowak, 1999). Previously, it mainly occurred in hilly areas near to water sources and exhibited seasonal movements; moving uphill in times of lowland flooding (Strien, 1975). It was also reported to depend on salt licks (Strien, 1975). Now, it can only be found in lowland forest and sometimes in fairly hilly areas.

The Sumatran rhinoceros is an important seed dispersal agent as it consumes fruits with seeds of between 4 cm and 6 cm diameter. Generally, the Sumatran rhino is a 'browser', feeding on leaves and twigs. It feeds on foliage of over 100 species of small trees and understorey shrubs, preferring the leaves of pioneer trees and vines, especially *Ficus*, *Artocarpus*, *Spatholobus* and *Macaranga*. Usually it uses its neck and body to bring a tall sapling down and then cuts off branches with its sharp teeth. It usually feeds at night and during the coolest times of the day, in the early morning and/or later in the afternoon. At the same time, it tends to eat fruits whenever available, especially mangoes. Other seeds dispersed by the Sumatran rhino are those of wild mangosteen, wild rambutan, most figs, and Belian (*Eusideroxylon zwageri*). Defecation sometimes takes place in streams and watercourses and this makes water the secondary dispersal agent.

Sadly, our Sumatran rhino has been under serious threat particularly during the early decades of the 20th century, primarily due to excessive hunting (Strien, 1975). This had greatly reduced the number of Sumatran rhino and their distribution range (Strien, 1974). Rhino horns have been used in traditional Chinese medicine (Rabinowitz, 1995) and traded in China since as early as 2600 B.C. (Nowell *et al*., 1992) with sources coming from South-East Asian territories such as Vietnam, Java, Sumatra, the Malay Peninsula, Borneo, Cambodia, Laos and Thailand (Rabinowitz, 1995). The high value of and demand for the horn continues to encourage the persistence of illegal hunting (Flynn & Abdullah, 1984). According to the records of the Department of Wildlife and National Park (DWNP), about 30 individuals of Sumatran rhino were poached in Peninsular Malaysia between 1975 and 2006 (DWNP, 2009). Apart from that, the Sumatran rhino has long been threatened by extensive habitat destruction due to logging and forest clearance for agriculture development. These activities have caused the rhino populations to become fragmented, small, and isolated (Flynn & Abdullah, 1984).

In 2013, Malaysia realised that the Sumatran rhino was most likely extinct in the peninsula and on the verge of extinction in Sabah (Abdul Hamid *et al*., 2013). In August 2015, the species was officially declared extinct in the wild in Malaysia (Martinez, 2015; World Wide Fund for Nature, 2017). The last record of a Sumatran rhino in Peninsular Malaysia was in 2007 (Magintan *et al*., 2010). Currently, no single living individual of this species has been found in the wild, and there are only two known to be living in captivity, namely, a male rhino, Kertam, and a female, Iman, housed at the Tabin Wildlife Reserve Lahad Datu, Sabah (Borneo Rhino Alliance, 2016b).

Poaching and habitat loss, especially in the lowlands, are no longer the most significant threats to the conservation of this species in Malaysia as this species is already extinct in the wild. Currently, the Sumatran rhino is mainly threatened by too low densities which will lead to a likely negative population growth rate (Havmøller *et al*., 2016), small population size and slow breeding rate. It is experiencing the Allee effect (Allee, 1931) which refers to a "positive correlation between population size or density and the mean individual fitness". This indicates that as the Sumatran rhino population declines to very low numbers, its chances of successful breeding will also decline (Courchamp *et al*., 2008). Difficulty in finding a mate, narrow genetic base, random skewed sex ratio, and reproductive tract pathology (also representing low reproduction) have all contributed to very low numbers of annual Sumatran rhino births. Currently, it appears that even in places with suitable habitats and zero human off-take, i.e. no poaching or hunting by humans, it is just a matter of time before the average annual death rate of the Sumatran rhino will exceed its annual birth rate, with the population going extinct due to its small, scattered and non-contiguous "populations" (Abdul Hamid *et al*., 2013).

