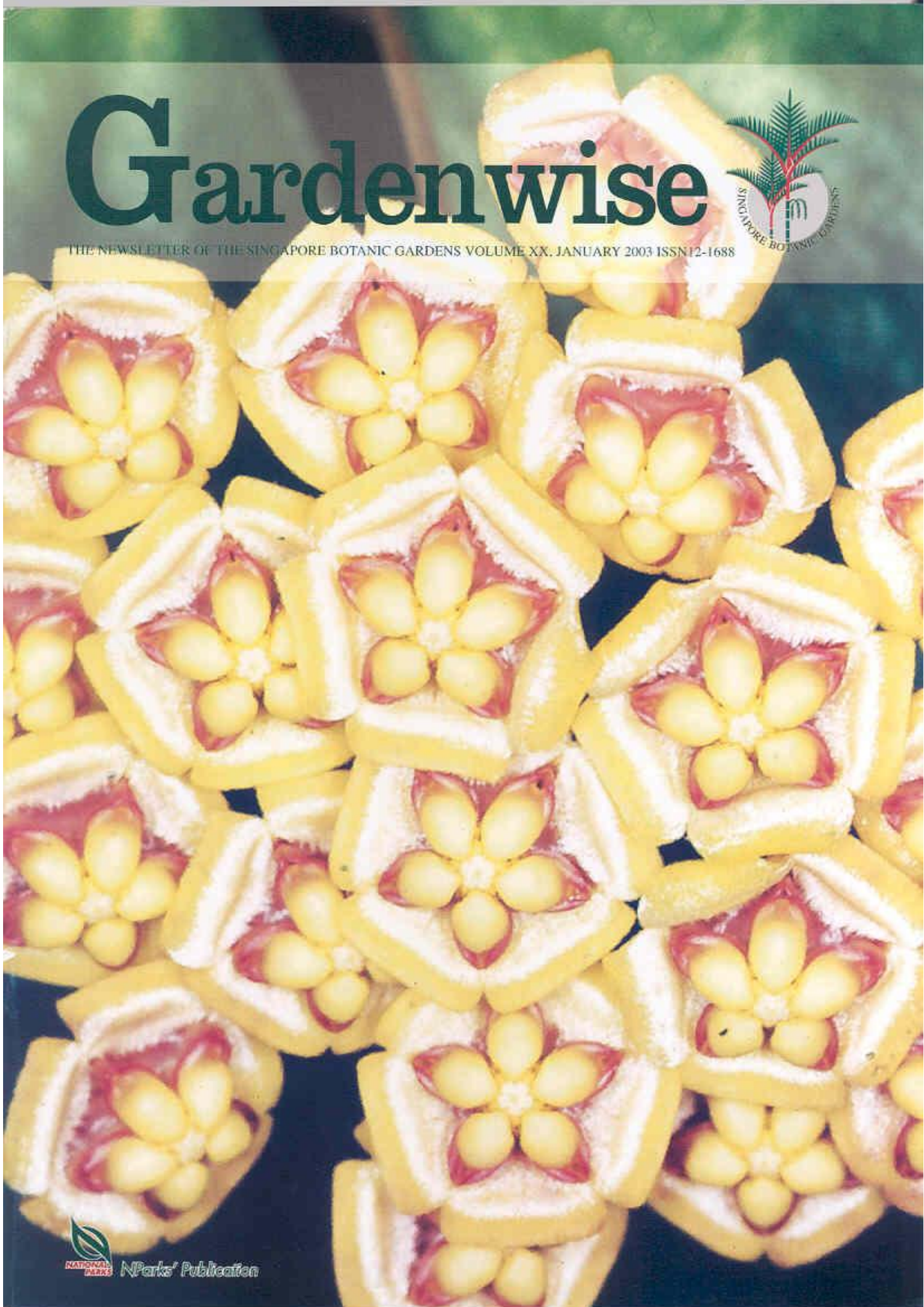


Gardenwise

THE NEWSLETTER OF THE SINGAPORE BOTANIC GARDENS VOLUME XX, JANUARY 2003 ISSN12-1688



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Front Cover:

Hoya klappenbergii from Sabah.
Photo by Anthony Lamb

Message from the Director

Changes in the Gardens continue apace as we strive to fulfill our mission to play more effective roles and assume greater responsibilities as a botanical institution, public park and tourist destination.

The improvements to the contents and the breadth of coverage in this Newsletter reflect in a small way what we are doing to upgrade the Gardens' facilities, scientific output, botanical and horticultural displays, programmes and activities and educational outreach. The section "Regular Features" now has a wider coverage. It provides a better representation of the range of activities and programmes that take place in the Gardens and gives all staff direct responsibility and stake in their Newsletter.

A major focus during the last six months was strategising and planning how our small team of three in Educational Outreach can increase its capacity to be more effective. This function is central to our mission of connecting plants with people. Its activities and programmes enable us to reach out to our visitors and the community, value-adding their experiences of the Gardens. It is one of the vehicles by which we will develop the Gardens as a botanical, horticultural and conservation hub of Singapore.

We consequently yoked Educational Outreach with Visitor Services for better synergy and also made outreach a responsibility of the botanical and horticultural staff. We implemented a programme to train volunteers and staff as instructors and guides, created new courses, designed new promotional brochures, which have been sent to all schools in Singapore, and upgraded our promotional mailing list. The added demand from the public and schools for our programmes, especially during the present school holidays, is testimony to the success of the staff involved. This is again straining resources, creating a happy problem and compelling staff concerned to continue innovating.

On the grounds, the development of the Prehistoric Garden has begun. This will create a unique and educational "walk-

through-time" experience using extant plant species to highlight and display the changes in plant life from the era before plants to the present time, on our planet. Of particular interest in this special landscape will be the display of our considerable collection of Cycads that will be consolidated here.

The long awaited Cool House, Ginger Garden and the special effect night lighting are now completed and will be officially opened at the end of the 1st quarter of 2003. The environmental conditions in the Cool House are still being fine tuned to accommodate the majority of the plants, and the selection of plants most suited for growing in this house, is continuing. The rich and intensive botanical display of over 300 species in the naturalistic landscape of the 320 m² Cool House constantly springs surprises with many plants thriving and flowering for the first time in Singapore.

The one-hectare Ginger Garden, currently with about 300 taxa from this plant family is fast maturing into a lush tropical 'gingerscape' with its tremendous ranges of foliage, form and colour. It is already a favourite location for many of our visitors.

Improvements to the Symphony Lake were completed in December 2002. It now has a significantly increased water storage capacity. Visitor access and enjoyment have also been greatly improved. The new landscape includes a small marsh garden at one end of the lake, and there are additional paths including a viewing pavilion built over the water. The lake's overflow channel has also been creatively reconstructed as a rocky stream.

On a more sombre note, with the economic climate still weak and uncertain, we continue to make very difficult choices on expenditure. All staff are diligently scrutinising their bottom line and making sacrifices. Increasing capacity in business acumen and revenue generation is made a priority area.

Chin See Chung

The Hoyas of Sabah

The Hoyas belong to the Milkweed family, Asclepiadaceae with about 3,000 species in 315 genera. The genus *Hoya* today has probably 150 species distributed from India & China, south to Australia, including most of South East Asia.

The genus *Hoya* was named for the plant cultivator to the Duke of Northumberland, Thomas Hoy, who was very successful in cultivating them in a huge conservatory in London. Hoyas with their unusual waxy and scented flowers were very popular during Victorian times when hot houses for growing tropical plants such as orchids & pitcher plants became such a craze with the aristocracy.

Hoyas are distinguished by the milky sap or latex, with the pollen of the flowers massed in pollinia as they are in the orchids. They are mostly epiphytic shrubs or climbers. It is interesting to compare how pollinia have evolved in a parallel way between the Orchids in the Monocotyledons and the Hoyas and related plants in the Eudicotyledons (Dicotyledons).

In the Orchid flower one of the petals has evolved into a platform or pouch for insect pollinators to land when they come to visit. The pollinia containing the pollen masses gets stuck onto their heads or backs, as they passed under the column to which the pollinia are attached. The same column structure contains the stigmatic surface and the pollinia are brushed off onto this when the insect visits the next flower. In *Hoya* the corollas are in most cases open, and surmounted with a corona of five lobes between which are grooves. In each groove lie two pollinia attached to a brown or black point (photo 1).



Flower of *Hoya imperialis* showing the waxy purple corolla, and white lobes of the corona in the grooves of which lie the pollinia.

A visiting insect will feed on nectar produced at the base of the corona and on flying off takes with it pollinia attached to its feet, if its feet are of the right size to fit into the grooves. At the next flower of the same species, the insect in its attempts to get rid of the pollinia, will drag its feet through the grooves. If successful, the pollinia will get caught under the upper lobes where the receptive stigmatic surfaces are located.

Hoya flowers are mostly night scented, and probably visited by moths. During the day, ants and honey bees are often seen on the flower mopping up the leftover nectar (photo 2).



An *Apis cerana* honey bee licking up nectar from the flowers of *Hoya meredithii*.

A flower when pollinated develops into the fruiting pod very rapidly, reaching full size in a month. The pod ripens in about three months and splits open down one side. The closely packed seeds, each with a parachute of fine silky hairs, are blown out into the air currents (photo 3).



A seedpod of *Hoya imperialis* that has just split open to show the closely packed, symmetrically arranged seeds each with a parachute of silky hairs. They are blown out by air currents and dispersed.

Most Hoyas are climbers with opposite leaves, that are often thick and waxy (photo 4). They either start from the ground and climb using vigorous roots that arise from nodes or along stems, or are epiphytes; rarely are they scandent shrubs. They derive nutrients from rotten wood and pockets of organic matter in tree forks or from rain water. Epiphytic Hoyas include *Hoya multiflora* (photo 5), *Hoya campanulata* (photo 6) and *Hoya cumingiana* (photo 7).



