

Palms

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The International Palm Society

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FRONT & BACK COVERS

A panoramic view of the Gardens by the Bay. The taller of the two conservatories is the Cloud Forest; to its left is the Flower Dome. The iconic Supertrees dominate the foreground. See article by Van Der Schans & Loo, p. 161.



Palms of the World of Palms at Gardens by the Bay include this unusual cultivar, *Cyrtostachys renda* 'Watermelon.' See article by Van Der Schans & Loo, p. 161.

PALM NEWS

Nurserymen have long sought a way to increase the speed of germination of palm seeds, some of which can take many months to germinate. A recent study by E.M. Bicalho et al. (*Plant Biology* 17: 990–996. 2015) examined the roles of gibberellins (GA) and abscisic acid (ABA) in the germination of fresh seeds of *Acrocomia aculeata* (endocarp removed). **They found that seeds treated with GA germinated faster and to a higher percentage than untreated seeds.** They determined that ABA levels in the embryo naturally decline during the germination process; consequently the GA/ABA ratio increases. The effective GA treatment was soaking seeds in 2000 mg of GA₃/l of water for 24 hr prior to planting. A summary of their study is here: <http://onlinelibrary.wiley.com/doi/10.1111/plb.12332/abstract>.



Tarciso Leão

IPS members were **saddened to learn of the death of Dr. Mardy Darian, of Vista, California**, on 25 August 2015; he was 82 years old. Dr. Darian was best known for his many palm expeditions to Madagascar, long before botanists began their modern exploration of the island. He introduced many Madagascar palms into cultivation, and of course, *Marojejya darianii* was named for him. A full tribute to Dr. Darian will appear in a future issue of PALMS.

The Harry Messel Award for Conservation Leadership recognizes exemplary service to the Species Survival Commission (SSC), especially from individuals who have made a specific contribution to species conservation on the ground or through their leadership, as part of the work of an SSC Specialist Group or Task Force. In September of this year, **this prestigious award went to Dr. Mijoro Rakotoarinivo in recognition of his pioneering work on Madagascar palm conservation** during his time working at the Kew Madagascar Conservation Centre in Madagascar. Congratulations, Joro!



Scott Zona

A new study **tracked the movement of systemic fungicide in coconut (*Cocos nucifera*)**. Yu and colleagues (*HortScience* 50: 1327–1331. 2015) found that fungicide injected into the trunk of coconut palms quickly moved into the crown. The fungicide was detected in leaflet tissue, but its concentration in that tissue quickly diminished over the next five weeks. In contrast, the fungicide moved more slowly into the spear leaf, but it persisted there and in the leaf bases for a longer period of time. The results are useful in predicting the movement of injected fungicides in coconut, but at the same time, they raise questions about the advisability and safety of using persistent systemic fungicides in crops that produce edible fruits.

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

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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.

Within the Heritage gardens are collections of entombotically significant palms such as Malayan dwarf *Cocos nucifera*, *Areca catechu* (wild-type, dwarf and albino mutants), *Arenga pinnata*, *Actinorhynchus calapparia*, *Borassus flabellifer*, *Livistona chinensis*, *Elaeis guineensis* (including cv 'Deli Dumpy'), *Roystonea oleracea*, and *Phoenix sylvestris*. Some palms are featured below.

Plants and Planet – The World of Plants and The Cloud Forest

The Discovery, Web of Life, Fruits and Flowers, Understorey, World of Palms and Secret Life of Trees gardens celebrate botanical diversity through different assemblages of plants that showcase their form and function. Palm lovers will definitely take to the World of Palms, which has our largest diversity of palms within Gardens by the Bay. The Cloud Forest is a culmination of this Plants and Planet theme – it houses a 35 m tall mountain top covered in lush vegetation that showcases plants that are found on tropical highlands. A favorite with our visitors is the world's tallest indoor plunge water fall set against the mountain side,

roaring its welcome at the instant when the visitor walks through the entrance.

A World of Palms

Palms have a special place in the gardens. Towering *Arenga undulatifolia* fronds frame the entrance to the World of Palms and the arching fronds of *Carpoxydon macrospermum* announce that one has arrived in a palm-rich section. Explore within this section and many palm species of diverse forms and origins

Facing page:

2 (top). Malay Gardens – one of the heritage gardens. Gardens by the Bay is situated in the new downtown. The traditionally designed Malay hut in the foreground of the modern 55-story Marina Bay Sands hotel is a reflection of how this island has transformed since gaining independence in 1965. Framing the picture are the Malayan dwarf *Cocos nucifera*. 3. *Elaeis guineensis* 'Deli Dumpy' was selected in the mid-1970s from Deli stock for its short, stout trunk that is more economical for harvesting. The oil yield is low, so it is not grown commercially. The fronds tend to be straighter and less plumose than typical *E. guineensis*. Two juvenile *Attalea cohune* are growing nearby.

1. Map showing part of Bay South, which is the most developed of the three gardens surrounding the Marina Bay Reservoir.





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 Khoon 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 hardiest 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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Palms in Southern Republic of Congo

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The central African country of the Republic of Congo is one of the botanically least-known countries in Africa, and this is especially true for palms. This country generally represents a blank spot in terms of species distributions for palms. Here we provide an overview of the palm flora of the southern part of the country.

