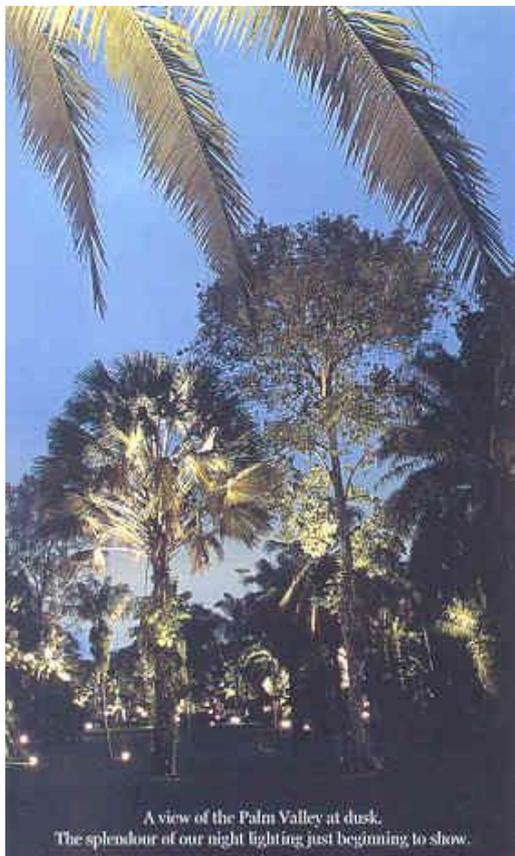


Gardenwise

THE NEWSLETTER OF THE SINGAPORE BOTANIC GARDENS VOLUME XIX, JULY 2002, ISSUE 1



NParks' Publication



A view of the Palm Valley at dusk.
The splendour of our night lighting just beginning to show.

A/C. Robinson

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Message from the Director

The Gardens is well into a heightened period of happenings and changes. The most obvious manifestations are the hoardings around our re-development sites. Over the next three years major upheavals include the creation, at the Tanglin Core, of a new visitor plaza and entrance complex, research and educational facilities, herbarium and library, new landscapes and carpark. At the Central Core, the Ginger Garden and Coolhouse are almost completed and improvements to the Symphony Lake have begun; at the Bukit Timah Core, the development of a Prehistoric Garden and a Children's Garden are imminent.

To make way for the re-development at the Tanglin Core, our offices together with the library and herbarium are being relocated to rented premises situated just outside the northern end of the Gardens. We will occupy three buildings at the former National Institute of Education campus. All except the herbarium, which will be moved in September, were relocated in the week of 17 June 2002. It was a culmination of much planning, coordinating and packing. I would like to thank staff for their hard work and co-operation as they organised the moving, unpacked and fitted themselves, their furniture, books and equipment into new spaces mostly built for very different uses. They also have to make transport and logistical changes to meet the needs of a new work location.

With the many major development projects and intense use of the Gardens as a recreational park, it is easy to forget the Gardens as a botanical institution. Our activities and achievements in research, education and conservation are often over-looked. While they are less obvious than plants, landscapes, or visitor amenities, they are crucial components of a botanical garden.

It is encouraging, therefore when the Gardens' research produces outcomes recognised internationally. In February, Dr Ruth Kiew was presented with the David Fairchild Award for Plant Exploration by the National Tropical Botanical Garden, USA. She is the first person from Asia so honoured. In June, hybrids created by the Gardens' research and breeding programmes received the highest honours at the World Orchid Conference Show in Malaysia. In the Individual Plants category we won 23 prizes. Our landscape display using the Gardens' hybrids won the Grand Champion Award for the landscape segment.

Beginning with this copy, each July issue will provide a summary of key activities and achievements of the past year to June, in a readable form. This will provide a balanced view of the Gardens. The reader will be able to see at a glance, the spectrum of activities and achievements that emanates from this very unique botanical institution. Our publications, for example, assert our standing as the top institution in Singapore for plant systematic research.

Chin See Chung

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NATIONAL PARKS BOARD

Year in FOCUS

Research Projects

Crossing Amazon Waterlilies

Andrea Kee

There are two species in the genus *Victoria*, *V. amazonica* and *V. cruziana* and plants of both species are growing well in the Gardens. The successful crossing of the two waterlilies has required some understanding of their phenology. The spectacular night-blooming flowers are unusual in being female the first night and male the second. We found that if fresh pollen was not available, it was possible to use pollen stored under refrigeration where it remained viable for up to five days. Upon successful pollination, a seedpod is rapidly formed. It takes from 34 to 48 days for each seedpod to rupture. Of the 200 crosses or so made, 90% resulted in seedpods. The result was the *Victoria* Longwood Hybrid, so called after the first cross carried out by Pat Nutt of Longwood Gardens, Philadelphia, USA, in September 1960. Our hybrids bloomed six months after the first batch of seeds were germinated. (Details appear in *Gardenwise*, 17:15-17.)



Victoria Longwood Hybrid.

The Basic Propagator

Andrea Kee

Plants collected from the wild tend to suffer a very high mortality rate once brought back to the Gardens. To overcome this problem, a simple propagator was devised to revive such

forest plants. (The idea originated from Mr Tan Jiew Hoe, a keen gardener and an ardent supporter of the Gardens.) It consists of a big transparent plastic bag supported by four bamboo sticks with a tray fitted below. The growing environment in the propagator simulates the constant and humid conditions of the forest understorey.

Once plants are placed inside, the top of the plastic bag is tied and the propagator is placed in shade and checked once a week. Watering is hardly required, but more importantly, the mortality rate of plants collected from the wild has gone down by about 85%.



The Basic Propagator.

Revision of the Bornean Tree Species of the Oleaceae

Ruth Kiew

Taxonomic revision of the Oleaceae, the olive and jasmine family, for the *Tree Flora of Sabah and Sarawak* involved the preparation of a key to all genera including the climbing genera *Jasminum* and *Myxopyrum*, as well as the tree genera, and descriptions of all tree species including a key to their identification covering 25 species of *Chionanthus*, 1



The type specimen of *Chionanthus subahensis*.

species of *Ligustrum*, 3 species of *Olea* and 1 species of *Schrebera*. Of the *Chionanthus* species, seven are described as new species.

Monograph of the Begonias of Peninsular Malaysia

Ruth Kiew

Field-orientated research firstly enabled the morphological variation within populations to be studied, secondly resulted in re-finding several species that were known from a single collection made 70-110 years ago as well as to discover species new to science, and thirdly to study the distribution and abundance of rare species to assess their conservation status. Of the 45 names for indigenous *Begonia* species, five are synonyms, and the six varieties of widespread *Begonia sinuata* cannot be upheld. In addition, ten new *Begonia* species were discovered.



A new species of *Begonia* from Kelantan, Malaysia.

The Herbaceous Flora of the Kuching Limestone, Sarawak

Ruth Kiew, Gwee Aik Teck and Paul Leong
in collaboration with
Botany staff
Sarawak Biodiversity Centre
Kuching, Malaysia

The limestone hills in the Kuching area of Sarawak are known to be floristically biodiverse. However, detailed inventories

of their flora are lacking and most of them have suffered from habitat disturbance. Through field surveys, a complete inventory of herbaceous plants will be built up with special attention on the distribution and population size of rare and/or endemic species, and a comparison of the individual hills for their conservation importance based on floristic diversity and level of habitat disturbance will be made. 17 hills are included in the survey. Field work started in 2001 and will continue until 2003.



Limestone Hill near Kuching, Sarawak.

Registration of *Curcuma* and *Hedychium* (Zingiberaceae)

Ruth Kiew and Ohn Set

Following the appointment of the Gardens as the International Registration Authority by the International Society of Horticultural Science for the ornamental ginger genera, *Curcuma* and *Hedychium*, an initial registration exercise was carried out in Chiang Mai, Thailand, a major centre of *Curcuma* cultivation for the cut flower trade and a centre for the selection of new cultivars and hybrids. Registration and the preparations of standard portfolios (detailed description, colour photograph and herbarium specimen) of 25 cultivars and grex hybrids were completed.



Field of Chiang Mai Pink, a popular *Curcuma alismatifolia* cultivar.

Reassessment of the Hybrid Status of Some Indigenous Taxa

Ruth Kiew and Ohn Set
in collaboration with
Gan Yik Yuen, Teo Lai Lai
and Lee Sing Kong
National Institute of Education
Nanyang Technological University

Some taxa in the region show morphological intermediacy and have been suggested as hybrids. The molecular technique Amplified Fragment Length Polymorphism (AFLP) was used to assess the hybrid status of the mango kwini (*Mangifera odorata*), the three hybrids between the pitcher plant species indigenous to Singapore (*Nepenthes ampullaria*, *N. gracilis* and *N. rafflesiana*), a natural hybrid between *Begonia decora* and *B. venusta*, and the local fruit duku-langsar (*Lansium domesticum*). Results from the AFLP analysis clearly showed that, except for duku-langsar, they are indeed hybrids. Duku-langsar on the other hand was shown to be a cultivar of the langsat, *Lansium domesticum*.