Existing statutes and laws, such as Wildlife Conservation Act, 2010 (applies to Peninsular Malaysia only), Wildlife Protection Ordinance, 1998 (applies to Sarawak only) and Wildlife Conservation Enactment, 1997 (applies to Sabah only) which list the Sumatran rhino as Totally Protected, have proven ineffective in preventing a decline in its numbers. This is due to lack of enforcement as well as the animal's low breeding rate. The species has also continued to go locally extinct across its range although protected areas had been created and other in-situ conservation efforts increased. Previous captive breeding programmes had also failed to increase the numbers of this species; from a total of 45 Sumatran rhinos taken from the wild since 1984, there were no captive births until 2001 when this occurred in Indonesia (Havmøller *et al*., 2016). Not a single baby rhino has been born in Malaysia from the captive breeding programme and by the end of the 20th century, almost all the captive Sumatran rhinos had died because of disease.

We hope we are not too late to save our precious jewel from extinction. At the Sumatran Rhino Crisis Summit held in Singapore in April 2013, and later agreed upon in the Bandar Lampung Declaration in October 2013, four key actions were identified to save the Sumatran rhino from extinction. The first key action is a need for a unifying global strategy to manage the global population (both wild and captive) as a single metapopulation across national and international borders (Havmøller *et al*., 2016). The national government of Malaysia and state government of Sabah are ready to collaborate with Indonesia on this management strategy. However, this project might take some time to fully materialise as the Malaysian and Indonesian governments have yet to sign the Memorandum of Agreement for the collaboration. The second key action is a need to continue deployment of strengthened Rhino Protection Units at sites with remaining breeding populations in Indonesia (Havmøller *et al*., 2016). The third key action is to create intensive management zones (IMZs). These are rhino breeding areas which need to be designated as protected areas with increased protection and monitoring. It has also been proposed that isolated rhinoceroses outside the IMZs be brought into these zones to maximize their chances of reproducing (Havmøller *et al*., 2016). The fourth key action is the development of advanced-reproductive technology (ART) in captive breeding. This is currently on-going in Sabah, conducted by the Borneo Rhino Alliance (BORA) in collaboration with the Leibniz Institute for Zoo and Wildlife Research, Agro-Biotechnology Institute Malaysia (ABI), Universiti Putra Malaysia (UPM), and others (Havmøller *et al*., 2016). ART which emphasises producing embryos through

in-vitro fertilization from cryopreserved gametes from Kertam and Iman is needed since Iman has reproductive pathologies and natural conception is not possible. Attempts are ongoing to create the first test tube Sumatran rhino embryo for implantation into a viable surrogate mother (Borneo Rhino Alliance, 2016). BORA also plans to cryopreserve gametes and skin cultures of Kertam and Iman for the future. It should be possible for every female in managed conditions to produce several progeny once the technique for removing oocytes from females and producing embryos in-vitro have been established (Havmøller *et al*., 2016). This management strategy may take many years, but it is better than doing nothing, to help increase the birth rate of the Sumatran rhino. The exchange of gametes between individuals across countries, such as Malaysia and Indonesia, can provide a genetic advantage for this species (Goossens *et al*., 2013). The Indonesian government has already agreed to send semen of their Sumatran rhinoceros, Andalas, to Malaysia for the ART programme. The plan is to use the Indonesian rhino's sperm to fertilise viable eggs of Malaysia's only remaining female rhino, Iman (Miwil, 2018). The collaboration between Malaysia and Indonesia in ART is seen as the last means of saving this critically endangered species (Gokkon, 2018).

There has been a significant increase in funding from the Sumatran Rhino Crisis Summit but only for Sumatran rhino habitat protection. The Forest Research Institute Malaysia (FRIM) has also provided funds to procure some equipment for the in-vitro fertilisation process, but funding is still inadequate to fully implement the new strategic management plan. According to Havmøller *et al*. (2016), there is a lack of funds for metapopulation management and conservation breeding, including expanding the conservation breeding facilities and development of the ART.

In a nut shell, it is very crucial that this new strategic management plan for small populations of this critically endangered species be fully implemented. So, let's not wait anymore. We need to work together to save our last jewel. Let us give our support to BORA in order to save our last two living individuals of the Sumatran rhino before it is too late. Otherwise, we are going to lose the species in Malaysia. As we have always been told, "it is better late than never".