The Republic of Congo (RC), also known as the “French Congo” in contrast to the Democratic Republic of Congo (the “Belgian Congo”), is a medium-sized country of Central Africa stretching from the Atlantic coast into the Congo Basin. The country is characterized by several different ecosystems, which all contribute to its high species diversity. Covering 60% of the territory (Sita 1990), the Guineo-Congolese rain forest *sensu* White

(1983) is found in the Mayombe mountains, Massif du Chaillu and the northern part of the country (e.g., Odzala National Park). Other vegetation types include mosaics of degraded forests and savannas and a mixture of sublittoral forest and pseudo-steppes. To date, RC remains botanically under-documented and this is especially true when it comes to palms. The number of plant species identified in the National Herbarium of the Congo

(CERVE, Brazzaville) is currently around 4400 species belonging to 198 families (Moutsamboté et al. 1994, Sita 1990). Endemism is estimated to be around 22%, similar to that of Gabon (Sosef et al. 2006). However, there are many undetermined specimens and the country remains under-collected in general.

In an effort to better document the palm flora of the Republic of Congo, the first author undertook an expedition supported by a grant from the International Palm Society to the southern part of the country in the Kouilou department (Fig. 1). This trip was part of the first author's PhD thesis on the evolutionary dynamics of palms in Central African rain forests. Adama was accompanied by Professor Jean-Marie Moutsamboté, a distinguished Congolese botanist. During the civil war that raged across the country from 1997 to 1998, he single-handedly "moved" the Brazzaville herbarium (some 60,000 specimens) to safety after pleading looters to wait before they ravaged the building. After several days and numerous taxi trips, the specimens were safe and are now back in the herbarium for everybody to use (David Harris, pers. com).

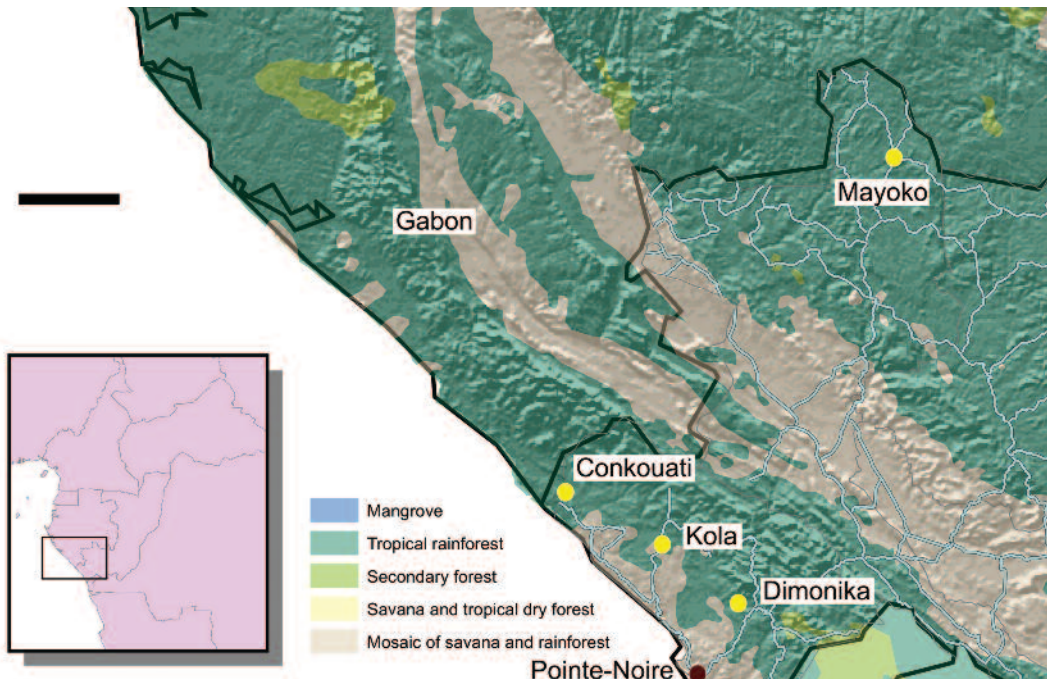
The expedition visited four different parts of the region: 1) the Biosphere Reserve of

Dimonika, 2) the central area of Kouilou, 3) Conkouati National Park and 4) the Moyoko area in the Massif du Chaillu (see Fig. 1).

We started the expedition from Yaoundé, Cameroon. Hiring cars in RC can be quite expensive so it was cheaper to use the local IRD (Institut de Recherche pour le Développement) car and drive across a large part of Central Africa. It took us, the driver Valentin and Adama, three days to arrive at the small town of Dolosie where we met up with Prof. Moutsamboté and one of his students.