The *Begonia decora* x *venusta* hybrid.

Biosystematics of Species and Cultivars of Banana, *Musa*

Ruth Kiew and Ohn Set
in collaboration with
Carole Wong, Jin Phang Loh,
Gan Yik Yuen and Lee Sing Kong
National Institute of Education
Nanyang Technological University and
George Argent
Royal Botanic Garden Edinburgh, U.K.

Amplified Fragment Length Polymorphism (AFLP) has proved an effective method for assessing the genotype of cultivars, subspecies, species and sections of the banana genus, *Musa*. AFLP is a neat method of finger-printing cultivars overcoming the confusion of



Musa beccarii, a wild banana from Borneo.

vernacular names, has resolved the status of subspecies of *M. acuminata* in Malaysia (spp. *malaccensis*, spp. *microcarpa* and spp. *truncata* are distinct), has provided evidence for the placing of 'atypical' Bornean species into their correct section (*M. beccarii*, *M. monticola* and *M. suratii*), and has provided evidence for the recognition of two sections in *Musa* (instead of four).

Mass Micropropagation of Recalcitrant Orchid Hybrids

Lim-Ho Chee Len, Woon Mui Hwang
and Whang Lay Keng

A number of attempts over the past three years to develop micropropagation procedures for two *Dendrobium* hybrids, *Dendrobium* Lee Kuan Yew and



Initiation of the recalcitrant orchid hybrid *Dendrobium Temasek* 'Botanic Gardens'



Dendrobium Temasek Botanic Gardens', had met with difficulties. Either the buds failed to grow or only a few plantlets were produced. The breakthrough came in early 2001. The leaf tips or the shoot tips of the few plantlets produced were excised as explants and cultivated on a medium rich in indole-3-acetic acid (IAA) and 6-benzylaminopurine (BAP). The callus that formed was transferred many times, until protocorm-like bodies and shoots were obtained. These were then moved to the Knudson medium for differentiation. The media used are being refined to improve growth rate.

Micropropagation of Rare and Endangered Species

Lim-Ho Chee Len, Woon Mui Hwang and Lena Chan

In Singapore, the fern *Dipteris conjugata* is an endangered species. Typically a highland plant, it was known in Singapore from a single colony in Labrador Park on a cliff fronting the beach. This population has since died out. Fortunately, another small population was recently discovered. A project to mass propagate this plant was initiated about two years ago to prevent extinction of the Singapore genotype of this species. Our experiments so far show



Development of gametophytes and sporophytes from spores of *Dipteris conjugata*.

that:

- i) for spore germination, the semi-liquid Knudson medium gives a 30% higher success rate than the same basic solid agar medium,
- ii) light is essential for spore germination with about 60% of spores germinating under 800-1,000 lux. (No germination occurs in darkness.)
- iii) adding inorganic salts favours the development of gametophytes. However,

to reach sporophyte development, it is necessary to reduce the inorganic salts in the medium.

Micropropagation of Quality Plants with Horticultural Potential

Lim-Ho Chee Len, Jassy Phua and Andrea Kee

Propagation of selected plants with horticultural potential by tissue culture techniques is attempted. One successful



Successful mass propagation of a decorative *Begonia* from seeds.

example is the propagation from seed (a gift from Mr Tan Jiew Hoe) of a decorative begonia from Thailand. Seeds were cultured in a modified Murashige & Skoog (MS) medium with naphthalene acetic acid (NAA) and 6-benzylaminopurine (BAP) added to induce shoot and root formation. A medium containing 0.02 mg of NAA and 0.5 mg of BAP gave best results. While lower concentrations of BAP yielded no shoots, higher concentrations promoted abnormal shoot formation with malformed leaves.

Micropropagation of *Nepenthes*

Lim-Ho Chee Len, Koh-Low Neok Chein and Andrea Kee



Nepenthes veillardii multiplied from seed.

To overcome the low viability of seeds of *Nepenthes*, *in vitro* seed germination and multiplication were attempted. Three highland and 12 lowland species were successfully multiplied thus far. Growth regulators and coconut water were found to be important ingredients for the cultures to proliferate. Activated charcoal (neutralised charcoal in powder form) was required in the cultures for all stages of growth apart from germination and multiplication. A higher concentration of activated charcoal was needed to help the plantlets to form roots before potting out.

Tropical Orchid Mycorrhizae

Lim-Ho Chee Len
in collaboration with
F.Y. Tham
National Institute of Education
Nanyang Technological University and
X.S. Zhang
Department of Biology
Lehman College
City University of New York, USA

The aim of the study is to isolate and identify mycorrhizae from various tropical orchids, with the potential to improve germination, growth and development of orchids. In addition to the traditional morphological characterisation methods, molecular characterisation by polymerase chain reaction (PCR) - restriction fragment length polymorphisms (RFLP) and random amplified polymorphic deoxyribonuclease (RAPD)-PCR was employed. From 12 terrestrial orchid species and hybrids, 67 mycorrhizae were isolated. Based on their morphological features, they were classified into four

groups. PCR-RFLP and RAPD-PCR profiling, however, distinguished 13 and 14 groups respectively.

Fungal Endophytes Of Tropical Orchids of Western Australia

Nura Abdul Karium

in collaboration with
K. Sivasithamparam

Faculty of Agriculture
The University of Western Australia,
Western Australia 6005 and

K. Dixon

Science Division

Kings Park Botanic Gardens & Park Authority
West Perth, Western Australia 6057

Endophytic fungi were extracted and isolated from the roots of several genera of Orchidaceae from Western Australia's Kimberley region. Identification of these mainly sterile fungi was carried out through morphological and electron microscopy studies and using nuclei staining and pectic zymogram (PZ). PZ involves electrophoresis of extractable pectic iso-enzymes produced by the fungi. The PZ method allowed rapid characterisation and grouping of the large numbers of isolates and permitted comparison of the diversity of isolates. Symbiotic germination was then carried out to test the host-fungus specificity. By identifying the diverse endophytic fungi involved in the crucial early stages of orchid development, we intend to build up an extensive collection of beneficial mycorrhizal fungi to facilitate the conservation of orchid species in nature.

Responses of *Catharanthus roseus* to Ash Yellows Phytoplasma Infection

Tan Puay Yok

Ash yellows is a disease of *Fraxinus* and *Syringa* species caused by phytoplasmas. The physiological responses of plants following infection by AshY phytoplasma were investigated using the Madagascar Periwinkle, *Catharanthus roseus*, as the experimental plant. The main research objectives were to test the hypotheses that sugar accumulation, which occurred during infection induced down-regulation



Puay Yok with his experimental plants in a greenhouse at Cornell University.

of photosynthesis and up-regulation of plant defense activities.

Revision of the Orchid Genus *Bulbophyllum*

J.J. Vermeulen

The orchid genus *Bulbophyllum* includes about 3,600 nominal taxa and about 1,200 species. Revision of a genus this size has to be done in two phases: a first phase to divide the genus in workable sections, and a second phase to actually revise each section. Making use of a provisional division into sections, 12 sections (about 350 species) have so far been revised. The revision of 50 species in two of these sections, sect. *Altisceptrum* and *Hirtula*, was completed in the year 2001. Preparations have started for the revision of sect. *Sestochilus*, a particularly large section



A new and as yet un-described species of *Bulbophyllum*.

(80 species), which includes a number of species of horticultural value, such as *B. lobbia* Lindl.

The Phylogenetic Structure of the Orchid Genus *Bulbophyllum*

J.J. Vermeulen

in collaboration with
Staff

Leiden University Branch
National Herbarium of the Netherlands

The aim of the project is to unravel the phylogeny of this genus using molecular techniques. Our living species collections are an excellent source of correctly identified material for this project. During the year 2001, samples have been taken from many specimens; this will continue with the first results of the analysis expected in 2003.



Molecular biology can solve the taxonomic position of this species of uncertain affinities.

Orchid Hybrid Research

Yam Tim Wing

Many interesting new orchid hybrids were brought to flower during 2001 and named after visiting dignitaries. Three notable examples are: *Aranthera* Gloria Macapagal-Arroyo, named after the President of the Philippines; *Arachnoglottis* Boun Nhang Vorachith, named after the Prime Minister of Laos and *Dendrobium* Abdullah II, named after King Abdullah II of the Hashemite Kingdom of Jordan. Besides our regular orchid breeding programme, efforts to produce tetraploid orchid hybrids were continued. Two more hybrids flowered for the first time. Tetraploid plants are typically superior to their diploid ancestry, producing stronger inflorescences that have longer lasting and bigger flowers.