Hoya coronaria is a common and widespread species. In the photo, the opposite leaves and umbels of flowers coming from the leaf axils are clearly shown. In this species the flowers can be white, green, cream or pink often turning a reddish colour when old.



Hoya multiflora is an epiphytic shrub often growing from the forks of trees. The flowers, like shooting stars make it a very desirable plant for hanging baskets.



Hoya campanulata is another epiphytic scrambling shrub with beautiful pendulous umbels of large waxy white flowers.



Hoya cumingiana (Syn. *H. densiflora*) is often found on cliffs, and rocky places as well as in forks of large trees. The habit with closely packed leaves along the stems is unusual, and the plant flowers nearly continuously.

An unusual epiphytic *Hoya* that is often mistaken for a hemi-parasite is *Hoya spartioides* (photo 8). It appears that its seeds are carried by ants into rotten cavities in tree trunks or branches. On germinating, the plant produces a single short stem with a few basal leaves. Long flowering stalks are produced, bearing orange, night opening flowers (photo 9). The basal leaves soon fall off and the flower stalks take over the function of photosynthesis. This species was previously considered to be a separate genus *Absolmsia*, but the flowers are identical to that of Hoyas.



Hoya spartioides is a species that loses its true leaves at an early stage, and continues photosynthesis through the flower stalks.



The scented orange flowers of *Hoya spartioides* open at night, and one can often see large globules of nectar on the corolla lobes.

Some epiphytic species that are subject to extreme water stress behave like many succulents by closing the stomata in daylight to conserve moisture and opening them at night when it is cool and humid.

Favourite habitats for Hoyas in Sabah are on trees along rivers and cliffs especially in limestone areas, and in heath forest



Hoya telosmoides, a newly described species from lower montane forest in the Crocker Range and Mount Kinabalu has an unusual corolla that forms a protective cup around the corona, the entrance of which is full of hairs.



Hoya erythrostemma is one of the most stunning flowering Hoyas of Sabah.



Hoya vitrata a heath forest species in Sabah starts off producing a cluster of leaves to form a home for ants that provide additional nutrients for it to take off as a climber.



Hoya fraterina was re-discovered 150 years after it was described by the Dutch botanist Blume. The yellow flowers covered with silvery hairs are stunning.

with a deep peaty layer on the forest floor; some species favour coastal forest.

The interest in Hoyas in Sabah has only really taken off in the last ten years, leading to the setting up of a small *Hoya* garden with a collection of Sabah species at the Agricultural Park in Tenom. Visits by *Hoya* experts Dale Kloppenberg from California,



Hoya waymaniae is a recently described species with small but brilliant orange flowers with a most unusual corona. It was found in heath forest in Sabah and is named after Ann Wayman who has spent many years growing and photographing the Hoyas.





Hoya callistophylla is a species with beautiful leathery bright-green leaves with dark green veins.

A. Lamb

and Ted Green from Hawaii in the 1990's, and other members of the International *Hoya* Association that produces the *Hoya* Bulletin called *Fraterna*, has greatly stepped up the elucidation of new species and identification of existing ones, and the discovery of many new and as yet unidentified species.

Pia Nutt of Muenster Botanic Gardens in Germany, who has recently completed an MSc Thesis on Hoyas of Borneo, has added to this information pool. She is currently collaborating with the author in producing an *Introductory Pictorial Guide* for the Hoyas of Sabah.

With the recent naming of new species found in Sabah we have at least 25 named species with a further 20 to be named.

The species thought to be endemic to Sabah, and Borneo include, *Hoya kloppenburgii*, *Hoya callistophylla*, *Hoya erythrostemma*, *Hoya glabra*, *Hoya waymaniae*, *Hoya telosmoides*, *Hoya lambii*, *Hoya clemensorum* and *Hoya spartiodes*.

Anthony Lamb
Horticultural Advisor to the Gardens

(This article is based on a talk given at the Gardens on Friday, 19th Sept 2002)



Hoya kloppenburgii, another recently described species from heath forest in Sabah with extraordinary flowers, is named after Dale Kloppenberg who has spent much of his life studying and describing Hoyas.

A. Lamb

Hoya species from East Malaysia – Sabah

- | | |
|--------------------------------------|--|
| 1) <i>H. callistophylla</i> T. Green | 14) <i>H. lasiantha</i> (Blume) Korth. Ex Miq. |
| 2) <i>H. campanulata</i> Blume | 15) <i>H. lucunosa</i> Blume |
| 3) <i>H. clemensorum</i> T. Green | 16) <i>H. lambii</i> T. Green |
| 4) <i>H. coriacea</i> Blume | 17) <i>H. meredithii</i> T. Green |
| 5) <i>H. coronaria</i> Blume | 18) <i>H. mitrata</i> Kerr |
| 6) <i>H. cumingiana</i> Decne | 19) <i>H. multiflora</i> Blume |
| 7) <i>H. diversifolia</i> Blume | 20) <i>H. scortechinii</i> King & Gamble |
| 8) <i>H. erythrostemma</i> Kerr | 21) <i>H. spartiodes</i> (Kunze) Kloppenburg |
| 9) <i>H. finlaysonii</i> Wigh | 22) <i>H. telosmoides</i> R. Omlor |
| 10) <i>H. fraterna</i> Blume | 23) <i>H. vitellinoides</i> Bakh. F. |
| 11) <i>H. glabra</i> O. Schwartz | 24) <i>H. verticillata</i> (Vahl) G. Don |
| 12) <i>H. imperialis</i> Lindl | 25) <i>H. waymaniae</i> Kloppenburg |
| 13) <i>H. kloppenburgii</i> T. Green | |

Rare Finds in



Robert Teo

A large specimen encountered at Endau Rompin National Park, Malaysia. It was later released.



Nick Baker

A juvenile specimen.

The Malayan Giant Frog or Blyth's Frog (*Limnonectes blythii*) is our largest indigenous frog; the males grow up to 26 cm from snout to vent. It lives in forest streams and pools and was believed to exist only within the Bukit Timah and Central Catchment Nature Reserves until recently.

In 1999, sightings of this rare frog were reported from a stream in King Albert's Park, and most recently, in 2002, it was seen also in the Gardens. My avid naturalist friend, Nick Baker, was on a nature ramble one night, when he spotted eight frogs at the marsh pond by "the Dell". Another was found at the nearby Tyersall Woods. From photographs taken, those frogs were confirmed to be *L. blythii*.

Frog in the Dell

The "Dell" is a little known part of the Gardens, sandwiched between Swan Lake and Lawn G. A stream flowing from nearby Tyersall Woods runs through it and eventually empties into the Lily Pond and Swan Lake. Although the vegetation has been heavily disturbed, as evidenced by the large number of exotic species, the stream habitat must have remained suitable for the population of *L. blythii* to survive.

In Peninsular Malaysia and perhaps in Thailand, locals eagerly collect *L. blythii* for food. The sight of their muscular legs must no doubt work up an appetite in

some. Thankfully, the frogs in the Gardens will be spared this unfortunate fate.

There has been much debate over the taxonomy of *L. blythii* due to the great variation in external features of the frog. Many believe it to be a complex of two or more species. In fact, *L. blythii* was itself known as *Rana macrodon*, together with *L. malesianus*, until 1984, when the two species were differentiated. Furthermore, the species previously known as *L. blythii* in Borneo is now *L. leporina*. The population in the Gardens would be important to research in this area.

More surveys are needed to determine what other treasures are hidden in the Gardens, which was once covered with lush primary rainforest and teeming with wildlife. At least two species of animals were first described to the world from specimens collected from the Gardens! The Singapore or Ridley's Roundleaf Horseshoe Bat (*Hipposideros ridleyi*) was described in 1911 from a specimen collected by H.N. Ridley, while the Harlequin Rasbora (*Rasbora heteromorpha*), a popular aquarium fish, was described in 1902 from specimens collected from the Gardens and elsewhere in the region. Could they be still around in the Gardens?

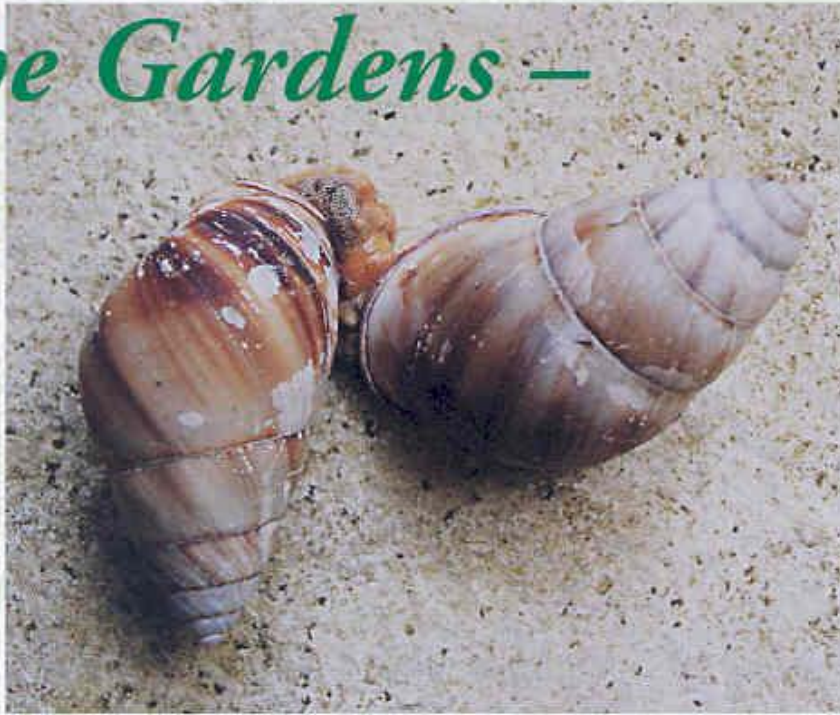
Robert Teo
Pulau Ubin Branch



Nick Baker

Limnonectes blythii from the Gardens. A matured specimen.

the Gardens –



Two *Amphidromus inversus* mating on the wall.

