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FRONT COVER

Trachycarpus martianus rediscovered at ca. 1500 m elevation in Myanmar. See Photo Feature by Henderson and Armstrong, p. 179. Photo by K. Armstrong.

BACK COVER

Washingtonia filifera growing in Borrego Palm Canyon, San Diego Co., California, USA. See article by Zona and Dransfield, p. 175. Photo by Tsy H. Chow.



Is there just one species of *Washingtonia*, *W. filifera*? See article p. 175. Photo by S. Zona.

PALM NEWS

New and Notable. In this issue we launch an occasional column in which we summarize and comment on important original palm research published elsewhere, especially, research that has relevance to palm growers or papers that describe new and interesting palms. Some contributions will be written by the authors of research being summarized; others will be contributed by the editors. For this first installment, we examine the ongoing controversy regarding the taxonomy of *Washingtonia*. See pages 175–178.



Katja Schulz

Palm growers in the southeastern USA will be familiar with the Lepidopteran known as Palm Leaf Skeletonizer (*Homaledra sabalella*) – or they will recognize its tell-tale damage. The gregarious caterpillars of this moth eat the soft tissue from the undersides of palm leaves, leaving behind only the veins and fibers (the “skeleton”) and frass. The damage they cause is mostly cosmetic, but caterpillars can quickly despoil a large leaf. **A recent analysis of *Homaledra* in Florida and the Southeast confirmed that two undescribed species of Palm Leaf Skeletonizer have been hiding in plain sight.** *Homaledra sabalella*, which attacks

Sabal, *Latania*, *Bismarckia*, *Washingtonia*, *Phoenix* and others, is found throughout Florida and the Southeast, as well as the Bahamas. In the 1990s, a second, as-yet-unnamed species was found attacking *Cocos nucifera* in Florida and the Antilles. In 2006, a third species came to light, this time from central Florida, attacking *Sabal* and *Washingtonia*. It was also collected in southern Texas. The fascinating detective work behind the discoveries is told in the article: Hayden, J.E. 2018. The palm leaf skeletonizer situation in Florida. *Southern Lepidopterists' News* 40: 275–281.

Bangladesh is planting palms to protect people and property from lightning strikes. Recent years have seen a dramatic increase in injurious, sometimes lethal, lightning strikes. Warm, moist air from the Bay of Bengal collides with colder air descending from the Himalayas and produces thunderstorms over much of the country, but warmer air, as a result of climate change, is leading to more frequent and more energetic storms. Last year, lightning killed ca. 360 people in Bangladesh – more than were killed by floods or cyclones. To combat the surge in lightning-related injuries, the government is planting 4.8 million palms nationwide. The palms used for the project are *Borassus flabellifer*.



M. Manners

A New and Endangered Species of *Astrocaryum* (Arecaceae) from Colombia

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To honor peace in Colombia, this new species is named *Astrocaryum pax*.

After the 2018 Peace treaty between the Colombian government and the Revolutionary Armed Forces of Colombia (FARC), many areas have become accessible to botanists. In a recent expedition to northeast Antioquia a new palm species in the genus *Astrocaryum* was discovered. Here, we provide a description of the species, photographs, distribution map and IUCN Red List assessment.

***Astrocaryum pax* Copete & Cámara-Leret sp. nov.** Palm with aerial stem covered by decaying leaves, differing from other species in the combination of inflorescence peduncle 2 m long, 2–4 pistillate flowers per rachilla, pistillate flowers with black spines, staminate flowers with 6 stamens and fruit epicarp with white indument and small spines. Type: COLOMBIA, ANTIOQUIA: Corregimiento de Buenos Aires. 6°47'52.2" N; 74°34'57.3" W, 418 m, 23 March 2019, *Juan Carlos Copete*

Maturana 52 (holotype: JAUM; isotype: JAUM); (Figs. 1–8).

Stem solitary, up to 3 m tall, 35 cm in diameter or acaulescent, covered by bases of decaying leaves. *Leaves* 10–18, pinnate, erect, 5–8 m long, forming a funnel where leaves from other plants accumulate; petiole up to 150 cm long, 4 cm wide, adaxially ribbed and without spines, abaxially rounded with brownish hairs and numerous wide black spines in groups of 3–5, to 19 cm long and 1 cm wide, easily broken; pinnae 91–121 per side and inserted in one plane, undersurface white with marginal spines; basal pinnae 81–111 cm long, 2–4 cm wide; mid-leaf pinnae 91–115 cm long, 3–5 cm wide; apical pinnae 27–39 cm long, 1–2 cm wide. *Inflorescence* interfoliar, erect, bisexual; peduncular bract 68 cm long, 12 cm wide, inserted 1.5 cm above the peduncle base and densely covered by black or yellow spines



1. Habit of *Astrocaryum pax*.

up to 4 cm long; rachillae densely covered at the base with brown spines and white indument, 17 cm long and 5 mm wide. *Pistillate flowers* 2–4 at the base of the rachilla, forming a triad (one pistillate flower surrounded by two staminate flowers), cream colored, 20 mm long and 5 mm wide; calyx 4 mm long and 3 mm wide, cup-shaped, covered by small brown spines; corolla 5 mm long and 3 mm wide, cup-shaped and covered by small brown spines; stigmas 3, 4 mm long and 3 mm wide, covered by white indument and with black spines. *Staminate flowers* towards the apex of the rachillae, cream coloured, 3 mm long and 1 mm wide, lacking spines, immersed in a cup-like structure, separated by white filaments; stamens 6. *Infructescence* interfoliar, 3 m long, peduncle 2 m long and 3 cm wide, with black spines to 1 cm long and brown trichomes, with a scar at the end of the peduncle; rachis 46 cm long; rachillae up to 100, 14 cm long and 0.5 cm wide, covered by black spines and white indument, each rachilla subtended by a black triangular and glabrous bract, 5 mm long and 3 mm wide. *Fruits* 6 cm long and 3 cm wide, nearly round, brown when immature, becoming orange at maturity;

epicarp covered in white indument and small black spines to 33 mm long; sepals and petals (perianth) persistent, corolla cup-shaped and covered by small spines 22 mm long at the apex; fruit with 3 locules and ending in a brown beak 1 cm long.

Etymology: *Astrocaryum pax* is named in honour of the peace treaty signed in 2016 between the government of Colombia and the Revolutionary Armed Forces of Colombia (FARC), which has enabled the scientific exploration of previously inaccessible forests.

Common names: *Palma estera*, but this name is likely a misnomer, as it is widely used for the more common *A. malybo* H. Karst.

Distribution: Known only from the type locality in forest remnants in northeast Antioquia, Remedios Municipality, in the middle Magdalena River valley (Fig. 9). The species grows in humid tropical forests on well-

2. Leaf and infructescence of *Astrocaryum pax*.





3. Comparison of the leaves of three *Astrocaryum* species that grow together in the study area. From left to right: *A. malybo*, *A. pax* and *A. triandrum*.

drained soils at 250–500 m. One population of 60 individuals was found in different stages of development (from seedlings to adults), co-occurring with 70 adult individuals of *Astrocaryum malybo* and 120 adult individuals of *A. triandrum* G. Galeano, R. Bernal and F. Kahn.