Dendrobium Abdullah II named in honour of King Abdullah II of the Hashemite Kingdom of Jordan.

Re-introducing the Tiger Orchid, *Grammatophyllum speciosum*, to Singapore

Yam Tim Wing

The tiger orchid used to grow at Tuas and on Pulau Ubin but has since become extinct in Singapore. To re-introduce it, seeds from a plant in the Gardens were germinated. Seedlings 15-20 cm tall with 5-6 leaves were used in the first trial in 1999. These were affixed onto trees at Pulau Ubin, the Visitors Centre at the Bukit Timah Nature Reserve and along Orchard Boulevard in the heart of the city. For the second trial in 2001, seedlings 30-40 cm tall with 16-20 leaves were used for planting in the Bukit Batok Nature Park, the Orchard Boulevard area and on the yellow raintrees in the Gardens. From these trials, several factors appear important for the survival of the seedlings: a micro-climate with high relative humidity, suitable bark texture of host trees, larger seedling size, and branches with existing epiphytes. The latter are probably indicators of a favourable environment for the seedlings. (Details appear in *Gardenwise*, 18:13-15.)

School of Horticulture

Foong Thai Wu, Nashita Mustafa and Janice Yau

The year 2001 was a crossroad where the School of Horticulture (SOH) defined its new directions after being in operation since 1972. In April 2001, SOH's proposed strategic changes were endorsed by the NParks Board. In keeping with the changing educational landscape, the part-time Diploma courses were essentially superseded by the full-time Diploma in Horticulture and Landscape Management, jointly administered by SOH and Ngee Ann Polytechnic. The Advanced Diploma in Landscape Studies, experiencing falling enrolment, were phased out in stages, to allow existing students to complete their courses of study. Instead, SOH has re-



Trade Certificate students undergoing practical work.

for the 2002 intake was conducted in February 2002 and the response was overwhelming with 52 applicants. With the rationalisation of SOH's formal courses, the Trade Certificate has remained relevant for the upgrading of junior supervisors. It has gained acceptance as a skills redevelopment programme (SRP) and is also supported by the Skills Development Fund (SDF). The Diploma in Horticulture and Landscape Management produced its first crop of 38 graduates in July 2001 and



Participants of the Singapore Co-operation Programme, 2001.

deployed resources to meet growing demand for green education/recreation by schools, hobbyists and enthusiasts. In particular, school outreach would seek to stimulate interest in life sciences and nurture future green citizenry.

In April, a new intake of 25 students commenced on the Trade Certificate in Horticultural Practices. By end March 2002, a total of 24 students successfully completed the programme. Recruitment

most of them have taken up jobs in the industry. In recruiting for the 5th intake that commenced in July 2002, some 190 applicants picked the Diploma their first choice at Ngee Ann Polytechnic and competed for 40 places.

Through SOH, NParks has taken a step forward to lead the industry towards achieving higher horticultural and landscaping standards through skills enhancement. In July 2001, NParks

Mohd Farid Basim

Ministry of Foreign Affairs

joined the National Skills Recognition System (NSRS), a national training framework aiming to establish work performance standards, identify job competencies and certify skills acquired in key industries. The Landscaping/Horticultural Industry Skills Standards Committee, led by NParks, was established, comprising key industry players from the private and public sectors. The Committee is tasked with developing the functional map and skills



Two-tier anchor exhibit at the 4th Skyrise Gardens Exhibition.

standards of the industry together with consultants appointed by the Productivity & Standards Board (PSB). Initially, seven skills standards were prioritised by the Committee for development. Draft documents on such skills standards are being edited and refined through circulation and feedback. SOH has applied to PSB to be an approved training/assessment centre under NSRS. This mechanism ensures that in the near future, individuals practising or intending to practise in the industry must undergo prior skills certification.

Since its inclusion as a portfolio of SOH in 1993, public education has been growing steadily. Its potential has not been fully exploited as resources have to be prioritised to meet contractual

obligations for conducting formal courses. Having rationalised its offering of formal programmes, SOH had set sight on expanding its educational outreach. From April 2001 to March 2002, 195 outreach programmes were conducted for 9,250 participants, an increase of 4.8% and 59.9% respectively over those achieved in the preceding period. Due to popular demand, the 2-week programme on "Developing & Managing a Garden City" was repeated in August-September 2001, for 17 participants from developing countries, namely, Vietnam, Belize, Tunisia, Brunei, Nigeria, Mozambique, Myanmar, Bhutan, People's Republic of China, Sri Lanka, Malawi, Iran, Maldives, Seychelles, Barbados, Solomon Islands and Fiji. The objective was to share Singapore's "Garden City" experience with other developing nations. SOH has become a regular partner of the Ministry of Foreign Affairs (MFA) in the offer of this programme under the Singapore Co-operation Programme.

SOH was party to the successful completion of two key projects. The 4th Skyrise Gardens Exhibition - City in a Tropical Garden, staged from 26th June - 1st July 2001 at the Singapore International Convention and Exhibition Centre was a resounding success. Held in conjunction with the 38th International Federation of Landscape Architect World Congress, the event was visited by some 109,000 visitors. Apart from being the secretariat for the Organising Committee, SOH was instrumental in putting up a special plant display "The New and Interesting", organising the computer art competition "My Vision of Singapore as a Garden City" for secondary schools, "Plant Clinic" - the

crowd-puller and a host of educational and entertaining outreach activities culminating in the on-the-spot Children's Dish Garden Competition. (Details appear in *Gardenwise*, 17-18-20).

The year's activities were capped with the launch of *Learn@Parks*. An educational and fun project jointly organised by the National Parks Board and the Ministry of Education, its objective was to promote nature appreciation among students through activities that engaged their critical and creative thinking faculties. The event was launched on 9 March 2002 concurrently at the Singapore Botanic Gardens, Bukit Timah Nature Reserve and Sungei Buloh Nature Park through a live webcast from the Singapore Botanic Gardens. A total of 640 students and teachers representing 128 schools (76 primary & 52 secondary) joined the competition at the three parks. Teams, each comprising four students and a teacher, armed with IT tools, set about to discover and capture interesting images of the wonders of nature along the themes - colour, pattern, defence and rhythm and two weeks thereafter present their observations in the form of a digital scrapbook for judging.

Overall, 2001 had been an eventful year for SOH, witnessing the completion of key projects and the introduction of new initiatives. Looking ahead, the key challenge lies in upping performance targets in a time of severe budget constraints.

Developments

Ian Turner

Singapore Botanic Gardens, just 7 years short of its 150th birthday, is dear to the hearts of many, both in Singapore and overseas. The sweeping lawns, tranquil lakes, majestic mature trees and familiar features like the bandstand and the sculptures provide an ambience of continuity and calm amidst the frenetic activity and seemingly ceaseless change of city-centre Singapore. Yet even in the Gardens there is development. Aimed at improving the experience of visitors without destroying the atmosphere of history and heritage, new amenities are added and tired displays refreshed. There



Students taking part in *Learn@Parks* activities at the Singapore Botanic Gardens.



A view of Ginger Falls in the Ginger Garden.

will always be those that resent any change, and work in progress often causes inconveniences that require forbearance, but with two million visitors a year to please ranging from the regular morning exercisers (human and canine), the 'been there - done that' tour groups and the connoisseurs of plants and gardens, we cannot afford to rest on our laurels.

A programme of renovation and development began in 1990. The first of several new themed gardens proposed under the current phase of the development programme is the Ginger Garden. It was decided to feature a group of plants strongly associated with South East Asia and the gingers with their ornamental potential and economic importance were the obvious choice. The Ginger Garden occupies the site of the old Orchid Enclosure. As many of the existing trees and palms, including the many beautiful royal palms, were kept providing an established frame in which to layout the display of gingers. The leading light behind the design and planting of the Ginger Garden has been Mr Alan Carle. Alan has acted as horticultural consultant for the project (thanks to the generous sponsorship of Mr Tan Jiew Hoe). An expert on gingers and tropical fruits, he has designed much of the Ginger Garden, provided detailed planting plans, sourced for many of the plants (offering many from his extensive collection in

Queensland) and given much advice on maintenance.

