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Palms in Southern Republic of Congo

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 Chaillus 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).

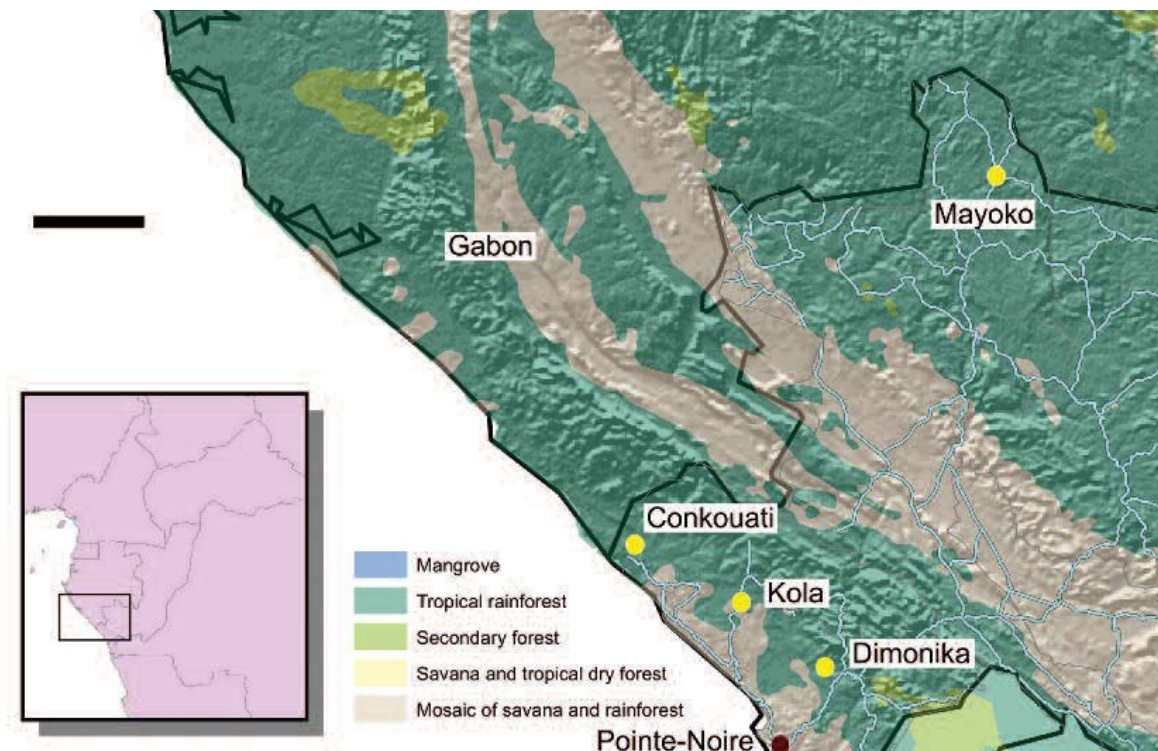
The expedition visited four different parts of the region: 1) the Biosphere Reserve of

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

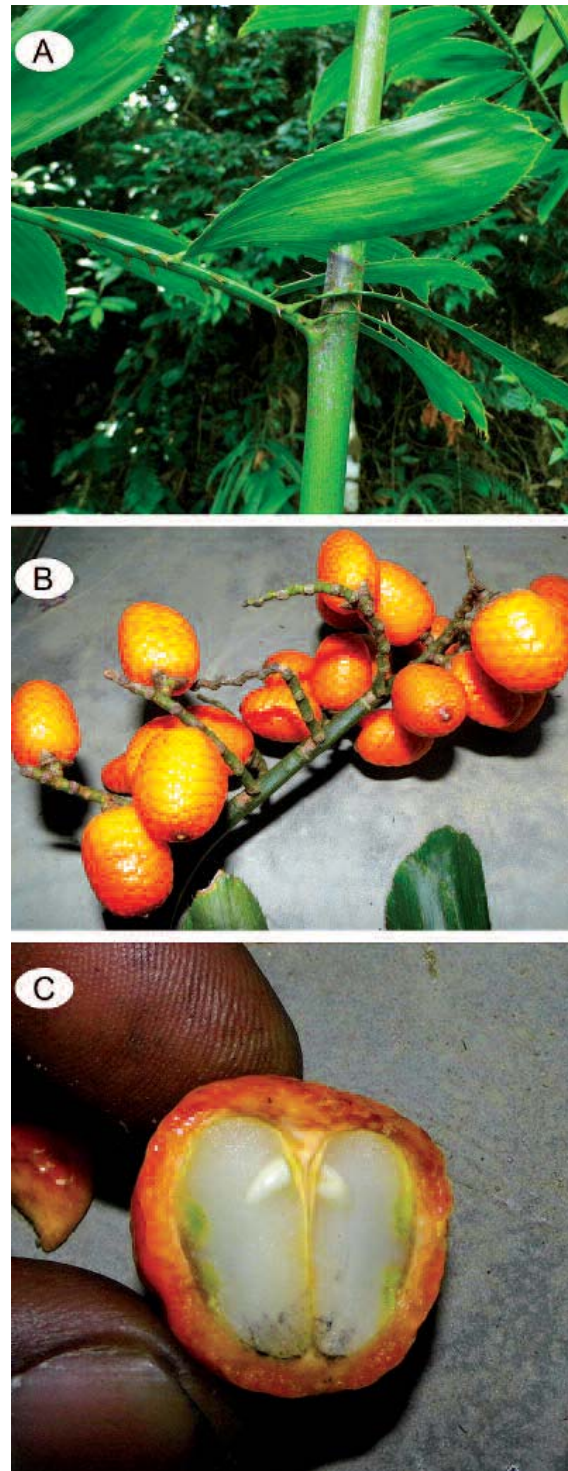
1. Distribution map of four visited sites: Dimonika situated in the extreme south of Mayombe forest, Kola in alternating forest-savannah zone in Kakamoueka District, Conkouati in the northern part near Gabon, Mayoko in the other northern side forest.