Conservation status: *Astrocaryum pax* is known only from the type locality, which consists of a mosaic of intact and logged forests used for livestock pastures. The proximity of gold mining and the construction of a powerline connection project make it likely that the species habitat will continue to decline. More surveys are recommended to assess if the species occurs in other patches and how abundantly. Our field surveys indicate it has an estimated Extent of Occurrence (EOO) of $<100 \text{ km}^2$ and an Area of Occupancy (AOO) of $<10 \text{ km}^2$, which would fall within the threshold for Critically Endangered under criterion B1/B2 (IUCN 2011). If found in more forest patches, EOO could increase to 100–

20,000 km^2 and AOO could increase to 500–2000 km^2 on the basis of the area of forests in the region. Given this high degree of uncertainty, the species could be assessed under criterion B1 as Critically Endangered, Endangered or Vulnerable (IUCN, 2011). Taking a precautionary approach and given the species small EOO and threats to its forest habitat, we assess the species as Endangered B1ab (iii).

Notes: *Astrocaryum pax* belongs to subgenus *Monogynanthus* Burret (Kahn 2008) on the basis of having fruits covered with white indument and small black spines. There are three other *Astrocaryum* species in the subgenus, but these grow in the Guyana shield: *A. farinosum* Barb. Rodr., *A. sciophilum* (Miq.) Pulle, and *A. sociale* Barb. Rodr. (Kahn 2008, Roncal et al 2013). *Astrocaryum pax* differs from these species in having more numerous pinnae: 91–121 pinnae vs. 57–81 in *A. farinosum*, 51–70 in *A. sciophilum* and 64–82 in *A. sciophilum* (Kahn 2000). *Astrocaryum pax* also has smaller



4. Inflorescences from left to right: *Astrocaryum malybo*, *A. triandrum* and *A. pax*.



5. Infructescence of *Astrocaryum pax*.



6. Rachilla of *Astrocaryum pax* with basal female and distal male flowers.

pistillate flowers: 10 mm long and 3 mm wide, vs. 12.5×12.2 mm in *A. farinosum*, 13.3×18.8 mm in *A. sciophilum*, and 8.8×13.1 mm in *A. sociale* (Kahn 2000).

Compared with other *Astrocaryum* species at the type locality, *A. pax* differs from *A. malybo* by having rachillae, pistillate flowers and fruits covered with spines vs. spines lacking in *A. malybo*. It differs from *Astrocaryum triandrum* by having 6 stamens in the staminate flowers and branched infructescences with 2–4 fruits at the base of the rachillae (vs. 3 stamens and 1 fruit at the base of the rachillae, which arise directly from the peduncle in *A. triandrum*) (Table 1).

Finally, the Amazonian *Astrocaryum ciliatum* F.Kahn & B.Millán could be confused with *A. pax*, but *A. ciliatum* does not grow in the study area, has one pistillate flower per rachilla (vs. 2–4 pistillate flowers per rachillae in *A. pax*) and lacks white indument and black spines in the prophyll or fruit epicarp (Kahn 2008).

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LITERATURE CITED

- GALEANO, G. AND R. BERNAL. 2010. Palmas de Colombia: Guía de campo. Editorial Universidad Nacional de Colombia. Instituto de Ciencias Naturales. Facultad de Ciencias. Universidad Nacional de Colombia, Bogotá, D.C.
- KAHN, F. 2000. Two Amazonian palm species revalidated: *Astrocaryum farinosum* and *A. sociale*. *Palms* 45: 29–36.
- KAHN, F. 2008. The genus *Astrocaryum* (Arecaceae). *Revista Peruana de Biología* 15 (Supp. 1): 031–048.
- RONCAL, J., F. KAHN, B. MILLAN, T.L.P. COUVREUR AND J.X-C. PINTAUD. 2013. Cenozoic colonization and diversification patterns of tropical American palms: evidence from *Astrocaryum* (Arecaceae). *Botanical Journal of the Linnean Society* 171: 120–139.

7. Fruits from left to right: *Astrocaryum triandrum*, *A. malybo* and *A. pax*.





8. Endocarps from left to right: *Astrocaryum pax*, *A. triandrum* and *A. malybo*.

IUCN STANDARDS AND PETITIONS SUBCOMMITTEE.
(2011) Guidelines for Using the IUCN Red
List Categories and Criteria. Version 9.1.
Prepared by the Standards and Petitions Sub

Committee of the IUCN species survival.
Commission September 2011. Available from
<http://www.iucnredlist.org/documents/RedListGuidelines.pdf>

9. Map of the type locality of *Astrocaryum pax* in Colombian middle Magdalena valley. Source: Google Earth.



Table 1. A comparison of *Astrocaryum malybo*, *Astrocaryum triandrum* and *Astrocaryum pax*.

	<i>A. malybo</i>	<i>A. triandrum</i>	<i>A. pax</i>
Leaves	15–20	6–12	15–18
Leaf length (m)	3	5	7
Petiole length (m)	ca. 1	0.05–0.09	1–2
Inflorescence peduncle length (m)	1	0.56–0.78	2
Rachis length (cm)	15	15–18	46
Rachillae	100–110	100–120	up to 100
Rachillae length (cm)	11, lacking spines	8–12, with yellow spines	14 cm long, with brown spines at the base
Pistillate flowers	2–4, not sessile, without spines	1, sessile, with spines	2–4, not sessile, with spines
Stamens	6	3	6
Sepals & petals persistent in fruit	not forming a cup, lacking spines	forming a cup, black spines at the apex	forming a cup, black spines at the apex
Fruits	in lax raceme, yellow when immature, becoming violaceous or nearly black when mature	in compact raceme resembling a cob, brown when immature, orange when mature	in lax raceme, brown when immature, orange when mature
Epicarp	smooth, without indument or spines	covered by white indument and black spines to 1.5 cm long	covered by white indument and black spines to 0.33 cm
Beak	black, 3.5–4 cm long	green, 1 cm long	brown, 1 cm long

Uses of Canary Island Date Palms (*Phoenix canariensis*) in the 19th and Early 20th Centuries

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With drupes too acrid for human consumption, Canary Islands Date Palms (*Phoenix canariensis*) are primarily known for their use as ornamental palms in private and public settings. Little is known about the non-food uses of the leaves, stems and roots of Canary Islands Date Palms. This paper summarises the provisioning services of Canary Island Date Palms.

Endemic to the Canary Islands, the Canary Islands Date Palm (*Phoenix canariensis*) entered the horticultural market in the late 1860s (Spennemann 2019) and was rapidly spread around the globe (Zona 2008). In Australia, as in other countries, *P. canariensis* was solely marketed and planted as an ornamental tree (Spennemann 2018a, 2018b), because its fruits have only a small amount of stringy pericarp ('flesh'), which is too little and too acrid to be of common use for human consumption.

Despite research into the nomenclature (Rivera et al. 2013), genetics (Saro et al. 2014) and biogeography (Santos Guerra 1994) of the Canary Island Date Palms, there has been little attention given to the non-food uses of the leaves, stems and roots of the Canary Islands Date Palm.

Methods

This paper reviews the extant literature, but is not based on a systematic review (Kitchenham

2004). A problem inherent in systematic reviews solely relying on database searches is that the sources are limited to journal publications and tend to be weighted both towards more recent and to Anglophone publications. More obscure publications, as well as mentions in non-referred publications and in the “gray” literature of student theses, consultancy studies and departmental reports, are likely to be missed. These publications can, however, provide valuable observations and data. Further, mentions of non-food uses of Canary Islands Date Palms in nineteenth century traveller accounts, for example, will not be found through database searches either. In consequence, the methodology employed in this paper espoused a combination of systematic database and general on-line searches with snowballing (Atkinson & Flint 2001, Greenhalgh & Peacock 2005, Wohlin 2014). The relevant databases (SCOPUS, Primo, FACTIVE, GoogleScholar, GoogleBooks, Web of Science, etc.) were systematically searched with the following keyword combinations: “Canary Island [date] palm” / “*Phoenix canariensis*” + artisanal term [mat(s) / basket(s) / hat(s) etc.] In addition, systematic searches were carried out in several digital depositories (e.g. Bibliothèque nationale de France 2018, National Library of Australia 2018). In the absence of systematic studies, the underlying original data presented here are essentially collated ancillary and anecdotal observations extracted in studies that discuss *P. canariensis*, or are derived from studies that discuss local manufactures. Until now, there has been no systematic attempt at collating and interpreting the state of research.