The Ginger Garden is designed to display the beauty and diversity of the gingers and their relatives. Culinary ginger, *halia* in Malay, is the rhizome of *Zingiber officinale*. Botanists place this species with similar rhizomatous herbs in the family Zingiberaceae. The 1,300 or so species in the Zingiberaceae occur across the tropics, but probably more than 1,000 species are confined to South East Asia, making this region the centre of diversity. As well as ginger, two other important spices, turmeric and cardamom, are derived from species of ginger. In South East Asia many other species are used by people for a variety of purposes, particularly as medicinal plants. One of the best known, and also most beautiful, is the torch ginger or kantan (*Etlingera elattor*). Kantan was chosen as the icon for the Ginger Garden and has been widely planted in the garden, including the whole range of flower colours from white to dark red.

There are seven other families of plants closely allied to the Zingiberaceae and placed into the order Zingiberales by botanists. These include the prayer plant or arrowroot family (Marantaceae), the spiral or corkscrew gingers (Costaceae), the bananas (Musaceae) and the heliconias (Heliconiaceae).

Representatives of all the families of the ginger order have been planted in the Ginger Garden, though the heliconias have been restricted to some of the more unusual sorts as the Gardens' main collection of heliconias will remain at Heliconia Walk.

As well as providing a fabulous display and educational attraction, the Ginger Garden incorporates several important amenities for visitors. Many tour groups come to visit the National Orchid Garden. Formerly, coaches dropped parties along Tyersall Avenue and visitors then walked to the entrance of the National Orchid Garden. This was very much a backdoor to the Gardens and upgrading of this entrance was much needed. As part of the Ginger Garden development, a coach



Finally, a dedicated coach drop-off point in the Gardens. It is at the edge of the Ginger Garden and replaces potentially unsafe roadside drop off.

drop-off area was created, so the tourists can alight from their buses in the safety of a correctly appointed bay and proceed through the Ginger Garden to the Orchid Plaza. Now instead of coming in through a rather shabby corner of the Gardens, tour groups are greeted by the sight of a cascading waterfall and the lush landscape along the Ginger Walk.

Commercial outlets were included in the Ginger Garden development. A restaurant, a refreshment kiosk and a souvenir shop have opened. The Halia Restaurant includes a spacious decking from which patrons can enjoy excellent views of the garden with their meals. The Ginger Garden is well-served with scenic lighting providing a beautiful backdrop for dining after dark.

The Ginger Garden has not been officially opened but public access has progressed

in stages from mid-2001. At present, the whole garden is accessible and the large water feature is completed. As with all gardens some time is needed for the plants to grow and the displays to appear at their best, but progress so far has been good and many visitors have been attracted sufficiently to explore the smaller paths.



Our cast-iron Gazebo restored and relocated to the edge of Swan Lake in an idyllic setting.

The cast-iron Gazebo is the oldest structure in the Gardens. Despite only making its first appearance in 1969, it was actually built in the 1850s and stood for many years in the grounds of Old Admiralty House in Grange Road. In 2001, the Gazebo was dismantled from its site at the corner of the Gardens' Rain Forest off Maranta Avenue. The old and brittle uprights had to be specially strengthened before the structure was re-erected near Swan Lake. A pitched roof was added to improve the exterior appearance. Visitors entering from the Main Gate now come on a view of the elegant Victorian structure with Swan Lake beyond. The benches inside make the Gazebo an excellent place to sit and enjoy the view of the swans on the lake.

The former site of the Gazebo has not been left bare following its removal. A new shelter has been installed as part of the development of a better entrance point for the Rain Forest. Inside the Rain Forest the former maze of concrete footpaths has been simplified by removal

of many of the minor tracks. This was done in the hopes of reducing visitor impact on the forest and freeing some space for more trees to establish.

While these developments are nearing completion, others are moving from the drawing board to site. Already begun is the Heritage Core re-development, which has already seen closure of the Taman Serasi Food Centre and Car Park in preparation for the diversion of Cluny Road. An alternative car park for visitors to the Gardens has been provided at Minden Road. In order to facilitate access to the Gardens from the car park, a new entrance gate has been provided on Napier Road near the pedestrian crossing from Minden Road. The Minden Gate is a wrought-iron structure featuring the Gardens' sealing-wax palm icon. Visitors entering the Minden Gate see the Marsh Garden on their left and a fine old banyan tree to their right.

In the next few months the work on the Heritage Core will begin within the Gardens. The old office and herbarium buildings, with the exception of the historic Ridley and Holtum Halls, will be demolished to make way for a new complex of visitor, education and research facilities. The first wave of staff decamping to temporary accommodation has just taken place. Three blocks on the Singapore Management University campus adjacent to the Gardens are to be home for a large portion of the Gardens' staff as well as the library and herbarium for three years. A gymnasium is being retrofitted to provide space for the herbarium for this interim period.

With the reconfiguration of Symphony Lake, and the ground breaking for the Heritage Core facilities and the



Minden Gate, created for convenient access to the Gardens from the new car park across Napier Road.



Part of our new home for the next three years at the former National Institute of Education.

Prehistoric Garden, 2002 promises even more activity than 2001.

Events

Camille Foo

The Concert in the Gardens series convinced thousands to pack their picnic baskets and convene at Palm Valley to enjoy open-air performances in our lush Gardens. The Singapore Symphony Orchestra lulled many with its soothing strains and won over the hearts of many who never had the pleasure of watching it perform before. The Singapore Chinese Orchestra performances were also major crowd pleasers. The M1 World Rhythm Series, comprising Bad Boys Batucada (Melbourne), Danish Radio Jazz Orchestra (DRJO) (Denmark) and The Groove (Singapore) put up sterling performances. Bad Boys Batucada, a percussion and dance troupe fired up the samba beat with its rhythmic martial art dance. The DRJO under the baton of maestro Palle Mikkelsen set Palm Valley abuzz with its renditions. The Groove lived up to its name as its interpretation of mambo, cha-cha, merengue, latin jazz and rhythm and blues got many on their feet grooving to the beat. Each of such performances attracted up to 5,000 visitors, reaffirming the Gardens as a premier event venue and cultural hub.

The Gardens continued to host many key visitors. His Majesty King Abdullah II, The Hashemite Kingdom of Jordan, Her Excellency Gloria Macapagal-Arroyo, President of the Republic of Philippines,



Thousands of concert-goers enjoying an evening performance at Palm Valley, Singapore Botanic Gardens.

His Excellency BounNhang Vorachith, Prime Minister of the Lao People's Democratic Republic, His Excellency Atal Bihari Vajpayee, Prime Minister of the Republic of India and His Excellency Junichiro Koizumi, Prime Minister of Japan, visited our Gardens and toured the National Orchid Garden. Orchids named after the VIPs include *Dendrobium* Abdullah II, *Aranthera* Gloria Macapagal-Arroyo and *Arachnoglottis* Boun Nhang Vorachith.

The Right Honourable Lord Mayor Alderman Sir David Howard Bt planted a Para Rubber (*Hevea brasiliensis*) tree along Maranta Avenue in the Gardens on 29 October 2001 to commemorate the third millennium. The tree was a present to the people of Singapore from the City of London and is an appropriate selection as the first rubber seedlings in South East Asia came from the Royal Botanic Gardens, Kew, London. Some of these seedlings were planted in the Gardens, eventually becoming a source of seeds that spawned the mighty rubber industry of the region.

The Gardens, together with the National University of Singapore and the Gardening Society jointly sponsored Prof Peter Crane, Director of Royal Botanic Gardens, Kew to visit and to deliver a public lecture on "Waterlilies - the Present & Future of Ancient Flowers". The lecture held at the Regional English Language Centre, received overwhelming response.



Two views of the Gardens' award-winning landscape exhibit at the World Orchid Conference Show 2002.

The gold-plated *Dendrobium* Elizabeth named after Queen Elizabeth during Her Majesty's visit to Singapore in 1972, was presented on behalf of the Government and the people of Singapore by President S R Nathan to the Queen on the occasion of the Golden Jubilee of Her Majesty's accession to the throne.

A pioneering Rain Forest tour conducted by volunteers was launched in April 2001. Visitors to the Gardens were enthralled by the wonders of the Rain Forest brought to life by the interesting commentary of the knowledgeable volunteer guides.

At the 17th World Orchid Conference Show 2002 held in Malaysia in April 2002, the Gardens came away with a remarkable number of awards. It was awarded the prestigious Grand Champion Award for the top landscape exhibit and the Gold Medal for quality. Our creative interpretation of the theme "Use of Orchids in Daily Lives" made use of two different facades to create garden settings representing two traditional festivals, the Malay Hari Raya Aidil Fitri and the Chinese New Year. In addition, the Gardens also won 23 prizes in the "Individual Plants" category for 18 entries, of which 16 are our own hybrids. Such awards truly acknowledge the success of our Gardens' Orchid Breeding and Research Programme.