An Arboreal Snail

Most snails in the Gardens are pests and are therefore bitterly pursued, poisoned, or crushed underfoot. One species, however, is a valuable part of the local biodiversity. *Amphidromus inversus* (Mueller, 1774) is rarely seen because it lives up in the trees and shrubs of the Gardens' Rain Forest. It probably feeds on algae and other soft plant materials. After abundant rainfall, the animals come down and can be seen scraping lime off the wall at the back of the Aroid Garden. They need this to build their shells, but as soon as the area dries up the snails disappear again.



Two shells of *Amphidromus inversus*.

Snail life up in the trees is hazardous. Birds like them for a snack, but even without them around, the snails occasionally lose their foothold and fall down. Their shells are often badly damaged in the process, but the animals are able to repair them, even if the whole top is missing (see photograph). Although empty shells are rarely seen on the forest floor, the population seems to



Ouch, that hurts: successful repairs on a shell after falling down.

be substantial; half a year ago, a falling forest tree sent at least eight adults and various juveniles to the floor. Animals brought down by falling trees may need to be collected and released in some dense vegetation. This would save their lives, because they dry out and die when exposed to sunlight.

Little is known about the species' habits. Related species elsewhere build hanging nests for their eggs by folding tree leaves together. It could be interesting to observe the nesting habits of our *A. inversus*.

Amphidromus inversus has been recorded from northern Sulawesi, Borneo, Sumatra, Peninsular Malaysia, Thailand, Cambodia and southern



The wall near the Aroid Garden. Some marks are caused by snail grazing, others by circular growth patterns of algae.

Vietnam (under various names). However, the records are few and far between as it is rare and occurs in isolated populations. The Gardens' population is possibly native and adds to the biodiversity of its Rain Forest. The species therefore deserves protection.



The shell of the pest species *Achatina fulica*.

Our population is safe. The only real threat arises from confusion with the pest species the Giant African Snail, *Achatina fulica* (Bowdich, 1822). The two species are superficially alike, which could tempt a gardener to mete out capital punishment to an *Amphidromus* that does not deserve such treatment. The two can be distinguished fairly easily; adult *Amphidromus* has a thickened rim around the opening of the shell, whereas in *Achatina* this is always thin. *Amphidromus* is also smaller, and has a slightly different colour pattern. Once aware of the differences, it is not difficult to tell the two apart.

J.J. Vermeulen
Herbarium

“Kinabalu Diary & Orchid Determinations”

C. E. Carr's Kinabalu Field Diary

Outside the world of orchids, Cedric Errol Carr's botanical legacy is not widely appreciated because he died prematurely of blackwater fever in Port Moresby, Papua New Guinea, in June 1936. Almost nothing has been written about him, even his obituary is extremely brief and not entirely accurate [1]. With reference to his 1933 expedition to Mount Kinabalu, questions have been raised about whether he ascended to the summit [2] and how many species of orchid he collected [3].

Carr's Diary

It was therefore exciting when recently his field diary came to light in a box of fungal specimens that were being unpacked for curation [4]. The diary is written in his characteristic neat and tiny hand more comfortably read with a magnifying glass and records on a daily basis where he collected and camped, the altitude, observations on the vegetation and plants he collected, the weather, supplies and food and the ailments he suffered. The diary itself, the 1933 Letts Indian & Colonial Diary, provides a fascinating glimpse of the past in the types of information it provided – Indian Stamp Duties; Times of sun rises and set in Delhi, Calcutta, Madras and Bombay; the Moon's Phases (add 1.5 hours for the Straits Settlements); High Water at London Bridge; and the dates of eclipses, amongst other things.

“In the afternoon everyone was much intrigued by a partial eclipse of the sun. The whole left half of the sun was obliterated and I had Mayandy smoke a bit of glass so that the sun could be easily observed. It was a magnificent sight” (21st August 1933)



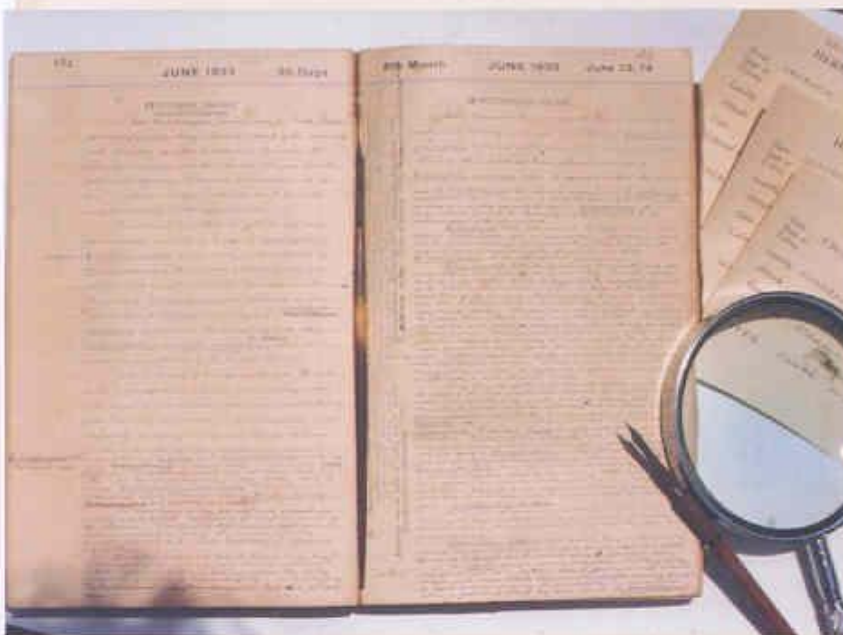
Carr on the Gunung Tahan Expedition.

Carr's Life

Carr was born in New Zealand in 1892, his family moving to England in 1899. In 1913 he came to Malaya as a rubber planter, first in Malacca and then in Tembeling, Pahang. Even as a youth in

England, he had developed a great interest in orchids and this blossomed with the wealth and variety of orchids in Peninsular Malaysia [1].

The Tembeling area in those days was a sea of lowland forest with Gunung Tahan, the highest mountain in Peninsular Malaysia, beckoning in the distance. There he took to collecting seriously and made meticulous notes and drawings on the colour, form and patterns of flowers and preserved the flowers in spirit (in gin actually) to retain their 3-D structure. He also set up an orchid garden where sterile plants he encountered in the forest could be grown and flowered and where he could observe pollination [5]. Holttum [1] says he cultivated 400 species in his garden. He was ably aided by his Tamil servant, Mayandy, who looked after the living collection and helped him prepare herbarium specimens and who accompanied him on the Kinabalu expedition and later to New Guinea and who was instrumental in bringing the New Guinea specimens safely back to Singapore after Carr's death. In the rainy season, when rubber could not be tapped, Carr spent his time writing scientific papers on the new orchid species he had discovered. He is credited with adding a



Carr's diary in his tiny hand with the fine-nibbed dip pens. Note the handle of one is a porcupine quill.

Abah Kimo

R. E. Holttum





Carr on a collecting trip at Sungai Sehill, Johore.

hundred species to the orchid flora of the Peninsula [1].

It was only natural that his interest in orchids should have come to the attention of R.E. Holttum, Director of the Botanic Gardens and author of the *Flora of Malaya* volume on orchids and a fruitful collaboration resulted with BG staff botanising in the area (he climbed G. Tanah with Holttum, and E.J.H. Corner twice visited to collect fungi in the Tembeling area). In return, Carr visited the Botanic Gardens to use the library and the Herbarium and to publish his results in the *Gardens' Bulletin*.

The Kinabalu Expedition

E.J.H. Corner

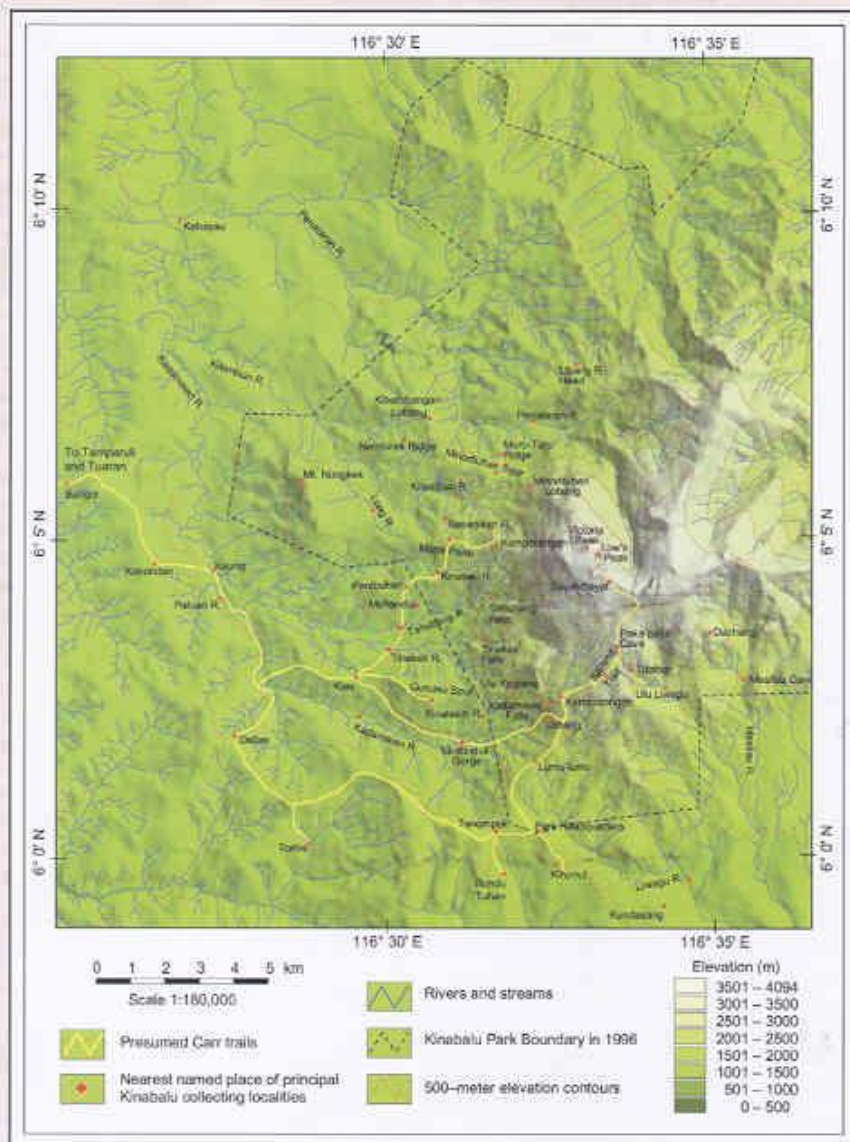
When he lost his job in 1931 during the Great Depression, the Botanic Gardens temporarily employed him to spend seven months (February to August 1933) collecting on Mt. Kinabalu, the highest mountain in Borneo; where the indefatigable Chaplain and Mrs Clemens were mounting a 2-year expedition (August 1931- December 1933).