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RELOCATION OF THE COASTAL HORSESHOE CRAB *TACHYPLEUS GIGAS* FOR CONSERVATION

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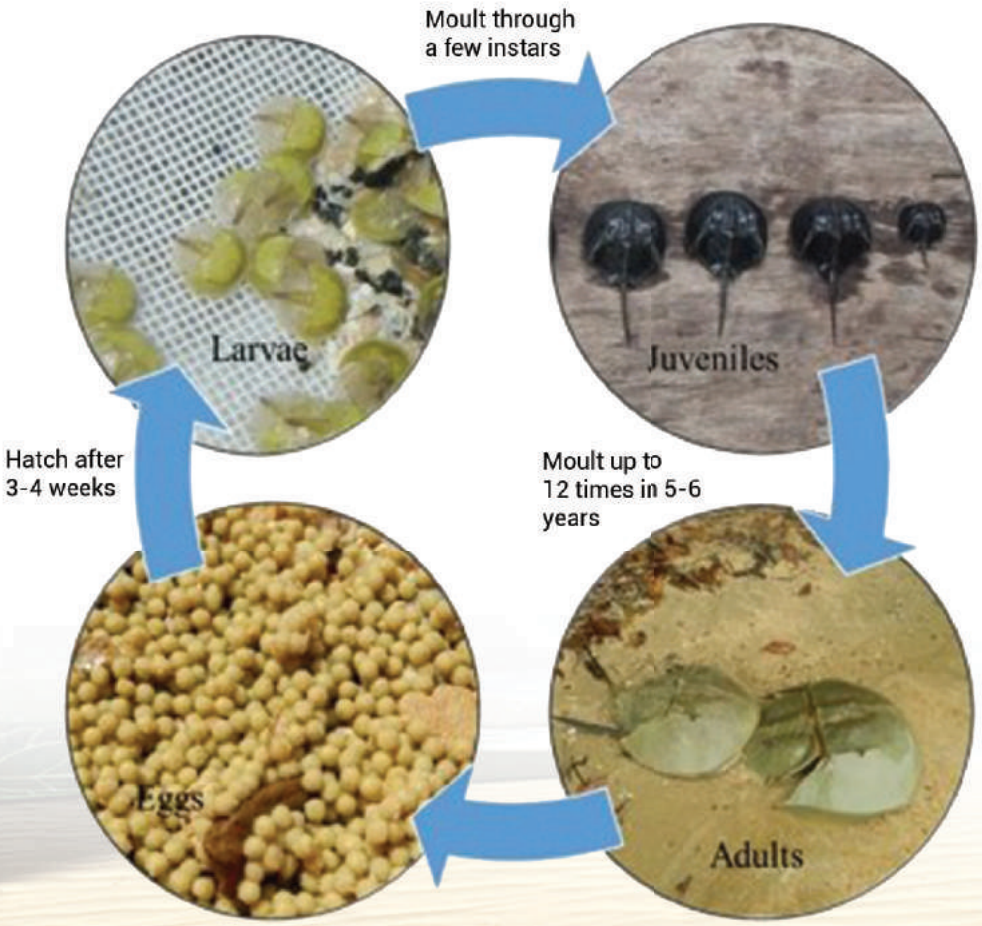
For coastal communities on the east coast of Peninsular Malaysia, stumbling upon pairs of horseshoe crabs while strolling on the beach during the full moon was a common occurrence during the past 30 to 50 years. In areas like Setiu, Kemaman and Marang in Terengganu, this animal used to be the riverside or beach "toys" for these communities in the 1960s and 70s. Horseshoe crabs have recently become popular as special delicacies at certain locations in Malaysia. With such popularity and high demand (pers. comm. with fishermen and fishmongers), and the long time it takes to mature, we believe our craving for the exotic horseshoe crab is bringing this fossil animal to the brink of extinction. The current situation highlights the importance of carrying out a population census on this unique animal in Malaysia.

There are four species of horseshoe crabs in the world today. The Atlantic horseshoe crab, *Limulus polyphemus*, inhabits North American shores and is found nowhere else. The other three species, namely, *Tachypleus tridentatus*, *T. gigas* and *Carcinoscorpius rotundicauda* are found in Malaysia. *Tachypleus gigas*, which is the medium-sized species of the Malaysian horseshoe crabs, is the one sought after for delicacies, both for local consumption and also for export to Thailand. As an adult,

From left, *Tachypleus tridentatus, T. gigas and Carcinoscorpius rotundicauda*.

T. gigas differs from the other species by its size, i.e. being larger than the mangrove horseshoe crab, *C. rotundicauda* and smaller than the gigantic *T. tridentatus*. The average prosomal width for females is 190-250 mm whereas for males it is 130-190 mm (Ismail *et al*., 2012).