To commemorate 10 years of effective partnership between the National Parks Board and the National Youth Achievement Awards (NYAA) Council, a new orchid hybrid, *Dendrobium* NYAA was named on 18 May 2002. The orchid-naming ceremony was held at the NYAA 10th Anniversary Dinner where Prime Minister Goh Chok Tong officially inaugurated the orchid.

Our Visitor Services Officer, Mr Jimmy Liew, made the Gardens proud by being one of the finalists of the prestigious Tourism Awards for the Tourism Host of the Year (Leisure Attraction) 2001 organised by the Singapore Tourism Board to honour the best in the tourism industry. The high level of service provided by Jimmy was recognized at a gala dinner attended by President S R Nathan who presented the awards.



The Prime Minister Goh Chok Tong (on the right) inaugurating *Dendrobium* NYAA to commemorate 10 years of partnership between the National Parks Board and the NYAA Council. On the left is Dr Tan Wee Kiat, CEO, National Parks Board.

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The Herbarium's Role in Conservation



The herbarium specimen of *Litsaea petiolata* collected by H.N. Ridley from the Gardens Rain Forest in 1889.

We live in a changing world. More so in the 682 sq km city state of Singapore where the teeming urban activities of the four million population cannot but impact upon the natural landscape. But if we stop and ask what was the island like fifty or even a hundred years ago, the place we turn to for the historic plant records of

Singapore is the Singapore Botanic Gardens Herbarium.

Set up in 1875 with collecting starting in earnest in the 1890s, the Herbarium has continued to accumulate specimens until the collection now numbers over 650,000 specimens. The early collections recorded the flora of Singapore's primary rain forest (now restricted to disturbed remnants in the Bukit Timah Nature Reserve and the Central Catchment Areas) and the fascinating freshwater swamp forests now sadly long since gone (see: **Carr at Mandai**). In fact, the Singapore Red Data Book of Threatened Plants and Animals reports the startling figure of 26 per cent of the original 2,106 native plant species as no longer extant in Singapore. (Actually, they record these species as extinct, which is not correct as they all still are found growing in neighbouring Malaysia).

For easy information retrieval, the collection of 28,000 Singapore specimens in the Herbarium is databased and bar-coded so that it is simple to obtain information at the press of a

button on, for example, a plant list for a particular place, all the places where a particular species was found, the dates a particular species was collected, etc.

This is important for pro-active conservation programmes, for example, in trying to re-find 'extinct' plant species or to identify particularly important biodiverse areas.

To attempt to re-find a certain species that has not been seen in Singapore for many years starts with our herbarium database where we can check the dates and places where it was collected in the past, and if such areas still exist, then we can search them. In this way, our staff have re-located in the Gardens Rain Forest eight of the species reported as 'extinct' in the Red Data Book. However, that is not the end of the story as these species are so rare and known from so few individuals that care must be taken that these plants do not die and really become 'extinct', i.e. lost from Singapore. Not all is doom and gloom, as more and more species previously recorded as 'extinct' are being re-found alive in Singapore.

Carr at Mandai

From C.E. Carr's Field Diary
Thursday 12th January 1933.

"With Corner to the catchment reserve in Mandai Road, a patch of primeval swamp forest approximately one square mile in extent and much more swampy than the similar small ones near Jurong now in the course of being felled.

There is a stream whose banks have been cleaned up and deepened for some four chains from the road but which then flows in a wide stream over the surface of the ground with no very well-marked channel.

This area should be remarkably good for saprophytes and should be visited early in the dry season.

Vrydaggynea tristriata Ridley (No. 485) was found to be quite common in humus in drier places, as also was *Hyllophila mollis* Lndl. (No. 484), the latter plant being common also in the patch of former swamp forest, now drained; at Jurong *Nephelephyllum pulchrum* Bl. grew

commonly on mounds near the stream (483) while *Calanthe pulchra* Lndl. was seen in fruit in similar situations.

A fine *Bulbophyllum stella* Ridl. of the section *Dialeiphanthe* was epiphytic on the trunks (487) as was also *B. singaporeanum* Schltr.

The swampy forest in Singapore and Johore contains many species of orchids which do not appear to thrive in the drier forest and do not penetrate up the Peninsula."

Postscript: This swamp forest was flooded by the Seletar Reservoir. The Singapore Red Data Book records *Bulbophyllum singaporeanum*, *B. stella* (= *B. macrochilum*), *Calanthe pulchra*, *Hyllophila mollis* and *Nephelephyllum pulchrum* as vulnerable.



Carr's specimen of *Vrydaggynea tristriata* (Orchidaceae), the last record of this species from Singapore.



1

Lynn Chan

Apelaea macrophylla



2

Lynn Chan

Alsodaphne nigrescens



3

Lynn Chan

Enospyros confusa



4

Lynn Chan

Epipremnum pinnatum

Eight 'extinct' species alive and well in the Gardens Rain Forest.

Using the Red Data Book as a guide to conservation status (whether the species is 'extinct', endangered or rare), we can identify areas that are particularly high in such species, and so are of special conservation concern. For example, the Herbarium includes 4,800 specimens collected from our Gardens Rain Forest - it is, in fact, one of the best collected areas in Singapore. Although small, covering just four ha, 314 species of green plants have been recorded from it representing 15 per cent of the total flora of Singapore, of which 58 per cent are rare or endangered. In addition, it is an important site for fungi. Clearly this is a place of great conservation importance.



5

Lynn Chan

Gnetum latifolium



6

Lynn Chan

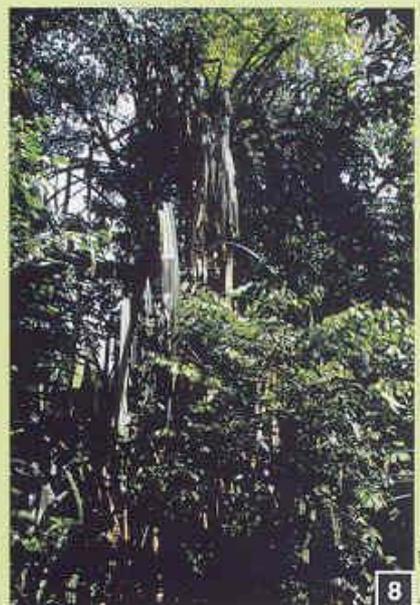
Horsfieldiarya



7

Lynn Chan

Mesua elegantis



8

Lynn Chan

Pandanus tetradon



Munsonia cantleyi, named for the second Superintendent of the Gardens, is known only from a few plants in the Gardens.

In conservation work, field surveys are a must and herbarium specimens are collected as the permanent record of the survey. Currently we are surveying for the first time the flora of Pulau Tekong, an illustration of how much there is still to be learnt about the plant life of Singapore.

Another aspect of our work is plant rescue. As areas are developed, populations of interesting native plants will be exterminated. We then not only make a herbarium specimen as a permanent record but we also collect live plants for propagation in the Gardens (see - **Plant Rescue**).

Ruth Kiew
Herbarium

Lena Chan
Nature Conservation



Paul Leong and Saifuddin Suran displaying the specimen of the rare *Vandila griffithii* collected during the Pulau Tekong survey.



The endangered *Liparis ferruginea* habitat.

Plant Rescue

Dr Jaap Vermeulen and Saifuddin Suran mounted a plant rescue exercise to rescue the plants from a patch of nutrient-poor, waterlogged sandy soil between Tampines Avenues 8 and 10, which was being drained. This habitat is becoming very rare in Singapore together with its characteristic species, such as the *Liparis ferruginea* orchid (recorded as 'extinct' in the Singapore Red Data Book), 4 *Utricularia* species and species of *Burmanna*, *Eriocaulon* and *Nyris* (all recorded as rare) and 25 species of sedges. Herbarium specimens were made as a permanent record of this vanishing plant community and to save the living genetic resource, plants of the two colour forms of *Liparis* that occurred there, the yellow and the brown forms, and the 4 species of *Utricularia* were collected for cultivation in the Gardens.

The Early Introduction of African Oil Palm to the Gardens

In *"Tropical Forests and Their Crops"* by Smith, Williams, and Plucknett (1996), it was stated that "the Singapore Botanic Gardens obtained oil palm seeds from Java around 1870 and also helped to diffuse oil palm throughout the Malay Peninsula and into Sumatra."

We know that the Gardens was instrumental in the development of the rubber and orchid industries in South East Asia, but are not aware of it playing a similar role for the African oil palm (*Elaeis guineensis*) industry. At the beginning of 2002, we received a query from The Center of International Cooperation in Agronomic Research and Development (CIRAD), about possible descendants of the very first oil palms introduced to South East Asia and which were planted in the Gardens. In the email query, it was mentioned that "British have planted the seeds of oil palms in the Botanical Garden of Singapore in 1875", and CIRAD was curious to find out if such palms descended from the first few planted in Bogor.