"At 3.30 pm Chaplain and Mrs Clemens paid me a visit and had tea, Mrs C using my cup and the Chaplain and I a cigarette tin each" (6th March).

"Clemens paid a visit before midday. He has been burnt out of his camp on the Kibombong river and came in search of clothing and blankets. I let him have 3 blankets (my new one from Tasmania) for which he insisted on paying \$7.50 and he also paid me \$1 for my old mosquito net" (23rd Aug).

Carr's Kinabalu Notebook

For this expedition, he kept a notebook, which is in our library archives, in which he made detailed descriptions of the colour patterns of flowers he collected. This notebook is particularly important because Carr used two numbering systems. His own for orchids, which included a spirit specimen, starting on Mt. Kinabalu at 3001 and ending with 3771; the other was the Singapore Field Number (SFN) that was used for all herbarium specimens including both orchids and non-orchids and ran from 26251 to 28059. In the notebook he gives his number at the top of the description and at the bottom in brackets the SFN number, which does not run consecutively because it includes other non-orchid species. This notebook is therefore vital for matching the correct description and spirit specimen with the herbarium specimen that has the SFN number [6].



Gunning Kinabalu showing the route that Carr took.

Produced courtesy of Royal Botanic

Carr's Kinabalu Field Diary

The existence of the field diary was either unknown or unread, buried as it was in the Herbarium, but it provides answers to the questions about his route and what he collected, as well as providing an insight into how he lived and worked on that magnificent mountain.

The Itinerary

Unlike the Clemens, he recorded the locality and altitude accurately so that it is possible to retrace his route up the west side of the mountain. From the port of Jesselton (Kota Kinabalu), he drove to Tuaran and from there he continued on foot, a four days' walk eastwards to the mountain. This was an arduous climb frequently ascending over 1,000 feet a day until he reached Mahandui, where he built his first camp. From here he made forays up the mountains following the routes pioneered by the Clemens. From Kiau, he took three routes up the western flanks of the mountain: north to Marai Parai via Penibukan; east along the Gurulau Spur; and southeast to the Minitinduk Gorge. From Tenompok he climbed up the Summit Trail via Lumu-Lumu, Kamburough (where the radio station now stands), Paka-Paka Cave and as high as Sayat-Sayat at 12,000 feet altitude. It is clear that he made no attempt to ascend to the summit, instead spent his time searching for orchids in cracks on the granite dome.

"The afternoon was bitterly cold and we were all glad to huddle up beside fires. Wearing a vest, shirt, flannel trousers, a sweater and a blazer I was still bitterly cold away from the fire" (20th June).

But in fact most of his time (more than five months) was spent at lower altitudes outside the present Kinabalu National Park boundary, although Tunggal and Mongoon recollected at higher altitudes. Carr found the Tenompok area extremely rich in species and his collections are now doubly valuable in view of the subsequent widespread forest disturbance outside the Park.

Besides Mayandy, he had 'Keah' (Kiah Haji Salleh, plant collector from the Singapore Herbarium) with him until 13th May. He employed two local Dusuns – Tunggal 'a very good climber' and Mongoon 'not a very good climber but speaks pretty good Malay' (2nd March). Later he was to say that "Mongoon is easily the best man I have ever had in the field" (2nd Aug).

At the end of the expedition, 30 carriers were needed to transport the plant

specimens and camping gear off the mountain. In those days, carriers were paid 40 cts a day. A loose sheet in the diary lists the names of the 29 Dusun carriers, Mongoon being the 30th.

Life in Camp

Where possible he would buy local produce which in those days cost 25 cts for a fowl, 1 ct for an egg, rice was 20 cts a gantang [1 gantang=1.5 kilos], 1.25 gantangs of new potatoes cost 30 cts, 28 bananas 5 cts, a papaya 1 ct and large yellow mangoes 5 for 1 cent!

"I secured 90 cheroots at 4 for 1 cent. The local cheroots are nice and quite mild but rather roughly made. I much prefer them to cigarettes which cost 1 cent each and they are far more satisfying" (2nd May).

Carr was much bothered by leeches:

"Mongoon has instructed me in two Dusun methods of killing leeches! One is simply to squeeze tobacco juice over them leaving them where they are. This is a very good method, very simple, and kills the leech inside a minute. The other method is to cover the leech with hot ashes from the camp fire or the fire in the house, a method which is especially effective. Most of the local Dusun carry a plug of cut soaked tobacco for this purpose. Personally, I use the more primitive, longer and more messy way of cutting the leech in two with my parang!" (17th April).

"I had soaked my canvas shoes in cigar juice and did not pick up a single leech all the way from Lumu-Lumu to Tenompok" (23rd June)

Before the days of antibiotics and malaria prophylaxis, field work could be hazardous and Carr had to endure complaints from time-to-time – "An attack of subtertian malaria fever. I dosed myself with quinine and kept covered up in bed" (10th March); "Fever again commencing with very violent shivering. Dosed myself with quinine and turned in" (30th March); "laid up with a poisoned leg" (27th April) and "My right knee still bad but answered to treatment with hot compresses" (3rd May).

The greatest danger he faced was when he was attacked by a swarm of Giant Honey Bees: "Just before reaching the bridle path I was assailed by a swarm of large honey bees. At first I lay down and kept still but they swarmed on me and I was stung many times. I then tried running, killing the bees as they settled and being stung many more times.

Coming on a small stream I threw myself into it and tried to keep the bees off by splashing but to no avail. After proceeding a further quarter mile the bees had thinned out a lot so I rested against the bank of the bridle path. The few remaining left me. (27th Feb). I was unable to proceed having a slight fever on account of some 50 or 60 stings principally on head and ears" (28th Feb).

Remote from civilisation he depended on his staff for many things. "Being in much need of a haircut I got Mongoon to do it. He made a good job with only a pair of scissors sharpened on a stone and says he was doing this work for 7 years presumably while he was in the police force" (5th April).

Carr's Plant Collections

As he was in the employ of the Botanic Gardens, the top and most complete set of his specimens are in the Singapore Herbarium, including the type specimens of new species.

Orchid Specimens

Confusion has arisen about the number of orchids he collected because two publications [1,7] state that he collected 700 species of orchids, but this cannot be correct as the most recent orchid checklist for Kinabalu [3] lists a total of 771 orchid species for the mountain. Unfortunately, due to his premature death, Carr published only a single paper [7] on his Kinabalu collection, which included 137 species of which 39 were new including a new genus *Neoclemensia*. From his orchid notebook, it is clear that he collected 770 specimens [6], of which 671 representing 372 species and varieties are recorded in the checklist [3]. The quality of his collecting is shown by the fact that he collected more species and varieties of orchids from Mt Kinabalu than anyone else and that a large number of orchids he collected have never been collected again – 57 of the 210 species collected only once [3].

His *modus operandi* for collecting orchids was to send out his Dusun staff to cut down trees, which he could then scour for orchids. If the tree was too large, he sent Tunggal up to cut off the branches. He records that the largest tree they found was 9.5 feet in diameter measured at 5 feet from the ground, and was estimated to have a height to 150 feet. Using creepers, Tunggal climbed up to the first branch 80 feet above the ground and cut down three branches.

Plants that were in bud or sterile were taken back to Tenompok, where the Clemens had built a small thatched house,

Two new orchids described by Carr.



Hubenaria setifolia Carr.



Trichoglottis smithii Carr.

and cultivated there, until there were 'many hundreds of plants' in his orchid garden (22nd May). The wealth of species it contained can be seen from the 60 flowering specimens that the Clemens were able to gather in November and December 1933 after he had left [3].

"Clemens was very struck with my living collection and most pleased when I told him that most of this would be left behind by me. The idea of growing sterile plants until flowering material can be obtained appeals to him and he will probably work on these lines in future" (15th May).

He also trained his staff to recognise the different orchid species and sent them back at different times to secure more, especially of flowering material. At Tenompok, villagers brought in interesting species from the surrounding forest for which he paid them between 10 to 30 cts to secure more, but at Koung he was constantly interrupted by villagers bringing him "common unwanted things".

The last few weeks he spent at Tenompok writing up descriptions and making drawing of new species (he listed 65 as new species in his diary) using his microscope to examine the flowers in detail. He also labeled and numbered species as they flowered in his orchid garden or were brought back from Mongoon and Tunggal's forays further afield.

