

A “World of Palms” at Gardens by the Bay, Singapore

ANTON S. VAN DER SCHANS

AND

ADRIAN H.B. LOO
Gardens by the Bay,
18 Marina Gardens Drive
Singapore 018953,
Republic of Singapore.
adrian.loo@gardensbythebay.
com.sg

Since its official opening in June 2012, Gardens by the Bay has welcomed over 18 million visitors. The gardens, built right in the heart of Singapore’s new downtown and developed over reclaimed land, comprise three waterfront gardens, namely, Bay South, Bay East and Bay Central, altogether spanning 101 hectares.

The 54-hectare Bay South is the largest of the three and currently the most developed with two cooled conservatories (a 1.2-hectare Flower Dome and the 0.8-hectare Cloud Forest) as well as 18 Supertrees that range from 25 to 50 m in height. Amidst these Supertrees, a 128 m long walkway suspended at a height of 22 m allows a panoramic view of the gardens, the waterfront and the city skyline. The inspiration for the Supertrees came from the giant Karri (*Eucalyptus diversicolor*) trees from the Valley of the Giants in Walpole-Nornalup National Park, Western Australia. One of these supertrees conceals a tall chimney that filters flue from the incinerator burning horticultural waste that provides biomass energy to cool the air in the two domes. These Supertrees are vertical gardens clad in epiphytes, mainly bromeliads, orchids, ferns, hoyas and woody vines.

These iconic structures are part of a design master-plan that is inspired by Singapore’s national flower, *Papilionanthe* (*Vanda*) Miss Joaquim. In areas that represent parts of a large

orchid flower motif are gardenesque horticultural displays centered on two main themes – “Plants and People” and “Plants and Planet.” The map in Fig. 1 shows part of Bay South and serves as a reference for sections being described further below.

Plants and People – The Heritage Gardens and the Flower Dome

The Indian, Chinese, Malay and Colonial Gardens form the Heritage-themed gardens that show how plants play important cultural and economic roles in Singapore’s three main ethnic groups. Through carefully selected plants, they celebrate our multicultural society and plants of commerce that were introduced during the time when Singapore was one of the Straits Settlements (late 19th and early 20th centuries). The Flower Dome displays plants from different parts of the world that enjoy a Mediterranean climate. The grandest palm in the dome is *Jubaea chilensis*, which matches the larger-than-life scale of the dome itself.



appear. Some of these palms, New World and Old World are featured below and in the figures.

The Golden Garden

The rich palm diversity is not isolated to the World of Palms section – palms feature



4. *Areca catechu* Dwarf – Pinang, or Betel Nut has been cultivated and naturalized through much of tropical and subtropical South and Southeast Asia for so long that its true native origin is uncertain, but it is believed to be the Philippines. The slender, single trunk can reach 20m, on young palms the trunk remains dark green, with prominent grey rings, if planted in a cluster these can resemble bamboo culms. The seed is chewed with lime and Betel leaf (*Piper betle*) and lime, the alkaloids released are intoxicating and mildly addictive, but carcinogenic tannins are also present. Ornamental cultivars include ‘Alba’ (a pale yellow albino mutation) and a dwarf form.

prominently everywhere and, in some sections, are used to spectacular effect. In the main arrival area of the gardens named the Golden garden, several large *Corypha utan*

palms wave their large fronds and orange-gold petioles amidst a section landscaped with variegated plants that, en masse, give an effusive golden glow and a sense of arrival.



5. *Actinorhynchus calapparia* – Calappa Palm is a monotypic genus (only one species), native to New Guinea and the Solomon Islands in lowland rainforest, it has been more widely cultivated in Southeast Asia as a betel nut substitute, with supposed magical properties. The slender trunk can reach 15 m tall, together with the strongly recurved fronds it looks similar to the Darwin Palm (*Carpentaria acuminata*) planted nearby framing the Dragonfly Bridge but when in fruit the Calappa palm can be easily distinguished by its much larger fruit to 7 cm long.

Adonidia merrillii 'Golden,' variegated *Elaeis guineensis*, *Latania verschaffeltii* are palms that add to this effect.