Canary Island Date Palms as animal fodder

Whereas drupes and especially the seeds of *Phoenix canariensis* were used in the Canary Islands as fodder for pigs, goats and turkeys (Noll 1872, 1876, G.V. Pérez cited in Anonymous, 1916a, Anonymous 1916b), they were not used for such purposes in other countries. There, drupes were left unharvested and fallen drupes were primarily consumed by birds and foxes (e.g., Spennemann 2018c).

While numerous animal species, such as sheep and kangaroos are known to graze on *Phoenix canariensis* leaves, this never became an established practice in Australia, not even in drought years. It was tried, however, in 1910 at Brighton (Victoria), when Richard Cheeseman’s nursery had an oversupply of large palms and was forced to destroy the

excess. The leaves were fed to cattle. According to an article in the Australasian, “a batch of large plants, too big for transplanting, was being fed to the home cow, and the animal seemed to relish the dainty and uncommon diet” (Anonymous 1910).

Items manufactured from Canary Island Date Palms

Globally, preindustrial societies used the leaves of palms for a number of purposes, ranging from basket weaving to thatching roofs. The Canary Islands, where *Phoenix canariensis* is endemic, were no exception. There the palm served as raw material for numerous items. The stem provided timber for houses (Santos Guerra 1994) and fences (Suárez 2013), brooms were made from inflorescences (Benítez de Lugo & Wildpret 1879), and rope was woven from aerial roots (Cook 1900, Suárez 2013). The leaves were plaited into hats (Suárez 2013), but in particular mats and baskets (Murray 1859, Glas 1864, Cook 1900, Babcock 1918, Hernández 1991) as well as fishing nets and sieves (Cook 1900). In addition, palm leaves were used to manufacture loin coverings (Conder 1892, Morales Mateos & Rodríguez Rodríguez 2007), which during the nineteenth century were occasionally still used as working attire among the poorer segments of society (Cook 1900). In the Canary Islands, the handicraft industry using *P. canariensis* still persists today, manufacturing woven molds for cheese making (*moldes empletas*), as well as baskets, mats and hats (Suárez 2013, Fuerteventura en Imágenes 2017).

When the Canary Island Date Palm was introduced into Europe, it expanded into an already existing industry, based on products derived from commercial date palms (*Phoenix dactylifera*) and the European fan palm (*Chamaerops humilis*). For example, baskets had been woven from *P. dactylifera* leaves and brooms made from inflorescences in the Middle East (El Hadrami & Al-Khayri 2012), North Africa (Johnston 1904) and at least since the late sixteenth and early seventeenth century also in Spain (Pardo-de-Santayana et al. 2006), a tradition of weaving that continued well into the twentieth century (Kuoni 1981, Morales Valverde et al. 2011). In Sicily, *C. humilis* was used to produce homemade brooms, bags, hat, brushes, ropes, fans and rush-mats (Manachini et al. 2013). A similar range of material culture from *Chamaerops* leaves was also produced in Sardinia (Atzei 2003) and Southern Spain (Kuoni 1981, Peña-

Chocarro et al. 2015), the Balearic Islands (Kuoni 1981, Gelabert et al. 1990) and to a lesser degree, Portugal (Costigan 1787, Kuoni 1981). In both southern Spain and Sicily at least, the industry persists today, with mobile-phone cases and other design objects made from the material (Manachini et al. 2013).

The large-scale planting of *Phoenix canariensis* in the south of France in the 1870s (Spennemann 2019, Zona 2008) ensured a steady supply of raw material. The artisanal industries in France took up the manufacture of hats, mats and baskets from its leaves (Guisabu & Vanden-Berghe 1882), as local production offset import tariffs on completed goods (e.g., hats: Firmin-Didot & Firmin-Didot 1862). Hats and baskets from *P. canariensis* leaves were also produced on Gozo, one of the islands of Malta (Mifsud 1995). In addition, petioles and stem wood were shaped into snuff boxes (Firmin-Didot & Firmin-Didot 1873).

Beyond the Western Mediterranean, the uptake of Canary Island Date Palm as sources for raw materials was limited. While *Phoenix canariensis* found some use as ornamental palms in urban areas of the Eastern Mediterranean and the Middle East, it never entered the artisanal production environment, which continued to use *P. dactylifera*. As palms did not grow naturally in the British Isles, palm leaves were not part of the British manufacturing mindset. Other areas of the world colonised by British settlers, such as the USA, Australia and New Zealand, followed the British tradition of manufacture, making brooms from wattle or hazel (depending on coarseness) as well as baskets made from wicker (*Salix* sp.), and later reeds or rattan.

The British, however, picked up the manufacture of walking sticks from palm wood. The petioles of various palms had long been used to manufacture walking sticks in various colonial environments. Walking sticks, shaped from the petioles of *Phoenix dactylifera* had entered the European market in the early 1850s (Dodd 1852, Jackson 1871). The French artisans soon switched to the petioles of the Canary Island Date Palm (Guisabu & Vanden-Berghe 1882), presumably as they were larger, of more homogenous consistence and in particular because they were already straight and thus required less preparation than those made from *P. dactylifera* (Dodd 1852). British manufacturers, however, continued the use of date palm petioles, which they imported from Algeria (Jackson 1888, Spon et al. 1892).



1. *Phoenix canariensis* leaves used in a late nineteenth-century American wreath (Credner 1887).

Canary Island Date Palms in the florist trade

While *Phoenix canariensis* was planted as a crop to cut the young leaves for use in wreaths and similar funerary ornaments in the USA (Fig. 1) (Credner 1887) and Germany (Bouché 1902, Kerlen 1914), the Australian florist trade did not draw on *P. canariensis* to any sizeable extent. In private and communal settings, however, palm leaves were often used as decorations for functions and events (Anonymous 1894).

Canary Island Date Palms as church decorations

In Spain, leaflets taken from palm leaves were, and still are, folded into small crosses that are fastened on door of barns and stables to project spiritual protection and ward off evil (Kuoni 1981).

In Australia the use of entire leaves, or large parts thereof, as ornamentation was limited to the decoration of churches on Palm Sunday (e.g. Anonymous 1895, 1899, Anonymous 1925), which is a common practice in many parts of the globe (France: Guisabu & Vanden-Berghe 1882, Mowat 1997; Ecuador: Pintaud & Ludeña 2008) and enshrined in liturgy of the Roman Catholic Church (Elliot 2002). In order to be self-sufficient on such occasions, numerous churches in Australia, for example, planted solitary *Phoenix canariensis* on their grounds (Fig. 2).



2. A *Phoenix canariensis* planted on the grounds of St. Matthew's Church in Albury, NSW. The palm provided an independent supply of leaves for ceremonial and decorative purposes.

Canary Island Date Palms as fuel

Traditionally, the dry palm leaves, and in particular the rachis and petiole provided fuel to the inhabitants of the Canary Islands (Suárez 2013).

Future work

As the first compilation of its kind, this contribution can only be as complete as the data that could be accessed. Future work should document the material culture of items made from Canary Island date palm held in public/museum collections, as well as ethnographically document the process of manufacture of such items where it still occurs.