Non-orchid collection

His outstanding work on orchids has overshadowed the importance of the total collection he made. Unlike the Clemens, he did not collect in bulk nor duplicate collections of ferns and monocotyledons that had been the focus of earlier Singapore expeditions by Holttum and Furtado, respectively. For Corner he made a special study of figs, noting particularly the colours of the figs as well as preserving their fruits in spirit, with the result 13 new species have his specimen as the Type. One fig is named in his honour, *Ficus carri* Corner, as is a rhododendron relative, *Diplocosia carrii* Sleumer. In addition, at least another ten species have been based on his collection as the Type (see box). He collected many more species

New non-orchid species described from Mount Kinabalu for which Carr's collection is the type specimen

Alphonsea kinabaluensis J. Sinclair Carr SFN 26931
Argyria discolor Oostbr. Carr SFN 26872
Chionanthus sabahensis Kiew Carr SFN 27170
Diplocosia carrii Sleumer Carr SFN 26975
Erycibe kinabaluensis Hoogl. Carr SFN 27115
Ficus barba-jovis Corner Carr SFN 27305
F. brunneovirata Corner Carr SFN 26608
F. carri Corner Carr SFN 27839
F. cereicarpa Corner Carr SFN 26613

F. dens-echini Corner Carr SFN 26807
F. eumorpha Corner Carr SFN 27566
F. leptocalama Corner Carr SFN 26829
F. leptogramma Corner Carr SFN 27328
F. midotis Corner Carr SFN 26324
F. palaquifolia Corner Carr SFN 27413
F. rubrocuspudata Corner Carr SFN 27323
F. subsidens Corner Carr SFN 26443
F. tarrenifolia Corner Carr SFN 27510

F. tulipifera Corner Carr SFN 27703
Lindera kinabaluensis Kosterm. Carr SFN 26578
Lithocarpus porcatus Soepadmo Carr s.n.
Racemobambos rigidifolia Holttum Carr SFN 27438
Ryparosa baccareoides Sleumer Carr SFN 26910
Staurogyne kinabaluensis Bremek. Carr SFN 26322
Tristriopsis ferruginea Leenh. Carr SFN 27276

that were new and which were used for describing new species although they do not have his specimen as the Type.

In spite of his early death in the service of botany, his contribution to the botany of the region is significant both in terms of the number of rare and interesting plants he collected and the number of new orchids he discovered and described.

Postscript

After the Kinabalu Expedition, he was employed at Kew for 4 GBP a week for six months during which time he worked up several other collections of orchids. Lists of these are found at the end of his Kinabalu field diary. The last entry on a loose piece of paper is dated 5th November 1934 and is written as he was about to leave Singapore for Papua New Guinea. In his brief time there he amassed a large number of collections (7,000), many of which have proved new to science and in recognition of the value of his collecting at least 25 New Guinea species are named in his honour.

The Kinabalu field diary was found together with pocket diaries for the years 1922, 1923, 1927, 1929, 1930, 1931 and

1932, which have notes on the seasonality of orchid flowering. There are also notebooks with detailed flower descriptions for his Brastagi trip in 1931 and the New Guinea Expedition in 1936 and others made at Earl's Court in March 1930. The backs of a large quantity of used rubber trans-shipment cards were used for 'Colour notes on orchids 1929-1931'. Lastly, there are several packets of photographs, including one with negatives completely stuck together. Most are not labeled, but of interest is one set annotated in Holtum's hand from their ascent of Gunung Tahan and another in Corner's hand on their trip to the Sedili River, Johore.

Most poignant among them is a series of a small boy, John Eschott Carr, b. 1923,

shown as a toddler in a bungalow with rubber trees in the background and later as a schoolboy. (Eschott was an estate in Negri Sembilan that Carr owned). One of the letters that Carr received on Kinabalu was from Stella about John's school fees and another enclosed letters from John. The obituary [1] is silent about Carr's family life but presumably Stella was the wife who left him and John, his son.

Acknowledgements: I am greatly indebted to John Beaman for advice and information on collecting localities on Gunung Kinabalu and to Reed Beaman for producing the map.

Ruth Kiew
Herbarium & Library

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C. E. Carr's Itinerary

(spelling follows Carr's diary. Modern spellings are shown in brackets. Localities in bold are those within the present Kinabalu National Park)

1933

February

18 sailed from Singapore
20 Kuching
21 Miri
22 Labuan
23 berthed at Jesselton (Kota Kinabalu)
24 Tuaran
25 Kapa
26 Kalawat
27 Koung (Kaung)
28 Koung

March

1 Kimu
2 Mahandui
3 Penibukan Ridge
4 Penibukan Ridge
5 Dahobang River (Tahubang River)
6 Ulu Mahandui
7 Penibukan Ridge 4600'
8 Ulu Dahobang c. 3000'
9-12 Mahandui
13 Penibukan Ridge
14 **Marei Parei (Marai Parai)**
15 Mahardai
16 Kiau
17 Gurulan & Ulu Kagitang 4600'
18 Menetendok 2700' (Minitinduk)
19-21 Menetendok Gorge
22 Kinataki Divide 4000'
23 Menetendok River
24 Kuala Sahat
25 Kuala Serab
26 Kulapis River (Kolopis River)
27 Lobang 4500'
28 Ulu Kegang 4500'
29 Menetendok/Kinataki Divide 3500'
30-31 Kintaki Stream

April

1-3 Kintaki Stream
4-6 Tenompok
7 Bundu Tuhan & Ranau bridle paths
10-11 Ranau bridle path 4800'
12 **Main Spur below Lumu-Lumu 5200'**
13 Bridle path to Ranau 4800'
14 **Main spur to Lumu-Lumu 5200'**
15 Bridle path to Ranau 4800'
16 **Main spur above Tenompok 5200'**
17 Tenompok 5000'
18 **Main spur below Lumu-Lumu 5200'**
19 Bridle path above Bundu Tuhan 4500'
20-23 Tenompok 5000'
24-25 **Main spur below Lumu-Lumu 5200'**
26 Upper Kulapis & Upper Kinanut (Kihunut) valleys 4000-4300'
27 Tenompok/Dallas bridle path 4000'
28 Upper Kinanut valley c. 4000'
29-30 Bridle path to Bundu Tuhan c. 4500'

May

1 below Tenompok 4500'
2 Bundu Tuhan 4200'
3 below Tenompok 4700'
4 below Lumu-Lumu c. 5200'
5 Tenompok
6 below Tenompok 4500'
7-8 Koung 1300'
9 Dallas 3200'
10 Koung 1300'
11-12 Paluan River 1600'
13-19 Koung
20 Kokohitan 2500'
21 Dallas
22-24 Tenompok
25-31 **Marei Parei 5000'**

June

1-3 **Marei Parei 5000'**
4-5 Kamborangah 7200' (Kemburongah)
6 **Main spur 7000-9000'**
7 **Tibabah River 7000' (Tibabar River)**
8 Pakka Cave 9000-10,000'
9-11 **below Kamborangah 6000'**
12 Kadamaian River 6000'
13 Pakka-Pakka 10,200' (Paka-paka)
14 Sayat-Sayat 12,000'
15 Ulu Liagu 10,500' (Ulu Liwagu)
16-17 below Pakka-Pakka 9000'
18 Kamborangah 6000'
20-22 Kadamaian River c. 6500'
23 **Kamborangah 7200'**
24-30 Tenompok 5000'

July

1-20 Tenompok 5000'
21 Bundu Tuhan 4500'
22 Kampung Thanis 4800' (Kampung ?Tomis)
23 Ulu Kulapis 4500'
24-31 Tenompok 5000'

August

1-3 Tenompok 5000'
4 Penokok River 3500' (Tinekek River)
5-25 Tenompok
26 Dallas
27 Kelawat
29 Tuaran
30 Jesselton
31 Labuan
September
1 Miri
2 Kuching
4 Singapore

The Herbarium Moves ... Again!

Like a snake, as the Herbarium grows there comes a point when it must shed its old skin and occupy a bigger one. In the history of the Singapore Herbarium, this has happened four times. In 1882, the Herbarium and office shared a 650 sq ft building which cost \$1,500 to build and \$500 to enlarge in 1889. The first separate Herbarium was built in 1905 by H.N. Ridley to house the collection that he and his predecessor, N. Cantley, had amassed. It was a single storey building with a rustic appearance created by the roughly finished Tembusu trunks that supported the verandah and the criss-cross verandah palings. However, it was never satisfactory as it was repeatedly recorded as being gloomy and damp.



On the left, the original 1882 office-cum-Herbarium, now called Ridley Hall. Distant right, the first single-storey Herbarium built in 1905. This photo, dated 1922, shows the simple tiled roof that replaced the original ornate one.

After twenty five years, the collection had outgrown its old 'skin' and in 1930 a new two-storey Herbarium was built on the same site. This followed the Kew design where the upper floor consisted of a gallery surrounding a central open space. The gallery was used for the Gardens Herbarium (plants grown in the Gardens), the spirit collection (specimens preserved in an alcohol mixture) and museum specimens. However, the collection grew and in 1954 the floor was extended over the open space so that more cupboards could be fitted in to accommodate the accumulation of herbarium specimens. Also in 1954, a small building was erected behind the Herbarium to house the spirit collection, which because of the alcohol, is a fire risk if kept in the Herbarium itself.

Drama occurred in 1963 when cracks in the walls were widening at an alarming rate. The Public Works Department was called in and immediately condemned the building as unsafe. The Herbarium was given three weeks to evacuate as the building was in danger of collapse.



The second two-storey Herbarium built in 1930.



The separate annex for the spirit collection built in 1954.

To facilitate the removal of the heavy cupboards, the cupboards complete with the specimens inside were winched down to the ground floor. Mohd Shah remembers the move. It was backbreaking work that took four

men to lift a single cupboard onto the lorry and three weeks to complete the move. The collection was split, most being temporarily housed in the Botany Museum of the University of Malaya with some in the National Museum.