The Silver Garden

The Silver Garden site is at perhaps the most visually prominent corner of the gardens,



6. Palms of all forms – specimens of *Livistona decora* at the Chinese Gardens specially chosen for their elephantine trunks make for an interesting palm display at the Chinese Gardens.

meant to be seen across water from traffic approaching the city, the Singapore Flyer and from the Marina Bay Sands' sky garden. The planting had to be bold, with large palms such as *Bismarckia* an obvious choice for immediate impact. International palm enthusiasts have commented on the mass plantings of silvery *Bismarckia* used in Singapore's parks and streetscapes, and the "cloud" effect of interlocking silver fronds, so this species has been used to create an ethereal canopy-scape

crowning the mound and shading the lawn below.

The glaucous tones are repeated in smaller palm species, and in the adjacent cluster of supertrees, where the epiphyte cladding is dominated by *Tillandsia* species.

The Supertree Grove

The Supertree Grove is a large central area circumscribed by the corridors formed by the

7. The Flower Dome. This conservatory set the Guinness World Record for being the largest glass greenhouse in the world. *Jubaea chilensis* and *Phoenix canariensis* are found in the South American and Mediterranean sections respectively.





8 (top). *Phoenix canariensis* in the Mediterranean gardens within the Flower Dome. 9 (bottom). World of Palms section with a rich variety of palms from all over the world.



10. *Caryota zebrina* is one of the many palms with striking forms and patterns that make the World of Palms section exciting to explore.

Heritage Gardens and World of Plants. It is home to 12 spectacular supertrees and is another rich haven for palms. From a height of 22 m, on the skywalk suspended from the Supertrees, one can admire spectacular swathes

of silver *Bismarkia nobilis* planted at the edge of the Super Tree grove and close to the waterfront.

Beneath groves of rain trees laden with epiphytes are understory palms belonging to



11. *Satakentia liukuensis* – Endemic to Japan's southern Ryuku archipelago, with the main population on Ishigaki-jima, and scattered specimens on Iriomote-jima, it appears to be in decline in its native habitat. Its habitat, small islands in the subtropics with a maritime climate helps give the palm a wide climatic tolerance in cultivation, thriving from the equatorial tropics of Singapore to frost free coastal microclimates in warm temperate zones. The straight trunk can attain 20 m, topped with a shiny dark brown crownshaft.



12. *Borassodendron machadonis* occurs in Southern Thailand, northern Peninsular Malaysia and possibly Burma, where it is found in lowland forests. The large, dark glossy green leaves, and split leaf-sheath and sharp petiole edges make it an attractive fan palm. The scent from the male inflorescences is sweet and the flowers, which last for two weeks, are visited by bees.



13. *Livistona endauensis* is endemic to Peninsular Malaysia with a disjunct range. The first descriptions were made by John Dransfield and Wong Khoo Meng from collections in Endau Rompin National Park in Johore, where the main groves occur on a sandstone plateau. Subsequently, another population was discovered in the eastern hills of Terengganu at Bukit Bauk. Young specimens have orange petioles.



14. *Hydriastele beguinii* – Formerly in the genus *Siphokentia* but now included in *Hydriastele* along with the other Papuan genera of *Gronophyllum* and *Gulubia* in the *Arecinae*. Occurs on the Moluccan island of Halmahera and adjacent islands in lowland forests. We have ten specimens, 4 to 5 m tall, thriving in a section of closely grown palms. The variously shaped leaflets and its dark blue-green crown makes an interesting addition to the collections at the World of Palms.

genera such as *Licuala* and *Johannesteijsmannia*. Intermingled with the 12 Supertrees within are *Corypha* and *Copernicia* palms that will one

day be supertrees of their own. A precious few *Tahina spectabilis* palms, the recently discovered “Suicide palms” from Madagascar



15 (top). *Licuala orbicularis* is just one of a few of many species of understory palms from Southeast Asia. 16 (bottom). *Licuala mattanensis*, an eye-catching understory palm.



17 (top). The Cloud Forest. Every two hours, a cool mist issues from the fogging system and surrounds the man-made mountain clad in a plethora of epiphytes. 18 (bottom). The Foothills of the Cloud Forest – Cantilevered walk-ways around the “mountain top” offer bird’s eye views of palms like *Howea forsteriana*, *Chambeyronia macrocarpa*, *Chamaedorea hooperiana*, *Chamaedorea tepejilote* and *Trachycarpus fortunei*.