LITERATURE CITED

- ANONYMOUS. 1894, Nov 30. The Technical College cookery classes. The Maitland Daily Mercury no. 286-7128: 3 col. b.
- ANONYMOUS. 1895, Apr 19. Late Bishop Hale. Telegraph (Brisbane) 7021: 5 col. a.
- ANONYMOUS. 1899, May 20. The palm tree. Its natural history. Cobar Herald 22: Suppl 1 col. d.
- ANONYMOUS. 1910, Jul 2. The nurseries. Australasian (Melbourne) 11 col. b.
- ANONYMOUS. 1916a. Miscellaneous Notes. *Phoenix canariensis*. Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew) 4: 107–108.
- ANONYMOUS. 1916b, Aug 12. A valuable palm. Australasian (Melbourne) 101: 10 col.d.
- ANONYMOUS. 1925, Mar 20. Alma Park Lutheran Church. Dedicated on Sunday. Albury Banner and Wodonga Express 2 col. b–c.
- ATKINSON, R. AND J. FLINT. 2001. Accessing hidden and hard-to-reach populations: Snowball research strategies. Social Research Update 33: 1–4.
- ATZEI, A.D. 2003. Le Piante nella Tradizione Popolare della Sardegna: Documentazione sugli Usi Alimentari, Aromatizzanti, Profumieri, Artigianali, Cosmetici, Medicinali, Veterinari, Magici, Ornamentali, Rituali, Religiosi, Tintori, Antiparassitari e Vari, Delle Piante. Delfino Carlo Editore.
- BABCOCK, W. 1918. Certain pre-Columbian notices of the inhabitants of the Atlantic Islands. American Anthropologist 20: 62–78.
- BENÍTEZ DE LUGO, N. AND G. WILDPRET. 1879. Catálogo de Las Plantas que Contiene el Jardín de Aclimatación de la Orotava en Tenerife, Islas Canarias. A No De 1879. s.n., [Orotava, Tenerife].

- BIBLIOTHEQUE NATIONAL DE FRANCE. 2018. Gallica. <http://gallica.bnf.fr/>. Retrieved on August 1–20, 2018.
- BOUCHÉ, F. 1902. 1. Monats-Versammlung am 22. März 1901. Sitzungsberichte und Abhandlungen – Flora, Sächsische Gesellschaft für Botanik und Gartenbau, Dresden 6: 7–8.
- CONDER, C. 1892. The Canary Islanders. The Scottish Review 19: 272–296.
- COOK, A.C. 1900. The aborigines of the Canary Islands. American Anthropologist 2: 451–493.
- COSTIGAN, A.W. 1787. Sketches of Society and Manners in Portugal. T. Vernor, London.
- CREDNER, A. 1887. Amerikanische Blumenarbeiten. Möllers Deutsche Gärtner-Zeitung 2: 208–209.
- DODD, G. 1852. Curiosities of Industry and the Applied Sciences. George Routledge & Co, London.
- EL HADRAMI, A., AND J.M. AL-KHAYRI. 2012. Socioeconomic and traditional importance of date palm. Emirates Journal of Food and Agriculture 24: 371–385.
- ELLIOT, P.J. 2002. Ceremonies of the Liturgical Year: According to the Modern Roman Rite. Ignatius Press, San Francisco.
- FIRMIN-DIDOT, A. AND H. FIRMIN-DIDOT. 1862. Annuaire Général du Commerce, de L'industrie, de la Magistrature et de L'administration ou Almanach des 500,000 Adresses, 22 ed. Didot, Paris.
- FIRMIN-DIDOT, A. AND H. FIRMIN-DIDOT. 1873. Annuaire Général du Commerce, de L'industrie, de la Magistrature et de L'administration ou Almanach des 500,000 Adresses, 24 ed. Didot, Paris.
- FUERTEVENTURA EN IMÁGENES. 2017. La Artesanía de Palma en Fuerteventura. <https://fuerteventuraenimagenes.com/la-artesania-de-palma-en-fuerteventura/>. Retrieved on Jun 25, 2018.
- GELABERT, M., F. NIELL, A. RAMIS, J. SUREDA AND SUREDA, P. 1990. L'Obra de Palma. Cistelles, Graneres I Cordats. Conselleria de Comerç Industria del Govern Balear, Palma de Mallorca.
- GLAS, G. 1864. The History of the Discovery and Conquest of the Canary Islands: Tr. From a Spanish Manuscript Lately Found in the Island of Palma. With an Enquiry into the Origin of the Ancient Inhabitants. To Which is Added, a Description of the Canary Islands, Including the Modern History of the Inhabitants, and an Account of their Manners, Customs, Trade, &C. London, R & J Dodsley.
- GREENHALGH, T. AND R. PEACOCK. 2005. Effectiveness and efficiency of search methods in systematic reviews of complex evidence: Audit of primary sources. British Medical Journal 331: 1064–1065.
- GUISABU, J. AND M. VANDEN-BERGHE. 1882. Les palmiers utiles et leurs alliés. Usages et produits. Bulletin de la Société nationale d'acclimatation de France 4: 741–767.
- HERNÁNDEZ, E. 1991. La Palmera, Santa Cruz de Tenerife.
- JACKSON, J.R. 1871. Walking Sticks. p. 508, in MACLEOD, N. (ed.), Good Words for 1871. Strahan & Co, London.
- JACKSON, J.R. 1888. Canes and sticks used in the manufacture of walking sticks, umbrella handles, etc. Pt II. Journal of the Society of Arts 36: 1122–1124.
- JOHNSTON, A. 1904. The common date palm (*Phoenix dactylifera*). Journal of the Royal African Society 3: 177–182.
- KERLEN, K. 1914. Palmen. Über *Phoenix*, hauptsächlich *Ph. canariensis* und *dactylifera*. Die Gartenwelt 18: 113–118.
- KITCHENHAM, B. 2004. Procedures for Performing Systematic Reviews. Keele University Technical Report TR/SE-0401. Keele University, Keele.
- KUONI, B. 1981. Cestería Tradicional Ibérica. Ediciones del Serbal, Barcelona.
- MANACHINI, B., N. BILLECI AND F. PALLA. 2013. Exotic insect pests: The impact of the red palm weevil on natural and cultural heritage in Palermo (Italy). Journal of Cultural Heritage 14: e177–e182.
- MIFSUD, S. 1995. Palms on the Maltese Islands Principes 39: 190–196.
- MORALES MATEOS, J. AND A. RODRÍGUEZ RODRÍGUEZ. 2007. El aprovechamiento de la palma (*Phoenix canariensis*) por los primeros habitantes del Archipiélago Canario: Bueno para comer, bueno para trabajar. El Pajar. Cuaderno de Etnografía Canaria 24: 4–9.
- MORALES VALVERDE, R., J. TARDÍO, M. PARDO DE SANTAYANA, M. MOLINA AND L. ACEITUNO-MATA.