The next day we set off to the Biosphere Reserve of Dimonika (BRD) created in 1988 as part of the Mayombe forest conservation project. This is a large protected area covering 136,000 hectares between the Kouilou, Loubomo and Loukoula rivers. It is located in one of the wettest areas of the country characterized by lush tropical rain forest dominated by emergent trees such as *Scorodophloeus zenkeri* and *Daniellia* spp. (Fabaceae) and several species of Burseraceae. We started collecting in an old secondary forest highly disturbed by gold mining, the main activity of the surrounding local villages. There we collected *Podococcus barteri* persisting in sparse populations in the undergrowth. This species is distributed from Nigeria to Cabinda

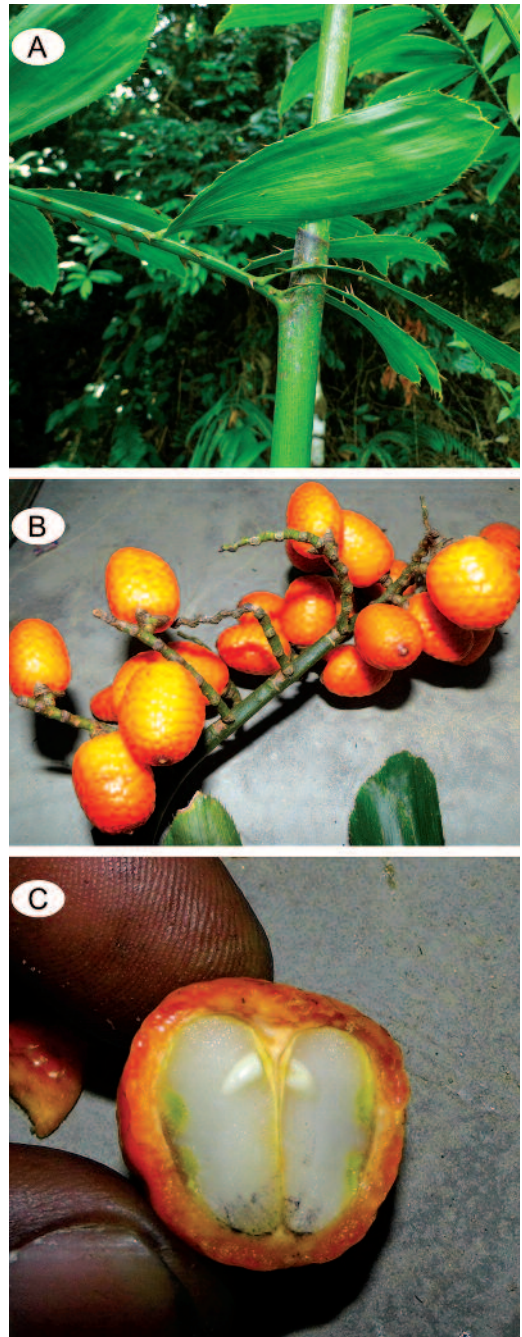
1. Distribution map of four visited sites: Dimonika situated in the extreme south of Mayombe forest, Kola in alternating forest-savannah zone in Kakamoueka District, Conkouati in the northern part near Gabon, Mayoko in the other northern side forest.



(Angola) and can become dominant in the forest understory which we noticed later on (van Valkenburg & Sunderland 2008). Indeed, in the southern part of BRD, *P. barteri* was often dominant, covering around 80% of the understory. This allowed us to undertake some important population level sampling for Adama's PhD thesis. We also encountered the majestic *Sclerosperma mannii* (van Valkenburg et al. 2008). *Sclerosperma* is mainly restricted to areas along rivers forming large populations in swamp forests. Amazingly, this was the first collection of this species for RC and just the second for the genus (*S. profiziana* was already documented for RC). The collections of *S. mannii* during this trip nicely fill in the collection gap between Gabon and the province of Cabinda in Angola where it was already known.

In this same area we also collected several African rattan species (subtribe Ancistrophyllinae). This is one of the most diverse subtribes of palms in Africa with 21 species (Faye et al. 2014, Sunderland 2012). Among them, we collected the rare species *Eremospatha tessmanniana* for the first time in RC (Fig. 2). We were pretty excited about this collection not only because it represents a significant range increase (previously known from West Cameroon, east Nigeria and Rio Muni in Equatorial Guinea) but also because it is the first documentation of its inflorescence structure and fruits (Sunderland 2012). *Eremospatha tessmanniana* is characterized by forward and rear facing spines along the leaflets as well as by the absence of a knee at the base of the leaves (Fig. 2A). The rachis of the inflorescence is 20–30 cm long, branched to one order, with around 10–12 subopposite rachillae, 10–15 cm in length (Fig. 2B). The mature fruits are a wonderful bright orange (Fig. 2B), around 3 cm long and 2 cm in diameter. Each fruit contained two flattened and smooth seeds, 1.5 cm long and 0.7 cm wide (Fig. 2C).

About 80 km West of Pointe Noire we visited the Foufoukou mountain chain. There we added yet another range extension for a palm species as we collected *Podococcus acaulis* (Fig. 3A), previously thought to be endemic to Gabon (van Valkenburg & Sunderland 2008). Once again, this species was not officially documented for the country, not appearing in any of the published checklists or in the recent monograph. However, it has been documented several times by the local botanists such as Prof. Moutsamboté. In fact, both species of



2. *Eremospatha tessmanniana*. A. Leaf and leaf sheath: notice the forward and rear facing spines along the leaflets. B. Inflorescence with fruits. C. Cross-section of a fruit showing the two flattened seeds and the embryos.

Podococcus where found to grow there in sympatry. This is one of the few places where this occurs, as in Gabon they occupy distinct habitats. Although in both species the flowers are similarly disposed in triads (Fig. 3C), *P.*



3. *Podococcus acaulis*. A. Habitat. B. Young fruits on inflorescence. C. Inflorescence with triads flowers. D. Leaflet with indumentum on the underside.

acaulis is easily identifiable thanks to the dense cover of hairs found on the underside of the leaflets (Fig. 3D), its acaulescent habit and the inflorescences produced from the base of the clump (see Fig. 3B).