We wondered if it was possible that these palms planted in 1875 were the source of palms distributed to the Malay Peninsula. Such a speculation would not be unreasonable, as a key function of the Gardens then was to introduce, cultivate and evaluate plants of economic importance.

Oil palms are native to West and Central Africa, and the use and trading of oil palm in Africa started at least 5,000 years ago. However, true oil palm plantations first began in South East Asia only in the early 1900s. The Dutch were the first to introduce oil palm to this region, when four seedlings were planted in the Botanic Gardens at Bogor (Buitenzorg), Indonesia, in 1848. Two seedlings came from Mauritius, and the remaining from Amsterdam Botanic Gardens. It was thought that these plants, of the *dura* or thick-shelled type, came from one parent

in Africa. According to information in the CIRAD query, the last of these four palms died in 1992. Descendants of the Bogor introductions were planted as ornamentals in Deli and Medan, in Sumatra before 1860, and these plantings eventually gave rise to the highly productive "Deli Dura" cultivars, which formed the foundation of oil palm industry in South East Asia.

Records in the Gardens' Herbarium indicate that the first introduction of oil palm to the Gardens was in 1875 when plants were brought in from the Perideniya Botanic Gardens in Sri Lanka (Ceylon). This was apparently also the very first introduction of oil palm to the Malayan region. However, oil palms were not introduced from Java until almost twenty years later, when some plants were sent from Bogor Botanic Gardens in 1893. Therefore, oil palms were indeed planted in Singapore in 1875, but these were from seedlings and not seeds, and the source was Perideniya, not Bogor.

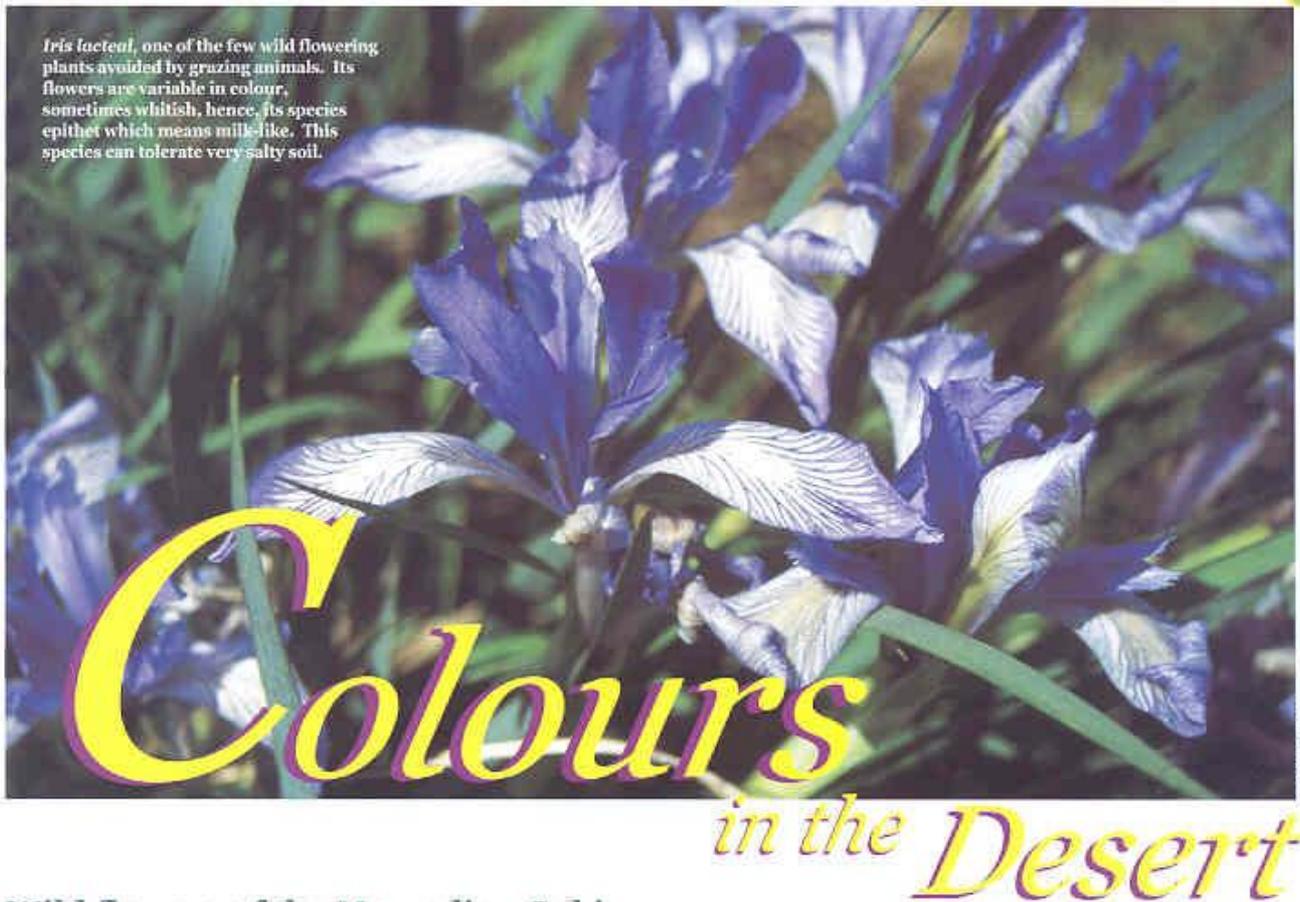
It is generally acknowledged that the Belgian, M.A. Hallet laid the foundation for the oil palm industry in Sumatra, when he started the first commercial plantation in 1911 using the Deli Dura palms in Sumatra. His friend, M.H. Fauconnier, was thought to be the first to plant Deli Dura palms in Malaysia at Kuala Selangor between 1911 and 1912, which eventually led to the pioneer oil palm plantation, now known as the Tennamaram Estate. Very interestingly, there is a record in the Gardens' Herbarium, of oil palm seeds introduced to the Gardens from Selangor by a "S. Ander" in 1901, which could mean that the first oil palms in Malaysia were planted more than a decade earlier (possibly as ornamentals).

H.N Ridley (Director, 1888 - 1912) wrote in 1907 in the *Agricultural Bulletin of the Straits and Federated Malay States*, that the oil palm was "very common in cultivation in Singapore as an ornamental

plant", and recommended the oil palm as suitable for plantation in this region. However, while shipment (sale) of rubber seeds from the Gardens was reported in almost all Annual Reports of the Gardens from 1900 to the 1930s, no shipment of oil palm seeds was ever mentioned. In addition, an unsigned note found among the Herbarium records, possibly written by I.H. Burkill (Director, 1912 - 1925), mentioned that oil palms in the Gardens in the early 1900s were observed to be of the *dura* or *semi-dura* types, indicating perhaps that they were of direct African origins. They were therefore, unlikely to be the source of palms in early plantations in Sumatra and Malaysia, which used the Deli Dura types.

While there are gaps in our records, it seems clear that the Gardens did not play a major role in helping to spread the cultivation of oil palm in Malaysia. Many Botanic Gardens play important roles as repositories of information on the introductions and studies of economic crops. The information provides the historical perspective on understanding the development of such and underscores the importance of keeping accurate records on our living collection. Plants that we grow have a finite lifespan, but records that we keep, are the heritage that we gift to posterity.

Tan Puay Yok
Horticulture Branch



Michele Foglietta

Wild flowers of the Mongolian Gobi



Wild poppy, *Papaver* sp. (Papaveraceae) plants, with bright yellow flowers and visiting pollinators

Most of us would imagine the Gobi desert of Asia to be an expansive, rocky, extremely hot, and lifeless place akin to the bleak moon landscape, and true enough, the word "gobi," in Mongolian language, means "lifeless." We were fortunate to have the opportunity to do plant hunting in the Gobi Altai region of the People's Republic of Mongolia in June - July of 2001. To our pleasant surprise, we encountered not only a relatively rich biodiversity but also a beautiful flora.

Because of the low precipitation of between 55 - 200 mm per year, the climate of the Mongolian Gobi Altai at a latitude of about 45 degrees North, is both continental and arid. The difference between day and night temperatures can

be astonishingly great like that between summer and winter.

The typical landscape of the Gobi desert consists of rocky outcrops shaped by the wind and sand, and a brown sparsely vegetated soil crust. Most of the available water is stored underground. Where there is a more or less continuous supply of surface water at and around springs, vernal pools from snow melt or lakes, there will be patches of green made up of mosses and algae; in addition to brilliantly-coloured wild flowers and lichens. This outburst of colours can be seen at higher elevations, in narrow canyons and on steep slopes where grazing is minimal.