Winching down the herbarium cupboards in the 1963 move. Note the floorboards, which show where the centre open space was covered over in 1954.



The teak herbarium cupboards needed four men to lift one.

Burskall Collection

Thirty years later it was the same story – the collection had expanded, all the cupboards were packed tight and there were about 50,000 specimens packed away unsorted in boxes. To file these specimens into their appropriate place in the main collection, innovative thinking was necessary, especially in view of the impending double move as again the new Herbarium is to be built on the same site. I remembered Professor C.G.G.J. van Steenis, late Director of the Rijksherbarium (which had moved two or three times in its recent history), telling me that he had introduced a system of housing herbarium specimens in specially designed boxes that could be stored on open shelves. These boxes are multipurpose: they have the advantage that they protect specimens when they are being carried about (ideal for the double move); allow flexibility as it is easy to add a new box to accommodate new additions to the collection or to rearrange the collection (for example, when genera change their names); and, of immediate importance, they could double up as shelves on top of the existing cupboards.

With a supply of these Leiden-style boxes, we could tackle the unsorted specimens, the boxes acting as additional shelves stacked on top of the appropriate cupboards. This enabled us to incorporate the backlog of 50,000 specimens into the main collection. Gradually over more than a year, all the specimens were transferred into boxes ahead of the move.

In getting ready for the move, the herbarium staff put their heads together to plan in detail how to effect the move with maximum efficiency and minimum damage. Mohd Noor suggested that the boxes be tied together in threes to prevent them from being thrown around or muddled up but would not be too heavy to lift. With the full co-operation of the team, this was done taking the opportunity to re-arrange the families to follow a modern system (Mabberley, *The Plant Book*), which takes into account evolutionary relationships, modern family concepts, and information from molecular biology. (The Herbarium was previously arranged according to Bentham and Hooker's *Genera Plantarum*, 1862-1883). Meticulous planning was also required as we were moving into a smaller space, a disused gymnasium. The position of the shelves was calculated and recalculated to within an inch and the positions marked on the floor. There would be no space for storing and then sorting the boxes later; they had to go straight onto the shelves in the correct order. After more than six months of solid work – labelling the boxes, tying them in threes and seeing they were in the right order – we were ready for the move, all 650,000 specimens in 10,000 boxes.

Would it be possible to complete the move in the five days allocated? While two of us supervised the moving of boxes into the lorries, the other eight members of the team with some extra help waited as a row



The third three-storey Herbarium completed in 1964.

Burskall Collection



The Herbarium expanded into the top floor of the new office and library building in 1968.

Burskall Collection



The Leiden-style herbarium boxes functioning as extra shelves as the Herbarium is once again full to bursting in 2001.

Tim Allen-Hew

of shelves was set up, then quickly checked the order of boxes, formed a human chain and put them on the shelves before the next batch came. With 10,000 boxes, it gave new meaning to the term 'repetitive arm syndrome'!

Speedy does not adequately describe the movers. They quickly erected chutes from planks so that the herbarium boxes, cupboards, tables, etc could be heaved out through a window and slid down from the upper storey. An eagle eye was essential to prevent the boxes from literally being thrown out of the window, turned upside down or even stood on. The movers referred to the specimens as 'leaves' and could not grasp the idea that they were of any value at all. The move was completed by midnight on the fifth day and three days later the collection was all in order and fully operational, which says a lot not only for the careful and accurate planning by the staff but also for their hard work and stamina too. And the Leiden-style boxes proved their worth although a few were squashed on one side, the specimens inside were not damaged. Without them, the specimens would have been smashed to smithereens.

Although we are cramped in our new quarters with minimal working space, the gym is a significant improvement on the



In September 2002, the Herbarium moved to temporary quarters in a vacant gymnasium adjacent to the Gardens.

old Herbarium as it is air-conditioned, has fire protection, is arranged following a modern system of plant classification, and the previously unsorted specimens are finally incorporated.

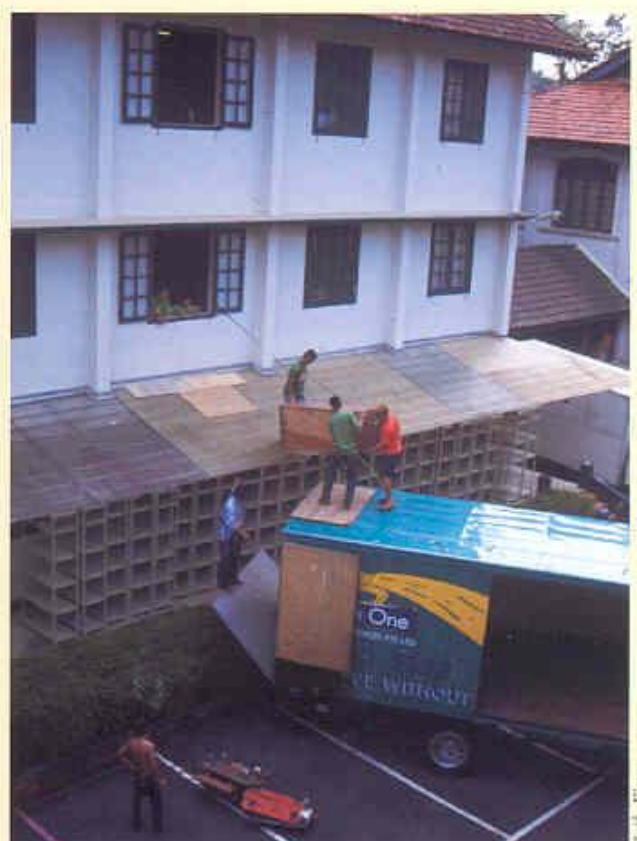
Now we watch with great interest as the new state-of-the-art Herbarium is being built on the old site. It will be spacious, have compactors to accommodate the

expanding collection, controlled environment and modern prep rooms. Are we looking forward to moving in 2005? Perhaps, like childbirth, the pain of the move will be forgotten in the excitement of the birth of the new Herbarium, the Gardens' fifth.

Ruth Kiew
Herbarium & Library



The improvised chute speeds the move of the herbarium collection. Note the herbarium boxes tied in three's to minimize damage.



The window provides a short-cut for removing the herbarium cupboards.

AROUND THE GARDENS

Christmas Fiesta



Galore of Christmas goodies on sale.

The Gardens organised its Christmas Fiesta on 1 December 2002.

Plants associated with Christmas decked the Visitor Centre. Christmas wreaths made from willow and decorated with various species of *Araucaria* cones and fruits of the *Licuala grandis* lined the walkway to the Visitor Centre. Mistletoe (*Viscum album*) was strategically hung at the entrance. A *Douglas fir* Christmas tree took centre stage at the Visitor Centre. An exhibition was set up featuring Christmas plants such as holly (*Ilex aquifolium*), ivy (*Hedera helix*), mistletoe (*Viscum album*) and poinsettias (*Euphorbia pulcherrima*). Workshops on Christmas Dish Gardening and Christmas Terrariums were organised.

Story-telling was held under the shade of the grand Tembusu (*Fagraea fragrans*) tree at Palm Valley. Sitting on picnic mats under the beautiful tree, children and

parents alike were transfixed by stories from around the globe.

A wonderful mix of stalls lining Lower Palm Valley Road lent to a unique shopping experience. Orchids from our National Orchid Garden were greatly sought after and the Orchid Garden staff were on hand to advise on the care of the plants. Other plants such as bromeliads, ferns, Kalanchoes, and Calatheas were also on sale by a nursery. Beautiful hand-painted linen aprons with floral motifs, lovely porcelain ware, interesting wine covers with angel wings, and unique clocks were some unusual and charming gifts sold. Hand-crafted Christmas ornaments and bamboo nativity sets added to the interesting mix. Children and parents alike were delighted by the colourful stall selling children's costumes. Imaginations flew as children dressed up as Harry Potter, a princess and even as a little Christmas tree. For rumbling stomachs, Turkish kebabs, hotdogs, hors d'oeuvres, specialty sandwiches and premium ice cream more than satisfied the palettes. Fine wines, imported beers, frappe mochas, sparkling drinks were the perfect accompaniment.

The National University of Singapore (NUS) choir kicked off the evening entertainment with its repertoire of Christmas evergreens. A special appearance by Santa Claus on



Santa Claus was a hit with the kids.

stage drew gasps of delight from the children. As Santa, his elf and two Christmas fairies made their way down stage, children from all over Palm Valley ran towards Santa. Seeing, and being photographed with Santa was clearly the highlight of the day for many. The evening ended on a high note with the NUS Jazz Band's special repertoire of jazz favourites and its rendition of Christmas classics.

The Christmas Fiesta in the Gardens was truly a lovely way to get infused with the Christmas spirit. This will be a regular event our visitors can look forward to each Christmas season.

Camille Foo Visitor Services



The NUS Choir serenaded the crowd with its rendition of Christmas evergreens.

TRAINING UPDATE

By popular demand, the 7th run of the training module on "Developing & Managing a Garden City" was conducted in August under the Singapore Co-operation Programme of the Ministry of Foreign Affairs. The 2-week programme was attended by 30 foreign participants from 26 developing countries – Antigua and Barbuda, Bahrain, Brunei, Egypt, Fiji, Ghana, Guyana, Jamaica, Jordan, Kiri Bati, Lebanon, Lesotho, Maldives, Mauritius, Mongolia, Myanmar, Nepal, Nigeria, Oman, Pakistan, People's Republic of China, Philippines, Seychelles, Sri Lanka, Thailand and Vietnam.

A short course on "Turfgrass Management – with emphasis on school fields" was conducted for 20 grounds and estate supervisors from the Ministry of Education in November. Participants of the 4-day programme found the training with a

balanced mix of classroom instructions and field observations, beneficial.