After a quick stop at the port town of Pointe Noire, we moved on to our second objective: Lake Nanga located in the central west part of Kouilou. This region is characterized by several types of vegetation from coastal shrub savanna, mosaics of degraded forests/savannas and the dense forest in Kola district. In the coastal grassland, 100 meters from the beach we collected the handsome fan palm *Hyphaene guineensis* growing in dense populations (Figs. 4 & 5). This palm, described in 1827 by Thonning, is generally overlooked in local floras and is often confused with another fan palm genus *Borassus* (see discussion in van Valkenburg & Dransfield 2004). *Hyphaene guineensis* occurs in the West African grassland in eastern Liberia, the Niger Delta and also in the southern forests in Angola. Before our collection, this species was only documented by two other collections despite its abundance (van Valkenburg & Dransfield 2004).

In the swamp forest just behind the costal grasslands, we collected another rattan species: *Eremospatha cuspidata*, easily identifiable due to his apiculate leaflets. It has a widespread range across central Africa, generally growing on the fringes of forests. This marshy vegetation was also characterized by dense populations of *Raphia hookeri*, *Podococcus barteri* and *Sclerosperma mannii*.

On our way to the next site, the National Park of Conkouati, we stopped at the small village of Mbena (Kakamoeka district), where we learned of some useful aspects of two interesting understory palms, *P. barteri* and *S. mannii*. Villagers use the stem and the well-developed root system of *P. barteri* as a broom to clean in and around households (Fig 6C). The large leaves of *S. mannii* (Fig. 6A) are often used by villagers to build "bush huts" (Fig. 6B). The leaves are also used by hunters to channel animals along their tracks into traps. Near this village we collected a nice fruiting specimen of *S. mannii*, a rare event. Indeed, the fruits are often buried several centimeters under leaf litter and other debris, which accumulates at the base of the leaves of the acaulescent palm



4. *Hyphaene guineensis* in its natural habitat.



5. *Hyphaene guineensis* A. Population along the Congolese Atlantic coast. B. Detail of the large fruits.



6. *Sclerosperma mannii* and *Podococcus barteri* at the Mbena village. A. *S. mannii* in its natural habitat. B. Bush hut made with the dried leaves of *S. mannii*. C. Craft broom manufactured using the stem and root system of *P. barteri* (on the left, Prof. Moutsamboté). D. Fruits of *Sclerosperma mannii* in its natural habitat.

(Fig. 6D). Even though they are a much appreciated delicacy, local people (as well as botanists!) are generally too late to harvest them, as animals are quick to dig them up when ripe.

The National Park of Conkouati covers a surface of around 500,000 hectares along the Atlantic Ocean, in the northern part of Kouilou and is was the first protected area created in the Republic of Congo. Thanks to the support of the Wildlife Conservation Society since 2000, a conservation management program is underway. Conkouati is identified as a priority area for African rain forest conservation by the IUCN and BirdLife International.

Unfortunately for us, the barge that transported cars across the Numbi River just before the reserve had broken down, a common hassle across Africa! We were, however, determined to reach the park, even if for just a few days. Luckily, the park manager was an old student of Prof. Moutsamboté (most of the botanists in the country were his students at one point!), and he was able to secure a car for us if we were able to reach the other side. Leaving Valentin with the IRD car behind, we hopped onto a small dug-out that transported us to the other side of the river, where a WCS car awaited us. The car was available for the next two days, not enough to make important collections, but it still allowed



7. *Raphia farinifera*, along the Mayoko road, showing pendulous inflorescences.

us to visit this wonderful park. Once again *P. barteri* dominated the forest undergrowth. These individuals were much taller and in higher density than those collected further inland, with stems reaching up to 3 m tall. It is a weird sensation walking among this small understory forest of palms! We also collected

Raphia hookeri, another species that can dominate the marshy environments.

By then it was time to undertake the long journey back to Yaoundé. However, after studying the road map we decided to take an alternative route home, making a quick last

stop in the Massif du Chaillu in the northern part of RC that borders with south Gabon. Specifically we stopped at Mayoko, a small area well known for its mining activity and thus mineral rich soils. We were not disappointed by this decision as we were able to make some interesting collections.

Mayoko was certainly a good spot for collecting interesting rattans. First, we stumbled across *Laccosperma korupense*, an easily identifiable rattan because it lacks the typical acanthophylls (leaflets modified into spines) along the cirrus. These past two years, the distribution range of this species has been significantly extended (Sunderland 2003). It was recently only known from a few localities in South West Cameroon, but has since then been collected in several new localities across the country (Couvreur et al. 2013). This first documentation of its occurrence in RC thus represents another increase in its distribution. We did, however, notice some slight morphological differences with the material collected from Cameroon, mainly the shape of the leaflets (more sigmoid than the individuals from Cameroon). We then saw *Eremospatha haullevilleana*, a rattan restricted mainly to the Congo Basin (Sunderland 2012). In addition, we also collected the beautiful *Eremospatha wendlandiana*, characterized by its rhomboid or trapezoid leaflets, *E. hookeri* and *Oncocalamus macrospathus*. Along the road we also collected *Raphia farinifera*, remarkable for its long pendulous inflorescences, up to 4 meters long (Fig. 7). This species is widely distributed across subtropical Africa and Madagascar (Stauffer et al. 2014). It is generally associated with human habitations, as the petioles and the leaves are used in construction.