19 (top). The Golden Garden. Palms with variegations, orange petioles and yellow leaves give our visitors that warm welcome near the arrivals. The tallest fan palm in the foreground with the orange petiole is *Corypha utan*. The Cloud Forest conservatory is in the background. 20 (bottom). Co-author stands in front of *Latania verschaffeltii*; at the back with yellow petioles is *Corypha utan*. *Latania verschaffeltii*, Yellow Latan Palm, is endemic to Rodrigues Island, near Mauritius, along with the Spindle Palm (*Hyophorbe verschaffeltii*), growing on cliffs and ravines amongst rock near the sea. Endangered by clearing and harvesting for thatch, with only about 500 specimens, regeneration is prevented by pigs. The fronds are less stiff than the other two species. The petioles, ribs and hastula are yellowish, the color is more intense and extensive on young plants. *Corypha utan*, the Gebang Palm is native through much of Southeast Asia from India and the Andaman Islands to Indo-China, Philippines, New Guinea and northern Australia, growing in savanna woodland, grassy floodplains that are inundated in the wet season, and along rivers, and gullies in monsoon forest. We have this species from two sources, from nurseries in Johore, the petioles are a dull orange-brown, and from Nong Nooch Tropical Botanic Garden, the petioles are bright golden orange.



21. *Adonidia merrillii* 'Golden' – The golden form, with yellow fronds and crownshaft, is believed to have originated in the garden of Mr. Cesar Pecson, in Singalong, Manila, in the mid-1980s, after Mr. Zacarias Sarian noticed some sprouted seedlings under a mature palm had yellow leaves, these soon caught the attention of palm collectors and nurseries in Thailand and Malaysia.

donated from Royal Botanic Gardens Kew, are doing well. Still young, the distichous arrangement of the leaves is very apparent.

Large fan-palms feature strongly here, as they reflect the circular crown and cylindrical design of the supertrees



22 (top). *Hyophorbe* Silver Lady. This hybrid between the Spindle Palm (*H. verschaffeltii*) and Bottle Palm (*H. lagenicaulis*) is often called the Spottle Palm or Sherry Bottle Palm. It combines good features from both parents, a more cylindrical trunk than a spindle palm, with the greater girth of the bottle palm. Ours have been used to create a formal avenue of short stout palms in planter boxes with limited soil depth. 23

(bottom). *Bismarckia nobilis* – The silver form has been massed with many individual palms of varying height as a canopy emphasizing the mounded form of the Silver Garden, with a single specimen of the green form planted in the plaza for comparison.



24. *Nannorrhops ritchiana* – Mazari Palm is native to Oman, the eastern Arabian Peninsula, Afghanistan, Pakistan and northwest India, in rocky deserts, up to 1600 m altitude. It is one of the palms hardest to cold and dry, where winters are dry and summers are hot, but also thrives in the humid tropics if growing in well-drained soil in a sunny, breezy spot.

The Promenade

The two conservatories are built along the edge of the Marina Reservoir. Take a stroll along the

winding promenade along the water's edge and one can easily encounter *Syagrus romanzoffiana*, *Hyphaene coriacea*, *Cocos nucifera*



25. In the foreground, juveniles of *Tahina spectabilis* showing the characteristic distichous arrangement of petioles when the palms are still young. The larger palms behind are *Corypha lecomtei*. In the background, the skyway which offers a view of the gardens, the ocean and the city skyline.

(‘Malayan Dwarf’ and ‘Fiji Dwarf’), *Syagrus schizophylla*, *Syagrus montgomeryana*, *Serenoa repens*, *Allagoptera arenaria* and *Beccariophoenix madagascariensis*.

There are, of course palms throughout other parts of the Gardens. Gardens by the Bay is

home to over 530 species, varieties, hybrids and cultivars of palms. Over 420 are species or varieties, and over 11,000 individual palms are planted in the gardens. This makes it the third most diverse plant family in Gardens by the Bay after the orchids (with 2247 species) and



26. Trees with leaning trunks always have a place in the gardens, like this *Butia yatay*. Here the jelly palm leans over one of our filter beds where run off is channeled to before reaching the perimeter lake of the gardens.

bromeliads (1065 species). The natural distributions of these palm species are extensive and represent palms from many countries around the globe. Come visit us and enjoy a World of Palms at Gardens by the Bay!

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