Training was carried out in October to qualify a pool of assessors and OJT (on-the-job training) instructors necessary to implement the National Skills Recognition System (NSRS). A mock assessment based on the "Skills Standard – Maintain plants" was conducted in November to familiarise recently trained assessors with the assessment process and to iron out glitches in operationalising the skills standard concerned. The latter was subsequently reviewed for final endorsement by the Industry Skills Standards Committee.

Foong Thai Wu
Nashita Mustafa
Training

AROUND THE GARDENS

Our 2003 Calendar

We officially launched the Gardens' 2003 Calendar, sponsored by ExxonMobil, at the Visitor Centre on 25 October. The ceremony was officiated by Guest-of-Honour Mr Lim Boon Heng, Minister (Prime Minister's Office).

The 2003 Gardens Calendar reflects the theme "Connecting Plants and People" through thirteen carefully chosen photographs of special places on its grounds that hold fond memories for many. With strong support from the government, the Gardens has in recent years added new attractions. New features continue to be created. However, such developments provide largely infrastructure and horticultural displays. To reach out to our visitors and to meet their needs and to remain relevant, the Gardens must also develop the associated software. The Gardens needs community outreach programmes such as events, exhibitions and publications.

The Gardens, as a public institution, cannot do this alone. While it engages the community, it also seeks the support of the community, corporations and



The launch by Guest-of-Honour Mr Lim Boon Heng, Minister (Prime Minister's Office). Also appearing on stage are, Mr Stan Tebbe, Regional Director of ExxonMobil Chemical Asia Pacific (second from left), Dr. Tan Wee Kiat, CEO of National Parks Board (far right); and Dr. Chin See Chung, Director of Singapore Botanic Gardens (far left).

individuals. The production of the 2003 Calendar sponsored by ExxonMobil marks an important milestone in our collaboration with corporate partners. Besides sponsoring the production of the calendars, part of the proceeds from the sale of the calendars will be given to the Gardens for its Public Exhibition Programme.

In addition, for every calendar sold, ExxonMobil will donate \$2 to Singapore's South West Community Development Council's Welfare Fund. This Fund supports needy families in the South West zone of Singapore. As an added bonus, the

government will match this donation with \$3 for every dollar given to the Welfare Fund.

The calendar project affirms the strong partnership between two like-minded organisations with the conviction that a difference can be made by reaching out and connecting to the community. We thank ExxonMobil, and in particular Mr Stan Tebbe, Regional Director of ExxonMobil Chemical Asia Pacific, for making this possible.

Wong Wei Har
Management & Development

STAFF NEWS

Abdul Hamid Hassan our Assistant Manager, Visitor Services, was awarded the Excellent Service Award (2002), Gold Award, by the Standards, Productivity & Innovation Board (SPRING Singapore). The award recognises individuals who have promoted quality service.

Hamid was also a finalist for the Tourism Host of the Year 2002 (Leisure Attraction), organised by the Singapore Tourism Board. This award honours individuals who have provided excellent service in the tourism industry.

Both awards are only conferred after stringent evaluations that include written and oral assessments as well as discrete monitoring of the nominees carrying out their daily work. We extend our heartfelt congratulations to Abdul Hamid for his achievements.

Chin See Chung



Abdul Hamid Hassan

EDUCATIONAL OUTREACH

School Holiday Workshops for Children



Arts & Craft with edible seeds and grains.

The biannual school holiday workshops for children were conducted once again in November 2002. Three full-day workshops were held for primary school students over two weeks. Two new workshops were designed, one focusing on palms for the lower primaries (Primary 1 to 3) and the other on herbarium for the upper primaries (Primary 4 to 6).

Participants of the workshop on palms had the opportunity to study ten different types of palms on an 1.5-hour tour, making observations on their growth habit, leaves, flowers, fruits and thorns. Palm parts were used in the arts and craft session later in the day, together with colourful edible seeds and grains.



Finished products from palm parts.

The older children were taken on a rainforest trek before visiting the Herbarium where they observed how living specimens were collected, pressed and dried before mounting onto herbarium sheets. They also practised making their own plant presses with living specimens collected earlier in the day. Subsequently, they mounted pre-dried specimens too.

Both workshops ended in a planting session. While the younger ones planted

edible plants (red beans, shallots, maize and chilli), each of the older ones made an open terrarium with plants commonly found in the undergrowth of rainforest.

If you had missed the last round of our popular school holiday workshops, do look out for the next run in the May/June 2003 school holidays.

Janice Yau
Winnie Wong
Seri Hayuni Hadi
Education Outreach



Hands-on in the Herbarium.



Proud owners with their mounted herbarium specimens.

THE SINGAPORE CONNECTION

In this new feature we will highlight plants bearing names that are of special significance to Singapore. These include plants named after Singapore, renowned botanists who worked in Singapore or after important Singapore personalities.

Bulbophyllum singaporeanum

This species was first described in 1896 by H.N. Ridley, director of the Gardens, 1888-1912, from a plant collected in Singapore. It was named *Bulbophyllum densiflorum* to reflect the form of the inflorescence where the flowers are densely arranged. The plant was recorded as an epiphyte growing on trees along rivers in the lowlands.

In 1911, R. Schlechter working in Berlin, changed the name because he discovered that prior to 1896, another species had been named *Bulbophyllum densiflorum*. He renamed the plant *Bulbophyllum singaporeanum* after Singapore where it was first found.

B. singaporeanum has since been found in Sabah (Borneo) growing on peaty leaf



Photograph taken of a plant in heath forest in Sabah, showing the inflorescence bearing densely arranged flowers.

litter in heath forest at 450 m elevation scrambling over fallen trees. Recently it was also reported from the central part of Sarawak (Borneo) growing as an epiphyte.

The species has a creeping rhizome tightly covered in sheaths. The pseudobulbs which are spaced about 10 cm apart are 5 cm tall. Each pseudobulb bears a single leaf about 30 cm long that is usually purple on the underside. The inflorescence produced from the base of the pseudobulbs bears flowers that are closely packed and that do not generally open wide. The flowers have a foetid smell and are fly-pollinated.

Anthony Lamb
Horticultural Advisor to the Gardens

NEW & EXCITING

Mauritiella armata (Ghost Palm)



The graceful specimen at Palm Valley.

Andrea Kee

Mauritiella armata is a very striking and elegant palm. The species is distributed widely along the banks of the Amazon River and its tributaries. Its habitat ranges from river margins to lowland rainforests usually at low elevations.

This palm has multiple, spiny trunks and can reach a height of 20 m. In mature specimens, the clustering stems are covered near the base with 1-3 cm long, stout, conical root spines. The leaves are large and palmate with leaflets that are waxy and silvery on the underside.

In its native home, this palm has many uses. The wood is made into slats while the leaves are used for thatching and baskets. Fruits are eaten or processed into a refreshing beverage.

This plant is prized for its elegant form and its silvery and graceful fronds. The Gardens purchased its specimens in 1997 from a specialist palm nursery in Hawaii. These lovely palms can now be viewed at Palm Valley and by the edge of Eco-lake.

Andrea Kee
Plant Resource Centre



Andrea Kee

Spines of modified roots arising from the stem of this palm.

FROM THE ORCHID SPECIES COLLECTION



Pecteilis suzannae, flowering in our cooled greenhouse. A spectacular species, but difficult to keep alive.



Liparis ferruginea; the flowers.



Dendrobium sp. (sect. *Aporum*), an unidentified species possibly new to science. Most other species of this group of *Dendrobium*s have tiny, inconspicuous flowers.

A two-year project to upgrade the Gardens' collection of orchid species is nearing completion. Orchid species growing scattered among hybrids in our nurseries have been gathered and housed in separate facilities. Much effort has been expended on accessioning the collection, and on databasing all available information on the plants.

With 3,600 accessions and some 1,100 different orchid species, the Gardens now possesses one of the most diversified, and certainly the best documented collection in the region. The collection is still growing through exchange of cultivated plants with other botanic gardens and private collectors. We also try to improve the facilities so that we can successfully grow more 'difficult' species.

When a plant flowers, we take photographs, preserve parts in spirit and make a herbarium specimen, and attempt to identify the plant. The collection and the documentation are invaluable for taxonomical and molecular research. Already, 25

species and 1 genus proved to be new to science. The collection is part of a pool of similar collections abroad, being used on a reciprocal basis by foreign scientists.

Ex-situ conservation is an important task of the Gardens. We grow rare and threatened species, and propagate them for distribution to other botanic gardens. We keep samples from threatened or extinct populations of orchids. For instance, we provide sanctuary to a re-located population of *Liparis ferruginea* from a swamp in Tampines, Singapore, now cleared for development. The plants are doing well in plastic-lined trays filled with water-saturated sand (a very unusual substrate for orchids in Singapore) and flowered recently.

The collection is a resource for experimentation and hybridisation. Attempts are also made to adapt wild species with horticultural potential to the less than favourable growing environment in our Gardens. Recently, a plant of *Pecteilis suzannae* flowered spectacularly. The species is not easy in cultivation, but our research laboratory is trying to create a hardier offspring of this beautiful orchid.

J.J. Vermeulen
Paul K.F. Leong
Herbarium



Liparis ferruginea in the shade house: *ex-situ* conservation of plants saved from a development site in Tampines.

TAXONOMY CORNER

The Red Banana

Name changes are very troublesome to gardeners and horticulturalists especially when they concern a well-known plant such as the red banana, *Musa coccinea*. Recently, some gardening books have given *Musa uranoscopa* as the 'correct' name for this banana. Taxonomy aims to stabilise names through careful and accurate examination of original publications and specimens and the case of the red banana shows how important this is.