Finally, we collected once again *Podococcus acaulis*. This was the first collection in this region, but it is not surprising as it is well known from the Massif du Chaillu in Gabon. The individuals were, however, very vigorous with leaves reaching up 3.5 m tall and inflorescences up to 1 m long, much larger than those found earlier during our trip.

It is important to note that most of the species that we have collected during this field trip were often collected by local botanists such as J.M. Moutsamboté, and then deposited in the herbarium in CERVE, Brazzaville. However, these collections rarely make it out of the country and are never included in revisions or checklists. Thus, even though our collections might be the first ones to reach

international herbaria, they are in no way new discoveries for the country (except maybe for *Laccosperma korupense*).

Acknowledgments

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**“Ready For A Garden Tour?”
Jim Wright, Lifetime Palm Enthusiast,
died August 8, 2015, aged 73**



“Are you ready for a garden tour?” For those of us who visited Jim Wright at his home in San Diego, this question is most certainly at the forefront of our memories of him.

Jim spent untold hours watering, pruning, potting, planting, raking, cleaning and fertilizing his yard. Caring for his palm garden was his life’s work, but when visitors arrived,

it was a chance for him to relax and enjoy the changes, the growth and the beauty of his plants. For a small price of admission – he always required that you added your name and date to his guestbook – you were invited to join him at his side in a stroll through the garden.

Our friend Jim grew up in the Normal Heights neighborhood of San Diego. As a teenager, he developed an interest in plants and reptiles. He began keeping rattlesnakes as pets. His mother did not share his fascination with this pastime and asked him to move out. Upon starting work, Jim bought his first and only house in the Bay Park area above Mission Bay in 1964.

He worked for over 30 years at Scripps Institute of Oceanography in La Jolla. He was a lab technician in the Physiology Department doing research on aquatic mammals. Most studies he was involved in were focused on how these animals could survive periods of asphyxia underwater so as to understand why human newborns can go without oxygen for up to 8 minutes. He would work with trained seals, penguins in Antarctica, sharks and sheep. People asked him where he had earned his PhD. They were often shocked when he told them he had only a high school education.

At his new home, he developed an interest in palms. Never a shy person, he quickly discovered who the local experts were and requested an introduction. Jim's mentors were charter International Palm Society members Ed Moore and Jim Specht. Ed was one of the first palm hobbyists in Southern California and a volunteer at the San Diego Zoo. Jim learned palm horticulture from his first-hand experience with these experts.

Jim also became very involved in the Palm Society of Southern California and the International Palm Society. He attended PSSC meetings and several IPS Biennials for more than 40 years and held board member and officer positions. He contributed greatly to the success and growth of both organizations.

One of his earliest plantings in the new garden was *Rhopalostylis sapida*. It was quite rare at the time. This palm became his trademark where they dominated the skyline in his neighborhood. Jim especially loved the small understory palms like *Chamaedorea geonomiformis* and *Linospadix monostachya*. A hybrid *Chamaedorea glaucifolia* × *klotzschiana* that he created was officially named *Chamaedorea* Jim Wright. He always kept *Palms of Madagascar*,

Encyclopedia of Cultivated Palms and the latest issue of PALMS next to his reading chair and would look at them nearly every day.

Jim was uniquely aware of his surroundings while he walked the pathways of his garden petting his beard. No matter how many people had joined him for the tour, he would notice if you stopped to study a particular plant. "What do you see there?" he would call out over the heads of several others in a booming voice. Then he would break away from the front of the group and join you in your inspection. "Isn't that a beauty?" He would loudly proclaim and enthusiastically discuss the palm in question and its entire history. Each palm was cared for as one of his children.

The garden tour always included a stop at the potting benches along the back fence. He was known by his palm friends as "One Gallon Jim" because he only bought small palms and raised them himself. He grew many others from his own seeds. There was always a crop of *Chamaedorea ernesti-augusti* and many other experimental palms on his benches. Jim was a true grower.

He was not only an expert in palms. Jim was extremely knowledgeable about orchids and bromeliads. He was very active in these plant societies as well as the San Diego Horticultural Society. Jim was always participating in orchid shows, giving horticultural talks, hosting meetings and having open garden tours.

As a natural extension of gardening, Jim was also fascinated by the weather. He loved the rain. He would call friends living in other areas of San Diego and the country to ask about any storms. He dreamed of being in the middle of a hurricane or a tornado. If you had just returned from a trip to an exotic place, oddly, the first thing he would ask was if it had rained. He kept meticulous notebooks of daily temperature and precipitation records for San Diego and Miami going back to the 1970s.

He was an entirely free-thinking person with a unique perspective. Visitors were always made well aware that Jim was an avid environmentalist. He took baths and saved the water to fill his toilet. Guests were expected to do the same. If you looked in his kitchen drawers, they were filled with the unused paper napkins left on tables at restaurants thinking it was wasteful that rules required them to be thrown out. When he went to other people's garden parties, he would carry a plate, cup and fork with him since he was very opposed to the

wastefulness of using disposable dinnerware. And Styrofoam was strictly off-limits! His refrigerator was covered with newspaper clippings about our warming climate, pet cats killing song birds, polluting gas-guzzler cars and many other personal causes.