The life cycle of a horseshoe crab.

The adults come to the intertidal zones in pairs to spawn, normally in shallow waters on the beachfront or protected river banks close to the estuary where the salinity is just right for the eggs to develop and for the newly hatched larvae to grow. *Tachypleus gigas* can lay up to 450 eggs (each measuring 3-3.5 mm) in a single nest. The females may dig up to 12 nests on one single spawning occasion laying a total of 2,000 eggs altogether (Faridah *et al*., 2016). The eggs which are buried in the sand and left unguarded, hatch after 3-4 weeks. The trilobite larvae live a planktonic life and swim with the tides and moult through a few instars into juveniles. The juveniles normally reside in the intertidal zones where they feed on benthic materials. As they continue to grow bigger, moulting up to 12 times, these juveniles or young adults move to deeper water where they reach maturity; most of their adult life is spent in the open sea. They reach sexual maturity at about 5-6 years, during which time they will

Tachypleus gigas swims free in its new 'home'.

Horseshoe crabs are sold together with other seafood as exotic delicacies.

find their mate. To mate, the males cling to the back of the larger females which swim to the intertidal zones during the new or full moon to spawn. This is the time when they are always sighted by beachgoers. The cycle will continue as long as their spawning areas are not disturbed.

As the horseshoe crab is not listed as a protected species, it is legally sold as common seafood. We acknowledge that this food industry is threatening Malaysian horseshoe crab populations, and the magnitude of the trade with Thailand is huge and worrying.

Therefore, the Horseshoe Crab Research Group (HCRG) of UMT has taken the initiative to relocate some of these precious animals to a new habitat on the east coast of Peninsular Malaysia. With financial support from the Ministry of Education, a relocation project is in progress, where some adult *T. gigas* are "saved" from being somebody's dinner and released to swim in a new more protected area. This new habitat was recently gazetted as Terengganu State Park, where conservation is part of its main agenda. These animals are tagged, introduced to the local communities who agree to become their guardians, and then released into the lagoon. The animals roam free there. Some were later found in the open sea whereas a few were reported to be recaptured within the released areas.

Awareness campaigns are undertaken continuously involving local communities, school children, teachers and also visitors from areas of tourist attraction within the lagoon area. While the success of this relocation programme is not yet guaranteed, the awareness campaigns have managed to increase the local communities' knowledge about horseshoe crabs, especially the local species. Breeding programmes and release of juveniles are our additional plans to increase horseshoe crab numbers in the area in the years to come once our hatchery facilities are operational.

It is our hope that our horseshoe crab, *T. gigas*, has at least one place where they continue to live freely and survive without being the target for financial benefit. *Tachypleus gigas* will remain in Malaysian waters as one of four living fossil animals on the earth for future generations.

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The Horseshoe Crab Research Group (HCRG) uses every opportunity to educate the public about this unique animal.

Obituary

KAMARUDIN SALEH (1958–2017)

In Memory of a National Expert and Para-taxonomist

By: Chew MY (chew@frim.gov.my), Chung RCK & Kiew R

Kamarudin proudly holding the consultancy report on trees of Kota Kemuning, Shah Alam, Selangor, produced in 2014, which was the product of months of hard work identifying trees in the field and in the herbarium.

Fondly known as *Abang Din* (=brother Din), the late Kamarudin Saleh was "THE plant identification expert" of the Forest Research Institute Malaysia (FRIM). We worked closely with him and it came as no surprise that the allocated pages for this obituary could hardly accommodate the official records of his lifelong contributions even in small font, let alone the countless ad-hoc questions from junior and senior staff alike of "have you asked *Abang Din* what this is?".

Kamarudin's life story is a classic example of a village boy made good. He had a humble beginning and rose through the ranks through his own hard work to attain his widely recognised professional status. In 1979, Kamarudin was offered work at the FRIM Herbarium as a junior laboratory assistant. A series of promotions followed, from research assistant (Q17) in 1985, senior research assistant (Q22) in 2002, and finally assistant research officer (Q27) in 2006. In his early years, Kamarudin spent many man-hours undertaking plant surveys and inventories under the mentorship of the late eminent botanist, K.M. Kochummen (Kiew, 1999; Ng & Saw, 1999), who had the renowned skill of being able to identify a tree from a single leaf.