2011. Biodiversidad y etnobotánica en España. Memorias de la Real Sociedad Española de Historia Natural 9: 157–207.
- MOWAT, L. 1997. Palm Sunday without palms. *Journal of Museum Ethnography* 9: 131–133.
- MURRAY, E. 1859. Sixteen Years of an Artist's Life in Morocco, Spain, and the Canary Islands. Hurst and Blackett, London.
- NATIONAL LIBRARY OF AUSTRALIA. 2018. Trove. <http://trove.nla.gov.au/>. [Retrieved on Aug 1–20, 2018].
- NOLL, F.C. 1872. Das Thal von Orotava auf Teneriffa. Schilderung seiner Vegetation nach verschiedenen Regionen. Ferdinand Hirt, Breslau.
- NOLL, F.C. 1873. Von Lissabon nach der Küste Marokkos und den Canaren. *Westermann's Monatshefte* 17: 36–55.
- NOLL, F.C. 1876. Das Thal von Orotava auf Teneriffa. Schilderung Seiner Vegetation Nach Verschiedenen Regionen. *Deutsches Magazin für Garten- und Blumenkunde* 29: 107–112.
- PARDO-DE-SANTAYANA, M., J. TARDÍO, M. HEINRICH, A. TOUWAIDE AND R. MORALES. 2006. Plants in the works of Cervantes. *Economic Botany* 60: 159–181.
- PEÑA-CHOCARRO, L., G. PÉREZ JORDÀ, J. MORALES MATEOS AND L. ZAPATA, L. 2015. Storage in traditional farming communities of the western Mediterranean: Ethnographic, historical and archaeological data. *Environmental Archaeology* 20: 379–389.
- PINTAUD, J.-C. AND B. LUDENA. 2008. Andean palms in Ecuadorean cities. *Palms* 52: 165–173.
- RIVERA, D., C. OBÓN, F. ALCARAZ, T. EGEA, E. CARREÑO, E. LAGUNA, A. SANTOS AND W. WILDPRET. 2013. A review of the nomenclature and typification of the Canary Islands endemic palm, *Phoenix canariensis* (Arecaceae). *Taxon* 62: 1275–1282.
- SANTOS GUERRA, A. 1994. Distribution of *Phoenix canariensis* in the Canary Islands. Pp. 141–148, in PAYÃO DEMATTÊ, M.E.S. (ed.), *I International Symposium on Ornamental Palms*. Acta Horticulturae.
- SARO, I., M.A. GONZÁLEZ-PÉREZ, C. GARCÍA-VERDUGO AND P.A. SOSA. 2014. Patterns of genetic diversity in *Phoenix canariensis*, a widespread oceanic palm (species) endemic from the Canarian Archipelago. *Tree Genetics & Genomes* 11: 815.
- SPENNEMANN, D.H.R. 2018a. Canary Island Date Palms (*Phoenix canariensis*) in Australia: Introduction and early dispersal. *Palms* 62: 185–201.
- SPENNEMANN, D.H.R. 2018b. Canary Island Date Palms (*Phoenix canariensis*) in the Australian media until World War II. *Palms & Cycads* 140: 16–27.
- SPENNEMANN, D.H.R. 2018c. *Phoenix canariensis* Seed Encountered in Scats and Ejecta Collected at Alma Park. Institute for Land, Water and Society, Charles Sturt University, Albury, NSW.
- SPENNEMANN, D.H.R. 2019. Canary Date Palms (*Phoenix canariensis*) as ornamental plants. The first thirty years of the horticultural trade. *Huntia* 17: 79–102.
- SPON, E., R. HALDANE AND C.G.W. LOCK. 1892. Walking sticks. *Workshop Receipts* 5: 397–406.
- SUÁREZ, M.M. 2013. The Traditional Uses of the Canary Island Date Palm. The Disappearance of Its Functions and Related Concerns. <http://www.mieldepalma.com/the-traditional-uses-of-the-canary-island-date-palm/?lang=en>. [Retrieved on May 1, 2019].
- WOHLIN, C. 2014. Guidelines for snowballing in systematic literature studies and a replication in software engineering. P. 38, in Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering. ACM.
- ZONA, S. 2008. The horticultural history of the Canary Island Date Palm (*Phoenix canariensis*). *Garden History* 36: 301–308.

New & Notable

How Many Species of *Washingtonia*?

The genus *Washingtonia* has long been thought to comprise just two species (Figs. 1 & 2). *Washingtonia filifera* (Rafarin) H.Wendl. ex de Bary was described in 1879 and is the type species for the genus. It occurs in California and Arizona, USA, and Baja California, Mexico, and is known for its thick trunk, gray-green leaves and cold hardiness. *Washingtonia robusta* H.Wendl. was described just four years later. It occurs in Baja California Sur, as well as Sonora in Mexico, and is known for its great height at maturity, bright green leaves, rapid growth and tolerance of wet, humid conditions. Differences in flavonoid chemistry and disease susceptibility have also been documented for the two species. Although a few other species and varieties have been proposed over the years, the taxonomic conclusion of Bailey (1936), that only these two species should be recognized, has been widely accepted (Henderson et al. 1995, Zona 2000, Villaseñor 2016). Subsequently, the only taxonomic change to the genus was the formal description of the putative hybrid between the species, *Washingtonia* × *filibusta* Hodel, in 2014.

Recently published studies are casting a critical eye on that two-species model. These studies looked at populations of *Washingtonia* along its 1300-km distribution, with intensive sampling of populations in the middle of the Baja California Peninsula, where the two species meet. The results paint a complicated picture of morphological and genetic variability.

Villanueva-Almanza et al. (2018) examined morphological characters, including height, trunk diameter, leaf color and petiole width among others. They sampled populations in California, Arizona, Sonora and throughout the Baja California Peninsula. They concluded that morphology changes gradually along the Baja California Peninsula and that there are no clear morphological distinctions between the two currently recognized species. Villanueva-Almanza et al. (2018) concluded that the two species represent the two polar extremes of a single, variable population.

Klimova et al. (2017) brought molecular techniques to bear on the two-species model. Klimova et al. used three nuclear and seven chloroplast loci that have been used previously in palm systematics. The investigators concatenated the chloroplast sequences and the nuclear sequences and analyzed them as two sequences. Although they did not examine populations from the USA, they concluded that the northernmost population of *Washingtonia*, one in the Sierra Juarez mountains of Baja California corresponding to *W. filifera*, was genetically distinct from all the remaining populations in the Peninsula and Sonora. The investigators found no shared genotypes between these two groups and concluded that the data support the current classification of two, geographically separate species.

A second molecular analysis was published by Klimova et al. (2018), in which a new technique, genotype by sequencing, was employed. This technique examined over 1400 single nucleotide polymorphisms over a far greater proportion of the genome than was sequenced by Klimova et al. (2017). The investigators were able to correlate genetic results with temperature and rainfall data from the length of the Baja California Peninsula and Sonora (again, populations from the USA were not included). This study identified a suite of genetic markers associated with temperature. The investigators interpreted these results as consistent with population-level adaptation to local ecological conditions. In terms of taxonomy, they found that the genetic difference between the Sierra Juarez population of *W. filifera* and *W. robusta* from the northern Peninsula was smaller than that found between populations of *W. robusta* from the northern Peninsula and those from Sonora. The investigators uncovered four population groups based on the genetic results, but they concluded that the differences among these populations did not rise to the magnitude of species-level differences.



1. *Washingtonia* in cultivation at the Jardín de Aclimatación de la Orotava, Tenerife, Spain. Two *W. robusta* are on the left, and a solitary *W. filifera* is on the right. Photo by S. Zona.

These recent publications are adding to our knowledge of this North American genus, especially filling gaps between the USA populations and those from the southern tip of the Baja California Peninsula. None of these

recent studies will be the last word on the taxonomy of *Washingtonia*, but they do reinforce the need to examine the genus across its entire range, especially populations from Sonora and the middle of the Peninsula. These



2. *Washingtonia* cultivated in downtown Palm Springs, California. Two *W. robusta* are on the left, and two *W. filifera* are on the right. Photo by S. Zona.

studies show that differences between *W. filifera* and *W. robusta*, although clear in cultivation, break down in the wild. These studies do not negate the facts that the northern populations are hardier than the

southern populations and the southern populations are more tolerant of wet conditions than the northern populations. If future studies support the recognition of a single, variable species, the correct name for

that species will be *Washingtonia filifera*. In the meantime, the two historic names will remain valuable for communicating the usually distinct features of *Washingtonia* in cultivation.