Jim was a funny person with a sophomoric sense of humor. When touring a garden, one of his favorite tricks was to casually toss a handful of trash into a planter to see the garden owner's reaction. He also loved to scare people by falling down in the middle of a crosswalk, then jumping up laughing when they stopped to help. In his early years, he would drive around with a dummy next to him in the car. One time he went a little too far by climbing 16 floors with that dummy to the top of the El Cortez Hotel in downtown San Diego and throwing it from the rooftop onto the street.

Jim had three children with his first wife Susan – Steve, Stacy and Jeff. She was very supportive of his palm passion, and they always stayed close friends. His second wife Lise Rasmussen-Wright was his soulmate. They were married in 1985. They shared a love of gardening. Lise was an expert rose and daylily grower. When she was diagnosed with leukemia, Jim did extensive fundraising for the Chronic Lymphocytic Leukemia Society and was awarded the “CLL Man of the Year” in 2012 for his commendable fund-raising efforts.

As the years passed by and his garden grew and filled in, Jim began to run out of space in his yard. When his friends would try to give him a new palm, and he would say “I’m pretty well maxed out.” Next, he would ask how big it would get (not even considering it would take at least 50 years to attain that size). Luckily the house next door to him came up for sale. He purchased it as a rental and used the backyard to further expand his own garden. He

added a lath house for his orchids and tillandsias. The tour always required a stop to see what was blooming there.

Outside of the lath house was a tree filled with hummingbird feeders. Jim had a specific sugar mixture and special feeders hanging all around his backyard. He kept busy making sure these were always full for his flying friends. Below the feeders was milkweed grown for attracting Monarch butterflies. Visitors who would pause for a moment and hold still in this area would quickly be surrounded with swarms of hummingbirds and butterflies that took refuge in his garden.

While on a garden tour with Jim there was never any pressure to learn the proper Latin names or to have any familiarity with these plants. He loved newcomers. Rather, his boisterous enthusiasm over a new leaf, an inflorescence or some seed brought on a gradual change in your mindset. His interest was infectious. Jim introduced hundreds of people over the span of fifty plus years to the gardening of palms, orchid and bromeliads. And, if he was not giving tours of his own garden, he was going around looking at other gardens. He knew just about every palm growing in San Diego County.

By the end of your time with Jim touring his garden, the stresses and problems of the day were trivial irritations consigned to an insignificant corner of your consciousness. He said, “This garden has kept me alive and gave meaning to my life.”

It was an honor to know you, Jim. Thank you for showing us the wonders as well as the simple joys to be experienced in any garden. We will always remember strolling with you on your garden tours – *Randy and Cindy Moore, San Diego, California, on behalf of his palm friends around the world.*

Healing a Valley with Open Palms

JON LETMAN

The Merwin Conservancy

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USA



1. William S. Merwin among his palms.

Among the many iconic images associated with Hawaii is the palm tree – most frequently depicted as a coconut palm darkened to a black silhouette arched in defiance of gravity against a fiery pink sunset. *Cocos nucifera* (the coconut palm), however, is not native to the Hawaiian Islands, having been introduced by the first Polynesian voyagers perhaps more than one thousand years ago.

Owing to its extreme isolation – some 2400 miles from the nearest land mass – Hawaii's flora includes fewer than 25 endemic palm species, all in the genus *Pritchardia*. Thanks to

one palm-loving resident, there exists a small valley on Maui's north shore that has been infused with a rich diversity of palms one could only imagine if combined in a fantastic



2. Paula and William S. Merwin in front of their home.

amalgam of Madagascar, South America and the Malesian biogeographic region spanning Southern Thailand to New Guinea.

And while the founder of this refuge keeps mostly to the 19-acre forest he and his wife Paula have built together, he is hardly anonymous. He is none other than William S. Merwin, celebrated U.S. poet laureate, two-time Pulitzer Prize winner, prolific writer of prose and verse and distinguished man of letters. William Merwin, author of close to 60 books of poetry, drama and translations, began his remarkable palm forest after coming to Hawaii to study Zen Buddhism in the 1970s.

Merwin's collection, which he started with Hawaiian *Pritchardia*, today has more than 2740 identified individual palms representing over 400 species and 128 genera including such wonders as *Johannesteijsmannia altifrons*, *Actinokentia divaricata* and *Hyophorbe indica*.

While living in the south of France in the 1960s, Merwin read about soil restoration and decided that if he were ever to own land, he wanted property in need of healing care. In 1976, while visiting Hawaii, Merwin was invited by a friend to Maui, where he was