KAMARUDIN SALLEH'S BIODATA

- Born on 30 January 1958 in Kampung Sungai Petai in the Alor Gajah District of Melaka.
- The second of four siblings.
- Attended primary and lower secondary schools in Alor Gajah, Sekolah Rendah Sungai Petai and Sekolah Menengah Dato' Dol Said, respectively.
- Attended upper secondary school at Sekolah Menengah Munshi Abdullah, Batu Berendam.
- Completed an agriculture course at the Rubber Industry Smallholders Development Authority Training Centre (currently Melaka RISDA College) at Ayer Pa'abas.
- Staff of the Forest Research Institute Malaysia (1979-2017).

Kamarudin had many anecdotes that he shared with us during break times in the field of how Kochummen drilled the Pasoh 50 ha ecological plot survey team rookies that included himself and the late Chan Yee Chong (Chua, 2013). Kamarudin carried on this tradition of on-the-job mentoring of the younger generation in the FRIM Herbarium. His ability to recognise tree species from leaves alone and to produce tree checklists via rapid surveys is unsurpassed, and his demise is a great loss to the fraternity of Malaysian botany.

An authoritative resource person in plant identification especially pertaining to trees, Kamarudin's abilities to quickly and accurately recognise many Malesian and exotic plants to the level of genus or family was of great help in the curation of the FRIM Herbarium. His expertise also ensured the provision of quality identification technical services and consultations to various stakeholders. Apart from assisting FRIM researchers from a wide range of disciplines, he also assisted local and foreign botanical researchers, the public, students and staff members of private universities and school students, as well as individuals who required species identifications in the herbarium and/or in the field. His services were in great demand by other government departments and consultants who needed plants identified for the surveys they were undertaking. While most botanists rely on fertile material for plant identification which usually captures about 5% of tree species (Ng & Saw, 1999), like his late mentor Kochummen, Kamarudin was highly regarded because he could identify sterile trees and so inventory about 90% of the trees. Kamarudin was indeed a valued para-taxonomist for any survey that required data on tree species composition, which serves as a basis for deciding the forest type and discerning the level of disturbance of the forest.

Kamarudin revised one tree family for the Flora of Peninsular Malaysia, co-authored eight journal articles, four chapters in coffee-table books, two technical reports, and three semi-technical articles. A small palm endemic to south central Pahang, *Licuala kamarudinii* Saw, was named after him (Saw, 1997). In addition, many technical publications in a variety of fields acknowledged Kamarudin's contributions in species identification. Kamarudin was in great demand for expeditions organised by government agencies including the Forestry Department Peninsular Malaysia (JPSM), Department of Wildlife and National Parks (PERHILITAN), Sabah and Sarawak Forestry Departments, Academy of Science Malaysia (ASM), and NGOs such as the Malaysian Nature Society (MNS) and World Wildlife Fund for Nature (WWF). Kamarudin was an instructor for various modules offered in the FRIM Tree Identification Course since the 1990s and was frequently asked to teach Forestry Science students at Universiti Putra Malaysia (UPM), MARA University of Technology (UiTM), Kepong Forestry School (ULP) and PERHILITAN.

From 1979, he collected trees from all states in Malaysia. Known for his fitness and enthusiasm in scaling mountains, Kamarudin covered no less than 34 peaks in Malaysia, namely Gunung (G.) Machincang, G. Raya and G. Jerai in Kedah, G. Hijau and G. Bubu in Perak, Bukit (Bt.) Takun, G. Bunga Buah and G. Nuang in Selangor, G. Telapak Buruk, G. Angsi, G. Berembun and G. Tampin in Negeri Sembilan, G. Tera, G. Saji, G. Ayam, G. Stong and G. Kob in Kelantan, G. Lawit, Bt. Besi and Bt. Bauk in Terengganu, G. Jasar, G. Irau, G. Brinchang, G. Beremban, Fraser's Hill, G. Ulu Kali, G. Tahan, G. Lesong and G. Kajang in Pahang, G. Ledang, G. Chabang Tiga, G. Lambak and G. Belumut in Johor and G. Kinabalu in Sabah. He collected more than 750 numbered herbarium specimens (mainly with the FRI prefix) and assisted in the collection of more than 1,000 specimens where he was acknowledged as the additional collector, which are deposited in the FRIM Herbarium and distributed to other herbaria, including the forestry herbaria in Kuching, Sarawak and Sandakan, Sabah, as well as the Singapore Botanic Gardens Herbarium and Kew Herbarium.