LITERATURE CITED

- BAILEY, L.H. 1936. *Washingtonia*. Gentes Herbarum 4: 53–82.
- HENDERSON, A., G. GALEANO AND R. BERNAL. 1995. Field Guide to the Palms of the Americas. Princeton University Press, New Jersey.
- HODEL, D.R. 2014. *Washingtonia* × *filibusta* (Arecaceae: Coryphoideae), a new hybrid from cultivation. Phytoneuron 68: 1–7.
- KLIKOVA, A., J.I. HOFFMAN, J.N. GUTIERREZ RIVERA, J. LEON DE LA LUZ AND A. ORTEGA RUBIO. 2017. Molecular genetic analysis of two native desert palm genera, *Washingtonia* and *Brahea*, from the Baja California Peninsula and Guadalupe Island. Ecology and Evolution 7: 4919–4935.
- KLIKOVA, A., A. ORTEGA RUBIO, D.L. VENDRAMI AND J.I. HOFFMAN. 2018. Genotyping by sequencing reveals contrasting patterns of population structure, ecologically mediated divergence, and long distance dispersal in North American palms. Ecology and Evolution 8: 5873–5890.
- VILLANUEVA-ALMANZA, L., P.P. GARCILLÁN, E. AVILA-LOVERA, V. PÉREZ, C. SILVA BEJARANO, E. FOCHT AND E. EZCURRA. 2018. A Hollywood palm icon unmasked: clinal variation in *Washingtonia* (Arecaceae) of Peninsular California. Botanical Journal of the Linnean Society 188: 406–425.
- VILLASEÑOR, J.L. 2016. Checklist of the native vascular plants of Mexico. Revista Mexicana de Biodiversidad 87: 559–902.
- ZONA, S. 2000. *Washingtonia*, vol. 22, p. 105, in: FLORA OF NORTH AMERICA EDITORIAL COMMITTEE (eds.) 1993+. Flora of North America North of Mexico. New York and Oxford. Online as <http://beta.floranorthamerica.org/Washingtonia>

SCOTT ZONA AND JOHN DRANSFIELD

Photo Feature

Trachycarpus in Myanmar



One of the best known “plant hunters” of the early part of the twentieth century was Frank Kingdon-Ward, who travelled and collected extensively in the rugged mountains of the eastern Himalayan region of northeastern India, Tibet, southern China and Myanmar. Just over 70





years ago, Kingdon-Ward was in the Naga Hills of northeastern India, not only looking for plants but also trying to track down American aircraft that had crashed in the mountains during World War II. He wrote a book about this trip, *Plant Hunter in Manipur* (Kingdon-Ward 1952). In May 1948, he was close to the border between India and Myanmar, on the mountain range that separates the two countries, about 10 km due east of Chattrik. Kingdon-Ward wrote, "It was a fine evening. The cliffs above us inflamed by the setting sun, looked easy to climb, and as there was a distinct dip in the range here, I decided to follow up the stream next day. I hoped to get an uninterrupted view into Burma from the top, besides a close-up of the palm trees which were almost the only trees growing on the naked sandstone."

The palm trees that Kingdon-Ward saw still grow on the sandstone cliffs there. In November 2017, KA photographed them from the Myanmar side, near Layshi in the Naga Self-Administered Zone (25°27'11.1"N 98°56'56.1"E, ca. 1500 m elevation), about 60 km north of Chattrik. Unfortunately, due to the difficulty of reaching the palms, collecting a specimen was not possible. Toby Spanner kindly identified these palms from the photographs and thought they were probably *Trachycarpus martianus*, previously known from Nepal, northeastern India and Chin State in Myanmar.

Acknowledgments

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LITERATURE CITED

KINGDON-WARD, F. 1952. *Plant Hunter in Manipur*. Jonathan Cape, London.

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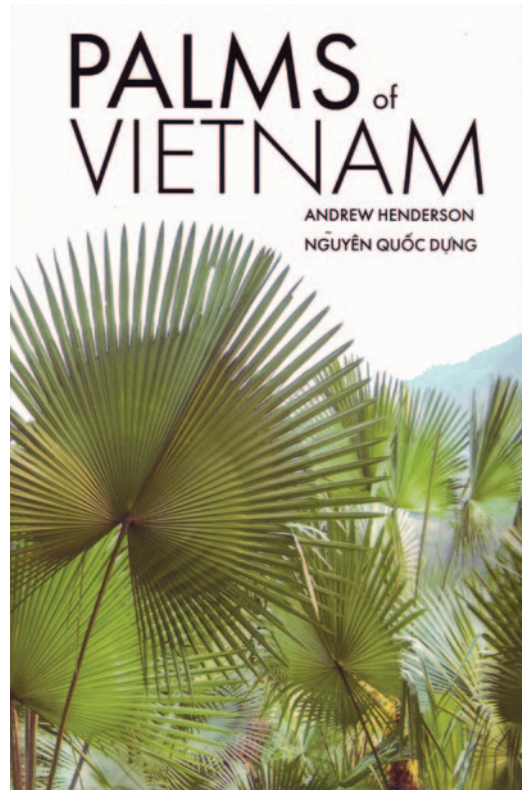
PALM LITERATURE

PALMS OF VIETNAM – Andrew Henderson and Nguyen Quoc Dung. New York Botanical Garden Press. 2019. Softcover. Pp 327, illustrated in full color. Available as a print-on-demand book from Amazon. Price £38.00 (Amazon UK), \$48.00 (Amazon USA).

Until the last decade or so, the palm flora of Vietnam was known largely through the 1937 account by Conrard and Gagnepain published in the *Flore Générale de l'Indochine*. Stretching from warm temperate vegetation on the border with China through to humid tropical vegetation in the far south, the country might have been predicted to have a palm flora substantially richer than that suggested in the old French flora. Indeed that is the case. The authors, more than any others, have put Vietnam on the map as having an astonishingly rich and interesting palm flora. During intensive fieldwork throughout the country the authors have discovered many new species and even uncovered a new genus, *Lanonia*, hidden within the historical concept of the genus *Licuala*. Among the Calamoid palms they have discovered strange species that seem to hint at an explosive early radiation of this group of palms in Indochina. Some of the fieldwork was supported by the International Palm Society, and this beautiful field guide well vindicates the support of field work.

This is quite simply a fabulous book. Beautifully designed and profusely illustrated throughout with color photographs of palm habitats, artifacts made from palms, habit shots of palms and close-up details that will aid identification, the book is a joy to handle and browse.

There is an introductory section covering the geography and vegetation of Vietnam, an analysis of diversity of palm flora across the country and the morphology of Vietnamese palms, this illustrated by simple line drawings. There is a key to genera, followed by the meat of the volume, the account of the palms genus by genus. Species are keyed out within each



generic account and arranged alphabetically; in the larger genera this has the effect of separating closely similar species, but with such beautiful photographs, problems of comparison are lessened. The keys to species utilizing simple field characters for the most part seem easy to use. Species synonyms are provided in a list at the back of the book.

Each species is provided with a clear dot map. The awkward shape of the map of Vietnam does not lend itself to easy incorporation into a text, but the designers of the book have draped the serpentine shape around text and photographs most elegantly.

For any palm lover intending to visit Vietnam this is an essential text. For anyone interested in beautiful palm books this is also a must. I encourage readers of PALMS to buy it – it is reasonably priced and quite simply one of the nicest palm field guides around.