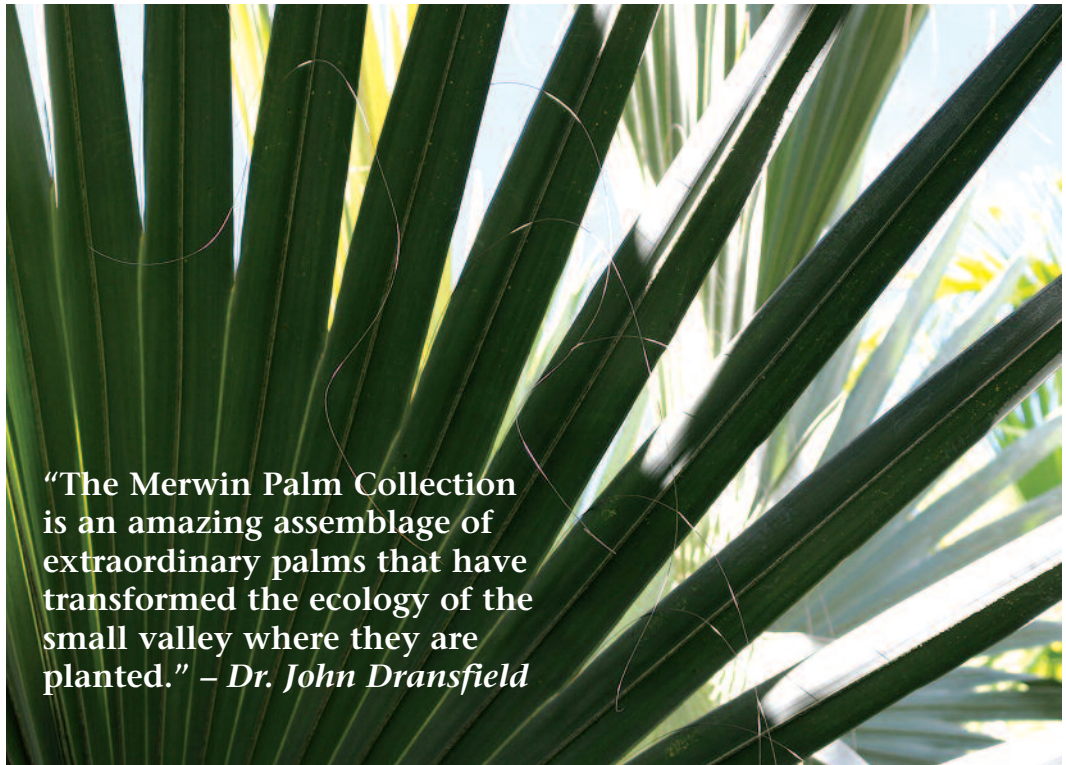
captivated by the island and where fate delivered him to just such a place. On a hardpan valley ridge scarred by abandoned pineapple fields, a land that had been so misused most thought nothing could grow there, Merwin first planted a windbreak of ironwood trees (*Casuarina equisetifolia*), which, years later, left him an 18-inch deep gift of rich, black top soil.

Over the next four decades Merwin and Paula spent most of their days gathering and planting seeds, nurturing the land and assembling a forest. Reflecting on the valley they transformed together, Merwin says it is the trees themselves that have reinvigorated the soil, not any chemical additives. Those first *Pritchardia*, many grown from seed, were raised on a simple diet of seaweed, manure and compost.

During the 1980s and 90s, as Maui's human population grew and development swallowed more land, the Merwins were quietly tucked away in their valley, as Paula put it, "[with] our heads down...working, weeding, planting" and collecting palms from all over the world. By the 2000s the valley had been dramatically transformed into a dense, green tropical forest.



3. The palm forest: *Kerriodoxa elegans* grows luxuriantly.



“The Merwin Palm Collection is an amazing assemblage of extraordinary palms that have transformed the ecology of the small valley where they are planted.” – Dr. John Dransfield

What began as one man’s dream based on a simple love of trees and the desire to reinvigorate a depleted valley, has grown into a world-class collection that was institutionalized as the Merwin Conservancy in 2010, a not-for-profit organization dedicated to perpetuating the work, vision and legacy of W.S. Merwin.

In April 2015, Merwin was awarded the prestigious Good Steward Award by the national Arbor Day Foundation for his tree planting and land stewardship work. In response, the poet said, “It seems somehow surprising to be honored for what has been a lifelong pleasure.”

On a small, perch-like lanai off his home, Merwin offers a guest tea and speaks lovingly of the surrounding palms, almost in a whisper, as a Brazilian cardinal flits between the fronds in flashes of red and gray. And while the collection includes many rare, threatened and endangered species, Merwin worries about having enough genetic material to safeguard some of the rarest palms. “Having one tree of a species – there’s a *Rhopaloblaste ceramica* (from Indonesia) out there – I haven’t saved that species,” he says. “I only have *one* tree. I have no genetic material at all, and it seldom drops seed... A species is not one tree.”

Not Just Another Garden

The Merwin collection is not laid out like a botanical garden. Rather it is more closely modeled on the conditions of a rainforest. The varied topography and elevation of the valley allow for palms to be planted in drier or wetter areas depending on their needs. Merwin concedes the valley does not offer ideal conditions for every species, but says he has “been lucky” to have had success growing such a broad representation of the *Arecaceae*.

For years Merwin planted a tree nearly every day, though as he approaches his 88th birthday, planting is no longer a daily ritual. When he does plant a new tree, he uses black volcanic cinders, old horse manure compost and organic 4-4-4 fertilizer mixed together with about one-third of the original soil adding a heavy mulch of half-rotted wood chips.

Over the past twelve years the Merwins have worked closely with Olin Erickson who today serves as the collections’ manager and head gardener, supervising half a dozen or so groundskeepers.