A 2011 interview summarised his attitude towards work:

"Work with sincerity and honesty, be grateful for all the gifts that have been bestowed on oneself and strive to seek knowledge."

This was typical of his humble attitude, always willing to help others, and always courteous in his interactions with others.

Kamaruddin (R) and Apuk (L) taking a break in the field at Ulu Muda, Kedah (1998). (Archive picture, photographer unknown).

Kamaruddin who left us on 7 Aug 2017 after an illness is survived by his wife, Rosana Md. Zin, a technician at the Public Works Department, Kuala Lumpur, and his two sons, Muhammad Faiz and Khairul Hisyam. He was a loving husband and kind father, always trying to strike a work-life balance, and never failing to greet everyone in the office with his characteristic warm smile and an ever-helpful countenance. His passing is greatly missed but he continues to live on in the memory of many Malaysian scientists for his warm and altruistic personality, his invaluable contributions to science, and his generosity in passing on the knowledge he had accumulated over his lifetime.

Personal Comments and Published Acknowledgements of Kamarudin by Researchers:

- Dato' Dr. Abd Latif Mohmod, FRIM Director General [In Nik Zanariah NM & Abd Latif M (2011) Tokoh dan Jejak Pewaris Generasi FRIM, p. 159]:
  "Kamarudin was my first teacher in FRIM since 1985, his friendly and polite attitudes placed him among my best of friends. His devoted teachings enabled me to pick up bamboo identification, then further the knowledge for the industry's benefit, besides obtaining a PhD for myself. His expertise was sought after by FRIM and outside researchers alike. Indeed, he was a precious living asset of FRIM!"
- Dr. Wong Khoon Meng, Principal Researcher (Plant Taxonomy), Singapore Botanic Gardens:
  "Kamarudin developed from a young junior research assistant with the Kepong Herbarium, during my stint at FRIM, to become a recognised field and herbarium botanist. We all know him to be clearly among the best in botanical identification, and in this he must have helped so very many scientists and students. I had continued to hear praise for his abilities and knowledge throughout his career."
- Veronica Khoo Swee Imm, FRIM entomologist, *Pteroptyx* sp. Habitat Survey at Sungai Chukai (2014):
  "Knowledgeable and hands-on work. Like a walking dictionary for plants."
- Nur-Zati Akma Mustafa, FRIM entomologist, CBIOD Project (2007–2012):
  "Passionate, never gave up teaching the younger generation, to a point where our former staff, Ahmad Fitri Zohari (currently at UKM), went to his house to learn identification techniques at night. He always shared his best tips and tricks to identify trees and never got mad when asked over and over again."
- Ong Su Ping, FRIM entomologist, FRIM-La Trobe Lac Scale Biocontrol Project (2012):
  "Identified two new yellow lac scale host plants—contributed to lac scale ecological knowledge growth."
- Nada Badruddin, FRIM entomologist, Inventory and Mapping of Fireflies in FRIM (2011):
  "Quick response to request for help in tree ID. A great motivator who really enjoyed and loved what he did, generous in knowledge sharing and a great person with very positive vibes to be around with."

Authorship:

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New locality record of a rare climber - *Genianthus maingayi* Hook.f.

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The Bukit Belata Tambahan F.R. is part of the North Selangor Peat Swamp Forest complex (NSPSF). This forest complex is an isolated, although sizable forested area that has been identified under the Central Forest Spine Two (CFS2) Master Plan in 2009. Due to its isolation, NSPSF needs to be linked to the other main forest complexes of CFS1 in the Main Range of Peninsular Malaysia. Most of Bukit Belata Tambahan F.R. consists of logged-over lowland dipterocarp forest, while small portions of its northern and southern regions are peat swamp forest. Under the "Selected Flora, Fauna and Insect Monitoring Project at the Central Forest Spine Ecological Corridor Secondary Linkage Number Three of the Selangor State", a quick flora survey was carried out at Bukit Belata Tambahan F.R. in 2016, in areas that had been identified for the potential linkage corridor.