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The National Tropical Botanical Garden's *Pritchardia flynnii* Project

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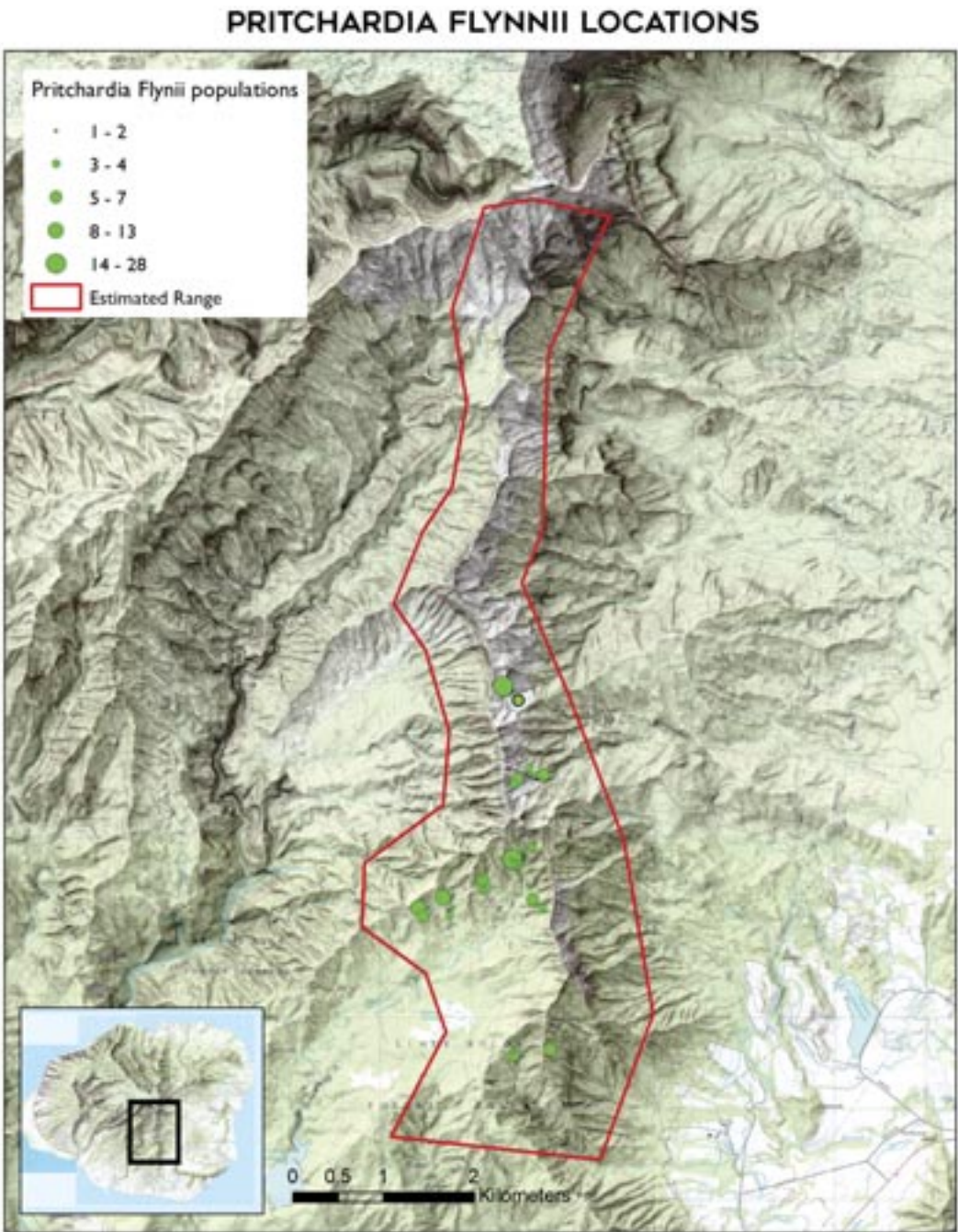
Since the 1990s, the National Tropical Botanical Garden (NTBG) has played a leading role in plant discovery in Hawai'i and the Pacific. Working in partnership with state, federal, and private conservation agencies and organizations, NTBG continues to conduct field surveys, discovery, and the collection of rare and endangered plants across Hawai'i and the greater Pacific region.

Pritchardia is Hawai'i's only native palm genus, and most species are threatened with extinction through habitat degradation and the effects of invasive species. Little to no regeneration is observed in the wild due to seed predation by rodents. *Pritchardia flynnii* was first noticed by NTBG's Herbarium Manager Tim Flynn and described by NTBG's Director of Science and Conservation David Lorence. It is endemic to the Wahiawa Mountains and southern forests of Kauai Island. The Wahiawa Mountains are located above NTBG Headquarters in Kalaheo, Kauai, making the McBryde Gardens an appropriate planting site within its natural range.

The IUCN Redlist assessed *Pritchardia flynnii* as Endangered with 400 individuals in the wild (Clark et al. 2015). U.S. Fish and Wildlife

Service lists *P. flynnii* as a Species of Concern. In the Chapin et al. (2004) article, the authors estimated *P. flynnii* to have 350 to 450 individuals. NTBG's Research Biologist (K.Wood, pers comm.) recorded it in small numbers around Powerline Road and Makaleha and believed the population count could possibly be higher.

With the support of a grant from the International Palm Society (IPS), an NTBG Botanist made two trips into the Makaleha Mountains, where Lorence and botanist Chrissen Gemmill had recorded the species in the original 2014 description of *P. flynnii*. However, nothing observed in 2018/2019 fitted Hodel's current (2012), more narrow definition of the species. The Makaleha Mountains and region are interesting in that



1. Map of the Wahiawa Mountains of Kauai showing *Pritchardia flynnii* populations.

five species of *Pritchardia* (*P. hardyi*, *P. flynnii*, *P. perlmanii*, *P. waialealeana* and *P. viscosa*) all co-occur in the range. Christine Bacon remarked that some *Pritchardia* species are “probably big hybrid swarms, mixing their phenotypes potentially with other species, too.”

There needs to be a new effort on this genus with comprehensive sampling and next-

generation sequencing focused across populations. With this in mind, we collected DNA samples from two small, unusual *Pritchardia* populations that had characteristics of both *P. flynnii* and *P. perlmanii*. A total of 32 DNA samples was collected from individuals representing eight different sub-populations. This DNA is being stored at NTBG for future genetic analysis. Additionally herbarium



2. We found that wire mesh bags allowed fruits to mature normally and prevented predation by animals.

vouchers were made for each sub-population and for some individuals with phenotypic variation.

Prior to the IPS grant, NTBG's living collections included only two wild-source individuals of *Pritchardia flynnii*. Because *Pritchardia* seeds are sensitive to drying and freezing, they cannot be stored in seed banks, and their survival depends in part on continued cultivation in botanic gardens. The more individuals NTBG can curate, the more genetic diversity we can conserve and the greater the conservation value of our collections. Mature seeds can be grown, but are rarely collected in the wild, unless botanists bag immature seeds with wire-mesh to prevent predation. This is a time-consuming and laborious task, as the trees usually need to be climbed in order to the seeds.

A total of 596 seeds was collected from 18 individual palms in eight sub-populations and are currently being propagated in the NTBG nursery. All sub-populations were vouchered and individuals in the field given Population Reference numbers so that we can identify and follow individual founders' progeny.

In addition to the heavy wire-mesh bags, we experimented with polyurethane rice bags lined with a layer of steel wool and polyurethane rice bags over copper netting. The hope was to use a lighter material and cause less stress to the inflorescence, as well as identifying a material that would be more pliable and easier to carry in bulk. The steel wool rusted and degraded away within six months; the copper netting held up well but became entangled with the fruit and pulled many off. In addition, though the trial was limited, it seemed that fruit bagged in the rice bags grew considerably more slowly than those in the wire mesh. Seeds bagged in rice bags for seven months appeared to have barely grown and were about a centimeter in length, while seed in wire mesh bags that had been about the same size when bagged were 2.5 times larger after seven months.