Palm Readers

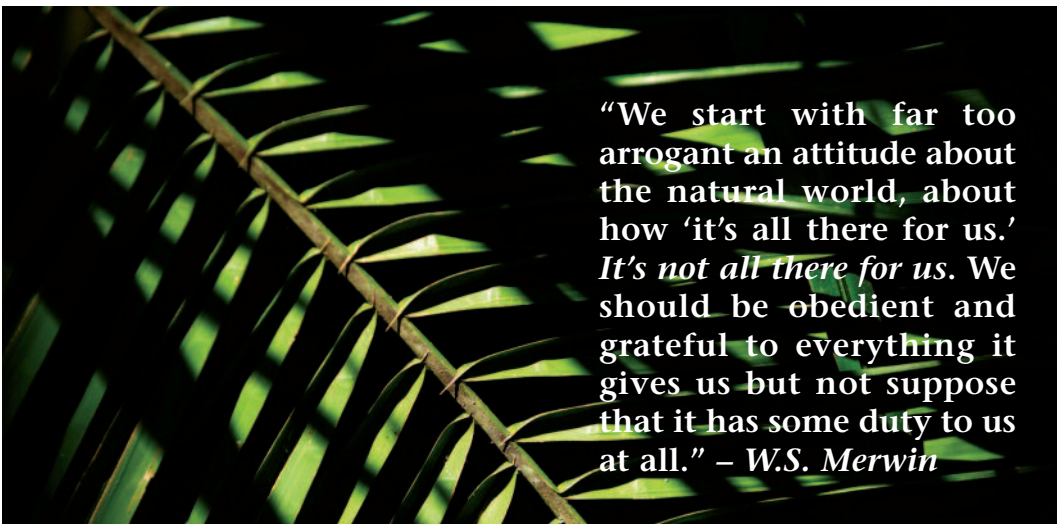
In 2012, the Merwin Conservancy sought the assistance Dr. John Dransfield, previously the



4. Another view of the palm forest showing the bewildering array of palms

head of palm research at the Royal Botanic Gardens, Kew, to visit the collection for the purpose of identifying and cataloguing the nearly 3000 living trees growing in the valley. Dransfield accepted the invitation and, during two visits over a one-year period, collaborated with staff from the Kauai-based National Tropical Botanical Garden (NTBG) to identify, label and plot the collection.

Delighted to escape a bitterly cold British winter for the milder climes of Hawaii, Dransfield nonetheless found the job of identifying so many palms an enormous task. In the process, Dransfield and NTBG staff confirmed the identity of hundreds of species from around the world. Because they were growing in varying states of maturity, it added to the challenge of differentiating between



“We start with far too arrogant an attitude about the natural world, about how ‘it’s all there for us.’ *It’s not all there for us.* We should be obedient and grateful to everything it gives us but not suppose that it has some duty to us at all.” – W.S. Merwin



5. Collections Manager Olin Erickson examines a mature *Areca vestiaria*.

what are often only subtly different species, sometimes without flowers or fruits.

Dransfield explained that because so many palms had been successfully grown in such high density, the trees frequently appeared as they would in the wild rather than in a

botanical garden setting, and because of the steep slopes, occasional wind and rain and a voracious mosquito population, the job was formidable.

Once the forest was mapped to the meter with GPS coordinates, numbered and labeled, the



6. Stilt-rooted *Socratea exorrhiza*.

2741 individual trees that include more than 400 species and 128 genera, were vouchered, accessioned and recoded in a permanent database (viewable online) to ensure the collection's integrity.

To see so many different species elsewhere, one would have to commit to weeks, if not months, of globetrotting. Dransfield says the value of the collection is in its extraordinary diversity and the fact that one can see palms from around the world growing much as they would in the wild.

In NTBG's final 2014 report, it described The Merwin Conservancy as having assembled "one of the largest known [private] palm collections" estimated to include a minimum of 407 species and varieties and possibly as many as 486. The report also offered a number of recommendations for maintaining optimum conditions and ensuring certain aggressive species are not allowed to naturalize and become invasive.

Looking to the Future

Merwin Conservancy Executive Director Jason Denhart says the organization is not only committed to preserving the Merwins' decades of work but also expanding the palm sanctuary and eventually transforming the Merwin residence (built within the forest) into a center for research and literature that will one day

serve as a retreat for poets and authors to imagine, create and write.

Since the autumn of 2014, the Conservancy has partnered with the Hawaiian Islands Land Trust to enforce a perpetual conservation easement protecting the property from any future development. Additionally, the Merwins have willed their entire property, the land, the palm collection and their unassuming low-slung jungle home to the Conservancy to be used one day as a place of inspiration and creativity. Merwin hopes that in the future botanists and others who know and appreciate palms can see the trees growing in a forest-like setting. In the decades ahead, the Merwin Conservancy wants students to use the collection for studying botany, horticulture and other related topics.

The Conservancy is nearly three-quarters of the way to achieving a one-million dollar fundraising effort that will establish a reserve fund to secure the future of the palms. This fund will help manage and maintain the Merwin's property for at least two decades during which time its value as a curated scientific collection and extraordinarily thoughtful space created in the name of beauty, and with the deepest reverence for nature and life itself, will only deepen and multiply. Learn more about the Merwin Conservancy at www.merwinconservancy.org.



"The [Merwin Collection] is particularly impressive because of the bewildering variety of palms, densely planted to form a forest." – Dr. John Dransfield



7. Looking up through the palm canopy.

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