The flowering plants encountered are the wild members of families of iris (Iridaceae), lily (Lilicaceae), buttercup (Ranunculaceae), rose (Rosaceae), primrose (Primulaceae), poppy (Papaveraceae), bellflower (Campanulaceae), saxifrage (Saxifragaceae) and *Crassula* (Crassulaceae), growing among the low grass tussocks. Many of them have high ornamental potential. Some of these beautiful plants were collected for growing in the Botanical Garden of

Moscow, Russia.

In the few oases we visited, there are groves of *Haloxylon*, *Populus* (poplar), *Salix* (willow) and *Ulmus* (elm) trees, albeit in rather dwarf and gnarled form, due the distorting action of strong wind. In one we found a very large specimen of *Cistanche* (Orobanchaceae) a temperate plant parasite predominantly of xeric areas.

The main objective of our expedition to the Gobi Altai of Mongolia is to assess the biodiversity of bryophytes in such a harsh and extreme environment. Compared to the flowering plants, the bryophytes are generally inconspicuous and certainly so in this environment. Often, one has to cling onto cliffs or lie down flat on the belly to search for the tiny plants.

The populations of mosses found are in general small, cushion forming and hoary looking because of their long leaf hair-points. They are usually hiding inside rock crevices, under stony ledges and shaded bushes, along wet margins of creeks, streams, or temporary water bodies. They become more common at elevations above 1,500 m.



The brilliant orange flowers of *Prulliac asiatica* (Ranunculaceae) forming flaming meadows in early summer. This plant is common in Mongolia and Siberia. The white inflorescences in the background belong to *Lagotis integrifolia* (Scrophulariaceae).



A wild carnation *Dianthus* sp. (Caryophyllaceae) plant seen on a rocky scree.



A beautiful legume, *Chestnut mongolica* (Fabaceae), with deep red flowers and villose leaves. The colour of the flower changes from brick-red to pale purplish with age.



The lovely pink flowers of *Primula nivalis* (Primulaceae) contrast well against fresh snow on the ground. The family of plants has contributed a great number of ornamental species for temperate gardens.



Marchantia polymorpha (Marchantiaceae, Hepaticae), one of the two thalloid liverworts found growing in the shade under the large boulder along stream. Note the presence of numerous male (plate-like) and a single female (with finger-like projections) reproductive structure.



The deep blue flowers of *Campanula taraxacinae* (Campanulaceae) are commonly seen on steep mountain slopes. The petals, which measure to 3 cm long, make the plants very showy.

Our four weeks of desiccating hardship in the field yielded more than a hundred species of bryophytes, mostly mosses, a few liverworts, and no hornwort. Many of these are new discoveries for the Gobi part of the country which to date had only three published records. This is a very significant proportion of the total of 412 species of mosses ever recorded for the People's Republic of Mongolia where the greatest diversity is found in the forested northern Tajga region of the country.

Wild animal life is still plentiful. More commonly seen are the cranes, vultures, foxes, antelopes, gazelles, wild camels and wild asses. In addition, there are thousands of domesticated sheep, camels, yaks and horses dotting the wide horizon of the Gobi desert. Due to the severe winter the year before, we saw many scattered carcasses of dead domesticated animals in places where we botanised.

Sad to report, we also witnessed the increasingly detrimental conflict between man and nature in the Gobi Altai of Mongolia, a vast country of 1,567,000 km² with a small population of 2.4 million. Evidence of overgrazing of the thin vegetation in dry steppe and semi-desert was apparent everywhere. Fortunately, there is also increasing efforts by the Mongolian government to establish more national parks and nature reserves to increase the protected natural areas in the country, especially in the unique and fragile ecosystem of the Gobi Altai region.



A bright colour mosaic of lichens growing on a boulder.



Benito Tan

Collecting bryophytes from a seemingly dry cliff.



Benito Tan

Cistanche sp. (Orobanchaceae), one of the largest parasites in non-tropical Eurasia. The plant besides it is a gymnosperm, *Ephedra* sp.



Misha Ignatov

Typical landscape of Gobi Desert in Mongolia with semi-wild camels in the background. Benito Tan is in the foreground.

A desert oasis with gnarled trees of *Haleghyon ammodendron* (Chenopodiaceae). The local people harvest the trunks for firewood in winter.



Misha Ignatov

Capsules of *Begonia* sp. (Bryaceae, Musci) found in wet and shaded sites.



Benito Tan

The skeletal remain of a dead horse.



Benito Tan

Benito C. Tan

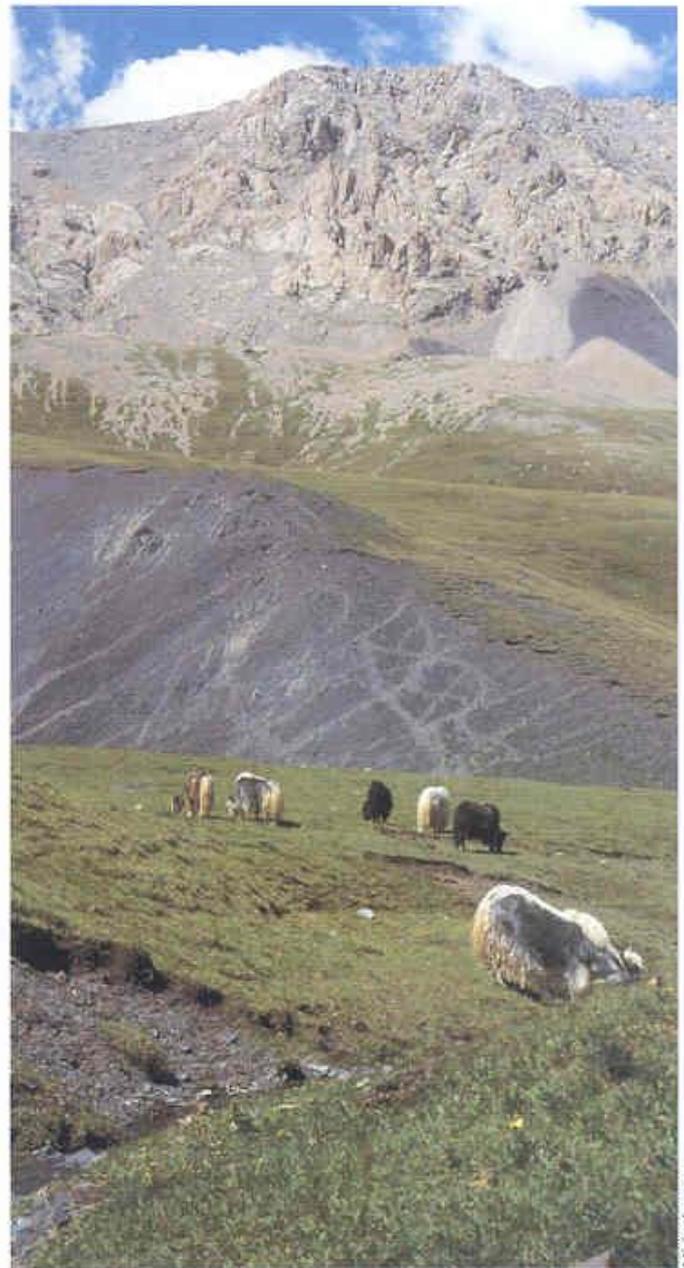
Department of Biological Sciences
National University of Singapore
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Primary Botanic Gardens
Russian Academy of Sciences
Moscow, Russia

Acknowledgement:

The authors would like to thank the National Geographic Society for a grant that made this trip possible for us to organize a surveying team of six botanists from People's Republic of China, Russia, Mongolia and Singapore.



Misha Ignatov

At higher elevations where there is better developed prairie, herds of domesticated yaks are common.

WHAT'S BLOOMING?



Julie Ong Bee Eng



Julie Ong Bee Eng

Buddleja asiatica

An evergreen shrub, *Buddleja asiatica* is one of about 100 species in this genus from the family Buddlejaceae/Loganiaceae. Endemic to India, this shrub is frequently known as the butterfly bush because of the attraction the flowers have for butterflies. It bears pure white flowers, the fragrance of which, lasting the whole day, is pungent to some but sweet to others.

The cylindrical panicles of the scented flowers are borne terminally as well as in axillary positions. The closely packed blooms tend to droop with their own weight. The straggly plant is sun-loving and blooms all year round. It can grow to about 3 m tall and needs to be pruned regularly to maintain the desired shape.