The name *Musa uranoscopa* was published by Loureiro in *Flora Cochinchinensis* in 1790 but his description in latin is vague and what few facts he gave do not fit the red banana as it records the bananas as red (they ripen orange in the red banana) and it does not mention the unique characteristic feature of the red banana, namely the red



The red banana, *Musa coccinea* Andrews, in the Ginger Garden.

Ruth Kiew

bracts that do not fall off and that have in-turned edges. There is no herbarium specimen in the Loureiro collection that can be used to check which banana he was referring to. There are therefore no supporting facts for applying this name

to the red banana and so it is incorrect to use this name for it.

On the other hand, the description of *Musa coccinea* by Andrews in 1799 is accompanied by a beautiful colour plate showing the characteristic in-rolled, persistent red bracts that leave no doubt about the identity of *Musa coccinea* even in the absence of a herbarium specimen. So in this case, the widely used name is the correct one.

The red banana was introduced into cultivation in 1791 and has been popular ever since. You can see it growing in the Ginger Garden.

Ruth Kiew
Herbarium

Reference: G. Argent & R. Kiew. 2002. *Musa coccinea*. *The Plantsman*, n.s. 1: 103-105.

SPOTLIGHT ON ORCHID BREEDING & MICROPROPAGATION

Tissue-cultured plantlets for sale in the Gardens

The Gardens' Micropropagation Laboratory has been selling orchid plantlets since 1980 at its premises to visitors who become inspired after savouring the beauty and wonder of our orchid displays. Before 1996, orchid plantlets, cultured in the laboratory, were only sold in conical flasks, each containing a minimum of 10 plantlets.

Most tourists who visit the National Orchid Garden (NOG), come as part of conducted tours and are hard pressed for time to take in all the sights and certainly do not have the time to drop by our laboratory. To reach out to these visitors, we started in 1997 to supply orchid plantlets in tubes and appoint RISIS, the

tenant of the shop in NOG, as our agent. Plantlets in flasks are also sold at the Garden Shop at the Visitor Centre. The two types of packaging appeal to two

customer segments - tourists who buy plantlets as souvenirs or gift items prefer them in tubes, while hobbyists and growers prefer them in flasks.



Tissue-cultured orchid plantlets in tubes for sale.

Lim-Ho Chee Len

Lim-Ho Chee Len
Orchid Breeding & Micropropagation

Since November this year, we have also started direct selling of orchid plantlets in tubes from a pushcart at the Visitor Centre. Each tube comes with a packaging, incorporating the Gardens' logo, the orchid's name, a picture of the plant in bloom as well as instructions on the transfer of plantlets to pot and subsequent care.

WHAT'S BLOOMING?



Leahy Puan Pong McWine

Chorisia speciosa

Chorisia speciosa (Bombacaceae), commonly known as the "Floss Silk Tree," is a deciduous tropical tree that is often rated among the most beautiful in the world. It is a native to Brazil and Argentina, where the tree can reach a height of 18 m. The trunk, that is enlarged at the base, and the branches, are covered with thorns that are often lost as the tree becomes fully mature. There are also thornless forms of this rather variable species.

The large showy, dark pink flowers are produced in small clusters when the tree is nearly bare, providing a dazzling show of colours. The five-petalled flowers have a yellow throat marked with brown and are about 12 cm across. Fruits and viable seeds are apparently rarely produced outside its native home. When produced, the fruits are large, pear-shaped and filled with silky, white floss surrounding the pea-like seeds. Floss from the seeds is traditionally used for stuffing pillows.

The two trees in the Gardens were grown from seeds, courtesy of the Brazilian Ambassador to Singapore through Mrs Christine Dhanabalan, wife of the former Minister for National Development, in 1989. These sun-loving trees grow well in the Gardens and require little care as they are practically free from pests and

diseases. Apart from one tree having much less thorns than the other, both show the same growth habit. They have not set fruit thus far.

Ohn Set
SBG Management



Leahy Puan Pong McWine



KEY VISITORS TO THE GARDENS (Jul-Dec 2002)

NAME	FROM
Dr Axel Poulsen	National Herbarium Netherlands, Leiden, The Netherlands
Mrs Barbara Cimoszewicz	Spouse of the Foreign Minister, Poland
Dr Carl Lewis	Fairchild Botanical Gardens, Miami, Florida, USA
Mr Chen Shuelong	District Commissioner, Shanghai Landscaping Administration Bureau, People's Republic of China
Dr David Given	Lincoln University, New Zealand
Dr G A Cordell	University of Illinois, Chicago, USA
Ms Gemma Bramley	Royal Botanic Garden, Edinburgh, UK
Ms Ho Ching	Executive Director, Temasek Holdings, Singapore
Mr Hor NamHong	Senior Minister and Foreign Minister, Cambodia
Ms Jane Skornickova	Charles University, Prague, Czech Republic
Mr John Corner	Stourport on Severn, UK (Son of E.J.H. Corner, Assistant Director of the Gardens, 1929-45)
Dr Julie F. Barcelona	Philippine National Herbarium, Manila, The Philippines
Mr K Sampth Kumar	Department of Anatomy, National University of Singapore
Mr Kazuhiko Satomi	Makino Botanical Garden, Kochi, Japan
Mr Kem Mongkol	Ambassador to Singapore, Cambodia
Mr Lee Hsien Loong	Deputy Prime Minister of Singapore
Mr M H Mohamed	Minister of Western Region Development, Sri Lanka
Mr Mah Bow Tan	Minister for National Development, Singapore
HE Dr Mari Alkatiri	Prime Minister of the Democratic Republic of Timor Leste
Dr Maxwell Goodey	Fellow of Royal Horticultural Society, Sydney, Australia
Princess Nanasipau' u	Tonga, South Pacific



Mdm Onon Tsolmon, wife of the Prime Minister of Mongolia, visited the Gardens on the 10th of October 2002. A new *Vanda* hybrid was named after her at a ceremony in Barkill Hall. On her left is Mrs Lee Wai Chin, Deputy CEO, National Parks Board.

Mr Neil McCarthy	Deputy CEO, Parks Victoria, Melbourne, Australia
Mdm Onon Tsolmon	Spouse of the Prime Minister of Mongolia
Prof Peter Crane	Director, Royal Botanic Gardens, Kew, UK
Prof Pilai Poonswad	Mahidol University, Bangkok, Thailand
Dr R J Dekker	National Herbarium of Netherlands, Leiden, The Netherlands
Dr Rusea Goh	Department of Biology, Universiti Putra Malaysia, Serdang, Malaysia
Mr & Mrs S R Nathan	President & First Lady of the Republic of Singapore
Ms Sophie Neal	Royal Botanic Garden, Edinburgh, UK
Ms Stella Sigcau	Minister of Public Works, South Africa
Dr Thomas Zumbroich	Encinitas, USA
Mr Uday Chand Basak	Regional Plant Resource Centre, Bhubaneswar, Orissa, India
Mr Yoshikazu Ito	Mayor of Fuchu City, Japan
Mr Yu Yaosheng	Headquarters of Guangzhou Nansha Development Zone, People's Republic of China
Ms Yvonne Su	University of Hong Kong, Hong Kong
Assoc Prof Zairul Hakim	Department of Landscape Architecture, Universiti Teknologi, Johor, Malaysia
Mr Zhang Dong Hai	Director, Urban Planning Bureau, Changzhou, People's Republic of China
Mr Zhang Guang Ning	Executive Vice Mayor, Guangzhou, People's Republic of China
Mr Zhang Zimin	Secretary-General, Sping City Government, Jilin, People's Republic of China
Mr Zhao Baojiang	Vice-President of China Mayors' Association, People's Republic of China
Mr Zhang Zhaolu	Deputy Chief of the Guangzhou Municipal Garden Bureau, People's Republic of China
Sir Richard Carew Pole	Royal Horticultural Society, UK

FROM THE ARCHIVES

Restoration of Water-colour Paintings



Artabotrys venustus King (Annonaceae) painted by Charles de Alwis on 12 July 1907 from a plant growing in the Gardens' Rain Forest. Unrestored – note the broken edges and corner, water-staining in one corner and discoloured brown spots.

Ruth Kiew



Musa coccinea Andrews (Musaceae) drawn by Charles de Alwis on 24 June 1907 from a plant growing in the Gardens showing the protective mounting. Note after restoration the brown spots have almost disappeared and the holes around the signature and on the banana leaf have been repaired.

Ruth Kiew

At the turn of the last century, the Gardens under the directorship of H. N. Ridley employed several talented artists, such as Charles de Alwis, 1900–1908 (*Gardenwise* 12: 14). Unfortunately the quality of the paper used (it was not acid-free) and the effect of the damp and heat of the tropical climate have with the passage of time caused the paper to become extremely brittle and badly discoloured. Besides being aesthetically unpleasing, it also means that the paper has become fragile and even with careful handling the edges and corners are prone to crack off.

When the Makino Botanical Garden, Kochi, Japan, proposed to exhibit a selection of these water colours in its

exhibition on the Singapore Botanic Gardens, it was clear that the paintings were too fragile and not in a condition that would withstand handling during transportation and exhibiting. The Gardens was therefore extremely grateful when the Makino Botanical Gardens provided a generous grant of S\$7,250 that enabled about 50 water-colours to be restored and mounted.

The specialised process of restoration and mounting was carried out by the Conservation Unit, National Archives of Singapore, and included de-acidification of the paper, repair of tears and cracks, strengthening of the edges and corners, and cleaning and reduction of discolouration of the paper. Mounting

included borders and support with museum-board and encapsulation in an acid-free film sleeve.

The paintings were on display in Japan from August 2002 to February 2003. The catalogue for the exhibition not only includes reproductions of many of these paintings but also includes a brief history of the artists and the circumstances under which the paintings were commissioned.

Restoration of the remaining collection amounting to about two thousand pieces of artwork (it costs about S\$ 125 per piece) will continue as funds become available.

Ruth Kiew
Christina Soh
Library