(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.



S. 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 Chaillus 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 Chaillus 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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Literature Cited

- COUVREUR, T.L.P., A. FAYE, AND B. SONKÉ. 2013. Palms of southern Cameroon. *Palms* 57: 123–132.
- FAYE, A., J.-C. PINTAUD, W.J. BAKER, B. SONKÉ AND T.L.P. COUVREUR. 2014. A plastid phylogeny of the African rattans (Ancistrophyllinae, Arecaceae). *Systematic Botany* 39: 1099–1107.
- MOUTSAMBOTÉ, J., T. YUMOTO, M. MITANI, T. NISHIHARA, S. SUZUKI, AND S. KURODA. 1994. Vegetation and list of plant species identified in the Nouabalé-Ndoki Forest, Congo. *Tropics* 3: 277–293.
- SITA, P. 1990 La forêt tropicale au Congo. *Hommes et Environnement: Conference article*, 1989/11/23; 104–110: ORSTOM, Brazzaville.
- SOSEF, M.S.M., J.J. WIERINGA, C.C.H. JONGKIND, G. ACHOUNDONG, Y. AZIZET ISSEMBÉ, D. BEDIGIAN, R.G. VAN DEN BERG, F.J. BRETILER, M. CHEEK, J. DEGREEF, R. FADEN, R.E. GERAU, P. GOLDBLATT, L.J.G. VAN DER MAESEN, L. NGOK BANAK, R. NIANGADOUMA, T. NZABI, B. NZIENGUI, Z.S. ROGERS, T. STÉVART, C.M. TAYLOR, J.L.C.H. VAN VALKENBURG, G. WALTERS AND J.J.F.E. DE WILDE. 2006. Check-liste des Plantes Vasculaires du Gabon / Checklist of Gabonese Vascular Plants. *Scripta Botanica Belgica*. Meise: Jardin Botanique National de Belgique.
- STAUFFER, F.W., D. OUATTARA AND A.L. STORK. 2014. Palmae. In J.-P. LEBRUN AND A.L. STORK (Eds) *Tropical African Flowering Plants: Monocotyledons 2*, vol. 8 (ed.), pp. 326–354. Genève: Conservatoire et Jardin botaniques de la Ville de Genève, Switzerland.
- SUNDERLAND, T.C.H. 2003. Two new species of rattan (*Palmae: Calamoideae*) from the forests

- of West and Central Africa. Kew Bulletin 58: 987–990.
- SUNDERLAND, T.C.H. 2012. A taxonomic revision of the rattans of Africa (Arecaceae: Calamoideae). Phytotaxa 51: 1–76.
- VAN VALKENBURG, J.L.C.H. AND J. DRANSFIELD. 2004. *Hyphaene guineensis*. Palms 48: 10–16.
- VAN VALKENBURG, J.L.C.H. AND T.C.H. SUNDERLAND. 2008. A revision of the genus *Podococcus* (Arecaceae). Kew Bulletin 63: 251–260.
- VAN VALKENBURG, J.L.C.H., T.C.H. SUNDERLAND AND T.L.P. COUVREUR. 2008. A revision of the genus *Sclerosperma* (Arecaceae). Kew Bulletin 63: 75–86.
- WHITE, F. 1983. The Vegetation of Africa: a Descriptive Memoir to Accompany the UNESCO/AETFAT/UNSO Vegetation Map of Africa. UNESCO. Natural Resources Research no. 20. Paris.
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