Buddleja asiatica prefers a well-drained soil and is commonly propagated by cuttings. This handsome plant is recommended for group plantings. The genus *Buddleja* is native to the tropics and sub-tropics of Asia, Africa and America. Plants of *Buddleja asiatica* can be seen in the Economic Garden.

Julie Ong Bee Eng
SIBG Management

NEW & EXCITING



Andrea Kee

Gardenia gjellerupii

Gardenia (Family, Rubiaceae) is a genus with about 250 species of shrubs and trees native to the tropics and subtropics of the Old World. Their flowers are typically scented. The genus has been popularised by the numerous cultivars of *Gardenia augusta*, a species originally from China.

Gardenia gjellerupii is a small shrub that hails from the forest of New Guinea. It grows to a dense bush about a metre tall. The striking, heavily scented flowers are 4-5 cm across with a long floral tube 7-8 cm long. They are cream-coloured when first open but over several days gradually change to a light orange and finally to an intense orange.

This plant was first introduced to the Gardens last August and seems to thrive in the sunny and humid weather of Singapore. It can be seen in the Economic Garden.

Andrea Kee
Plant Resource Centre

KEY VISITORS TO THE GARDENS (Jan-Jun 2002)

NAME	FROM
Mr Ahmad Zainudin Ibrahim	Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
Mr Amihan M Lubag-Arquiza	University of Philippines Los Banos, The Philippines
Ms Anita Jullana Mohd	Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
HE Atal Bihari Vajpayee	Prime Minister of the Republic of India
Mr Bob Coveny	Royal Botanic Garden, Sydney, Australia
HE Bounheuang Douangphachanh	Mayor of Vientiane, Lao People's Democratic Republic
Mdm Charita P Puentaspina	Devao Tropical Botanical Garden Foundation, Inc.
Ms Chiou-Rong Sheue	Department of Biological Science, Xat University, Kaoshing, Taiwan
Mr Chukiat Laonspol	Department of Biology, Faculty of Science, Prince Songkla University, Thailand
Ms Clyde L Calvin	Department of Biology, Portland University, Portland, USA
Mr Hakuo Yanagisawa	Minister of State for Financial Services, Japan
Mdm Helena Opolecka	Deputy Minister for Foreign Affairs, Czech Republic
Prof Dr J G Rohwer	University of Hamburg, Germany
Ms Jana Skornikova	Charles University, Prague, Czech Republic
Dr Joan Watson	Manchester University, UK
HE Junichiro Koizumi	Prime Minister of Japan
Dr Kamarudin Mohd Salleh	Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
Dr Kitchate Sridith	Department of Biology, Faculty of Science, Prince Songkla University, Thailand
Mdm Li Yongqing	Spouse of HE Hu Jintao, Vice-President of the People's Republic of China
HE Lourdes C Fernando	Mayor of Marikina City, The Philippines
Ms Meg Lowman	Marie Selby Botanical Gardens, USA
Mr Miura Chiaki	Parks & Greenery Division, Okazaki City, Aichi Prefecture, Japan
Ms Noor Fatimahwati Moktar	Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
Ms Nurul Nahar Esa	Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
Ms Nyree Zerenga	New York Botanical Garden, USA
Dr Obchant	Département of Botany, Faculty of Science, Chulalong University, Thailand
Dr Oradee Saharocharin	Mohidol University, Thailand
Dr Patrick Sweeney	University of Missouri Botanical Garden, St Louis, USA
Ms Piyat Subsathum	Department of Botany, Faculty of Science, Chulalong University, Thailand
Mr Q C Basek	State University of West Bengal, India
Mr Ram Naik	Cabinet Minister, Petroleum & Natural Gas, Government of India
Mr Haungaard Pederson, K	Department of Earth Science, University of Aarhus, Denmark
Ms Rossarin Pollawan	Department of Botany, Faculty of Science, Chulalong, Thailand
HE S R Nathan	President of the Republic of Singapore
Assoc Prof Somchai Dechapromphun	Burapha University, Thailand
HE Somsavat Lerisavad	Deputy Prime Minister, Ministry of Foreign Affairs, Lao People's Democratic Republic
Ms Surazaha Shahri	Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
Prof T K Bose	State University of West Bengal, India
Prof Thaweesakdi Boonkerd	Department of Biology, Faculty of Science, Chulalong University, Thailand
Mr Thaya Jenjittikul	Mohidol University, Thailand
Mr Tu Yong	Vice Mayor of Wuhan City, Hebei Province, People's Republic of China
Mr Victor Marquart	Department of Biology, Portland University, Portland, USA
Ms Wesgh Hygin	Marie Selby Botanical Gardens, USA
Prof Wu Su-Gong	Kunming Botanical Institute, Yunnan, China
Mr Yoto Tonouchi	Deputy Mayor, Nagoya City, Japan
Mdm Zhang Suzhen	Spouse of HE Li Langqing, Vice-Premier of the People's Republic of China
Mr Zhuo Tao Qiang	Deputy Mayor, Shunde Government, People's Republic of China



The Prime Minister of India, HE Atul Bihari Vajpayee signing our guest book during his visit to the National Orchid Garden. Looking on to his immediate left is Dr Tan Wee Kiat, CEO, National Parks Board.

AP/AR

HE Junichiro Koizumi, the Prime Minister of Japan, admiring a display of *Phalaenopsis* hybrids in the Mist House of the National Orchid Garden, during his visit on 14th Jan 2002. Dr Tan Wee Kiat, CEO, National Parks Board, is on his left.



AP/AR

Staff News



Wee Tan Wee

Dr Kiew, recipient of the David Fairchild Award, savouring the new begonia hybrid, *Begonia* Dr Ruth Kiew (*B. deliciosa* 'Bob Cochran'), courtesy of Tim Anderson of Palm Hammock Orchid Estate, Inc., together with Dr Tan Wee Kiat, CEO of the National Parks Board (right) and her daughter, Lisa (middle).

DR RUTH KIEW - RECIPIENT OF THE PRESTIGIOUS DAVID FAIRCHILD MEDAL FOR PLANT EXPLORATION

Our heartiest congratulations to our colleague, Dr Ruth Kiew, Keeper of Herbarium and Library, for having been presented with the David Fairchild Award for Plant Exploration by the National Tropical Botanical Garden, on 8th February 2002. Her award is a significant international recognition of an aspect of the botanical research undertaken by the Gardens.

FROM THE ARCHIVES

An Excursion to the Sungai Sedili on 29th January 1933



EJH Corner

The long reach of the Sedili above Danau



EJH Corner

Tongkangs on the Sedili



EJH Corner

The Sedili River by Bagan Kijang



EJH Corner

The Dohol, the tributary of the Sedili

Who even remembers taking black & white photographs now-a-days? But while modern colour photos tend to lose their original colour, black & white ones stay the same and so are a permanent record of the past.

This collection of photos is unique in that we have a contemporary account to accompany them, which unlike many in our collection are annotated.

Between 1929 and 1941, EJH Corner, then Assistant Director of the Botanic Gardens Singapore carried out a detailed study of the flora of the Sedili Rivers in Johore, Malaysia. In 1933, he made several excursions there staying at the Ulu Tiram Estate and on one occasion was accompanied by C.E. Carr who recorded the event in his diary as follows:

January 1933

28 Saturday

Corner & I stayed overnight with Reginato and Lloyd on Ulu Tiram Estate in order to make an early start for the Sedili river.

29 Sunday

Left Ulu Tiram at about 8.0 a.m. by car, I with Reginato and Corner with Lloyd. Leaving the cars about 8.5 miles down the new Kota Tinggi-Mersing [road] a walk of just over a mile down a wide rentis brought us to the river at Bagan Kijang where our motor boat ordered the previous day was waiting. The course taken was upstream as far as Danau above which the river is not navigable for large prahus owing to snags.

There is a rackit at Danau belonging to an old Malay who makes his living by jungle produce, fishing and trapping. Here we had lunch, afterwards gliding downstream without the engine until about 5.0 p.m. when a short way from our starting point.

[Rentis (Malay), path cut through the forest; rackit, a bamboo raft or pontoon.]

Carr, by profession a rubber planter, was an expert with wide field experience of Malaysian orchids. In his diary he also includes a list of 69 orchid species from the Sungai Sedili with one, *Bulbophyllum clavifilum*, being noted as a new species, though this name was never published.

The photos and diary are a part of the botanical materials that came to the Gardens after Carr's untimely death of blackwater fever in Papua New Guinea at the age of 44. The photographs were taken by Corner who wrote the captions on the back and they are still in the original envelope addressed to Carr in Corner's hand. They record a scene that has long since vanished as the importance of river transport diminished in the face of competition from road traffic.

Ruth Kiew
Library