A number of noteworthy species including the very rare and endangered *Willughbeia grandiflora* (Apocynaceae) and the endemic *Polyalthia hookeriana* (Annonaceae) were collected from a small area of peat swamp forest surveyed. *Genianthus maingayi* was recorded for the first time from the state of Selangor and reported for the first time from a peat swamp forest. Besides being the first specimen record of the species for the Kepong Herbarium, the full-colour images of the life plant in flower and fruit are also published here for the first time.

***Genianthus maingayi* Hook.f.**
(Family: Apocynaceae, subfamily: Secamonoideae; note: formerly under Asclepiadaceae) Fl. Brit. India 4, 10 (1883) 16; Fl. Malay Pen. 2 (1923) 378; Klackenberg, Botanische Jahrbucher für Systematik, Pflanzengeschichte und Pflanzengeographie 117 (1995) 401–467.

Selangor specimen: Malaysia, Selangor, Hulu Selangor, Bukit Belata Tambahan F.R. *Chew FRI73086* Apr 2016 (KEP, SING, K, L, SAN, SAR, A). Growing near the edge of the peat swamp forest, smothering the canopy of a badly damaged Sapotaceae tree.

Flowering and fruiting specimens of *Genianthus maingayi*.

Slender twining climber that climbs to the low canopy of the forest (± 10 m tall), where the plant itself is much longer than 10 m. All plant parts produce white sap when injured. Stem, petiole and basal part of midrib, inflorescence rachis and fruit covered in dense, reddish brown scurfy hairs. Stem lenticellate. Leaves simple opposite; petiole c. 1 cm long; leaf blade narrowly obovate to oblanceolate, rarely elliptic, 6–9 × 3–4 cm, texture coriaceous, glabrous, upper surface slightly glossy, leaf base broadly cuneate; leaf tip short acuminate to cuspidate; midrib narrowly channeled when dry, pubescent or glabrescent especially on the upper surface; secondary veins 6(–7) pairs, arching, forming indistinct, rounded loops at the margin. Inflorescence extra-axillary, often unbranched and racemose, sometimes branched once near the base, rarely with 3 main branches, branches usually slightly shorter than the leaves, rachis often as thick as the stem and sinuous. Flowers borne in few flowered clusters along rachis, less than 1 cm across, slightly fragrant; bud light yellow; calyx lobes ovate; corolla orangish red inside with white hairs; stigma stout, club-shaped; stamens arranged in a star shape, with coronal scales overlapping the anther cells, anther appendages minute.

Close-up of *Genianthus maingayi* flowers showing the stout stigma and the coronal scales overlapping the anthers.

Distribution. Previously known from a few historical collections, from the lowland forest of Taiping (Burkill & Henderson, 1925), Larut, Perak (by Kunstler), Mawai-Sedili Road, Johor (Chew, CWL217, 1961), Bukit Timah, Singapore (Cantley, s.n., 1883), and possibly one from Belaga, Sarawak (Haviland, 3057, 1892). Current collection from a patch of disturbed peat swamp in North Selangor.

Ecology. Reported by Ridley (1923) to be local and scarce. Probably under-collected due to it being a slender canopy climber with relatively small flowers and inconspicuous fruits.

Conservation status. At present not evaluated (NE). Suggested conservation status: Data Deficient (DD), based on the scarce distribution records available.

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Acknowledgements. The authors would like to thank Dr. David Middleton from the Singapore Botanic Gardens for his help in the identification and Dr. Ruth Kiew for her comments on the draft. Fieldwork was financed by the FED-0615-FA-01 project that is funded by the Selangor State Forestry Department and headed by Mohd Shahfiz A.

Erratum (Issue No. 26): Stinkhorn fungi - a food source for butterflies? Picture on the left showing the Lesser Cruiser sharing its meal with Drosophila (arrow) and other flies. The arrow was misplaced and supposed to point to the tiny reddish fly on the right of the black fly.

Forest Research Institute Malaysia

We welcome articles on new research information on flora or fauna and discussions related to biodiversity or conservation. Please send articles to The Editor, Conservation Malaysia Bulletin, Forest Research Institute Malaysia, 52109 Kepong, Selangor (attn: Dr. Lillian Chua, lilian@frim.gov.my). Conservation Malaysia is published twice a year and is distributed free of charge upon request. Contact the editor for queries or comments. Past issues are available at http://www.mybis.gov.my/one/publication.php?menu=27&g=1. Funded by the Government of Malaysia. Editorial team: Dr. Lee Su See, Dr. Lillian Chua and Ms. Chan Yoke Mui.