In the end, we had the most success with wire bags that were attached to a lower leaf petiole for support (Figs. 2 & 3). It seems reasonable to conclude that *P. flynnii* fruits require bagging for 6 to 12 months to reach maturity. No

3. Enclosing young fruits in wire mesh bags to prevent predation by rats.



mature fruit was observed on unbagged infructescences. Immature fruit that we did not bag disappeared, most likely taken by rats. There were occasionally juvenile palms in the larger clumps or near the tallest mature palms, a fact that suggests rare natural regeneration.

There were some major setbacks in the course of the project. Six months into the project, the unpaved, main access road was closed for a year. Shortly after the road was reopened in January 2019, the land was sold, and the new road owner limited access to between 7 a.m. and 3 p.m. Furthermore, camping was not allowed. Without being able to camp, minus the one hour commute each way, we were able to work the site a maximum of only six hours per day.

In addition to the limited access to the populations of *P. flynnii*, two storm events affected the project by removing or causing the breakage of inflorescences on which bags had been placed. On April 15, 2018, 49.69 inches (1262 mm) of rain fell during a 24-hour period on Kauai, setting a new U.S. 24-hour rainfall record. Then on February 10, 2019 a “historic” storm brought damaging wind gusts to the islands. This storm hit the largest concentration of *P. flynnii* in the Wahiawa Basin, notorious among Kauai’s helicopter pilots for its strong, unpredictable winds and sudden downdrafts. It is hard to estimate the toll of the first storm, as we were unable to monitor it, but the windstorm removed or damaged about a third of the inflorescences with deployed seed bags.

In order to maximize our helicopter dollars and survey the largest possible range, NTBG used drone technology. With the drone, researchers were able to monitor most of the Wahiawa Range and take GPS points for each *Pritchardia* or group. High quality images were

captured by the drone and later used to assess phenology. The drone survey, ground surveys and helicopter surveys over the inaccessible eastern hanging gorges of Wai’ale’ale basically agree with the Chapin et al. (2004) estimate of 350–450 individuals of *P. flynnii* occurring in the wild. Based on these surveys, we estimate the population to be 300–400 individuals.

In summary, nearly 600 seeds from 18 founders were collected, and 163 individuals were mapped. These seeds are currently being grown in the NTBG nursery for inclusion in its collection as part of its conservation efforts. A total of 32 DNA samples was collected from individuals representing eight sub-populations. This DNA is being stored at NTBG for future genetic analysis. Surveys found the *P. flynnii* range is likely to be limited to Wahiawa Mountains, including the Kahili Range up to Wai’ale’ale. We estimate that approximately 300–400 individuals occur in this area.

Pritchardia flynnii was discovered and described by NTBG staff. It is the *Pritchardia* that occurs in the natural range of NTBG’s Headquarters on Kauai, McBryde Gardens and the Lawai Forest Restoration. NTBG has a *kuleana* (Hawaiian for responsibility) to care for this species. This project has been a big step toward securing the future of this species.

LITERATURE CITED

- CHAPIN, M.H., K.R. WOOD, S.P. PERLMAN AND M. MAUNDER. 2004. A review of the conservation status of the endemic *Pritchardia* palms of Hawaii. *Oryx* 38: 273–281.
- CLARK, M. 2015. *Pritchardia flynnii*. The IUCN Red List of Threatened Species. <http://dx.doi.org/10.2305/IUCN.UK.2015>
- HODEL, D.R. 2012. *Loulu: the Hawaiian Palm*. University of Hawaii Press, Honolulu.

Photo Feature



Aiphanes gloria

Benjamín Cárdenas Valderrama, 2019

In the last issue of PALMS, in Palm News (p. 154), we mentioned a new paper by R. Bernal et al. (A revision of the *Aiphanes parvifolia* complex (Arecaceae). *Phytotaxa* 411: 275–292. <https://doi.org/10.11646/phytotaxa.411.4.3>) in which a new species, *A. gloria*, was described and named for the late Dr. Gloria Galeano. A beautiful illustration of that species by B. Cárdenas Valderrama was provided to us by Dr. Bernal.

The Editors

Calamus nudus – An Exceptional New Rattan from New Guinea

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The island of New Guinea has been the site of many recent palm discoveries. In no group is this more so than the rattan genus *Calamus*.

Recent studies indicate that 62 species of *Calamus* occur in New Guinea, with an astonishing 34 species having been described as new to science since 2002 (e.g. Baker & Dransfield 2014, 2017). During the preparation of a taxonomic monograph of New Guinea *Calamus*, a further new species has come to light in the curious and distinctive *Calamus lauterbachii* group. Here we formally describe this new species and provide comparisons with its apparent relatives.

Calamus nudus W.J.Baker & S.Venter, **sp. nov.**
Type: INDONESIA. Papua Province: Boven Digoel, south of Mindiptana, 30 August 1957, *Dijkstra BW 6635* (holotype L!; isotype LAE). (Figs. 1–5).

Diagnosis: Distinguished by the leaves with 3–5 leaflets on each side of the rachis, arranged in a single fan-like group, the long, inflated ocrea with numerous solitary spines and the flagelliform inflorescence in which the first primary branch emerges directly from the base and is not subtended by any primary bract.

Moderately slender, clustering rattan climbing to 30 m. **Stem** with sheaths 9–15 mm diam., without sheaths to 7–9 mm diam.; internodes 10–28 cm. **Leaf** ecirrate to 64 cm long including petiole; sheath green, with indumentum of scattered dark scales, spines numerous, 1–4 × ca. 1 mm, narrowly triangular, stiff, green, solitary; knee 18–20 mm long, green, lightly armed as sheath; ocrea 40–55 × 1–2.5 cm, erect, inflated, boat-shaped, splitting longitudinally to base adaxially, papery, brown, with numerous solitary spines, similar to sheath spines, but finer, ocrea tattering to dry fibers, sometimes disintegrating; flagellum 100–200 cm; petiole to ca. 13 cm, 3–4 mm wide and ca. 3 mm thick at base, flattened adaxially, rounded abaxially, indumentum and armature as sheath; rachis ca. 3 cm, armed as petiole; leaflets 3–5 on each side of the rachis, arranged in a single fan-like group, lanceolate, leathery, longest leaflets at apex, apical leaflets 44–51 × 3.5–4 cm, proximal leaflets slightly smaller, apical leaflet pair united from one third to one half of their length, leaflets armed only on margins with



1. *Calamus nudus*. Base of inflorescence showing the first primary branch (bearing ripening fruit) emerging directly from the base of the inflorescence, with no visible evidence of a prophyll. Purari River, Papua New Guinea. Photo: Stephanus Venter.

stout bristles, more numerous towards leaflet apex, transverse veinlets conspicuous in dried material. **Staminate inflorescence** not seen. **Staminate flowers** not seen. **Pistillate inflorescence** flagelliform, 1.6–2.2 m long including 0–4 cm peduncle, the remainder being flagellum-like, with distinct pulvinus at peduncle base, branched to 2 orders; prophyll absent; peduncular bracts absent, remaining primary bracts very narrow and tightly sheathing as in flagellum, tattering at mouth, armed as flagellum with numerous grapnel spines; primary branches 1(–3), to 21 cm long, held parallel or at narrowly acute angle with main inflorescence axis, compact, first primary branch emerging directly from inflorescence base and not subtended by any primary bract, with up to 15 rachillae, rachilla-subtending bracts straw-like and tattering; rachillae 14–25 mm × 3–4 mm, straight; rachilla bracts 3 × 1.2 mm, distichous, spatulate; floral bracteoles 2–3 mm long and forming deep cup-like recess for flowers. **Pistillate flowers** 5 × 2–2.3 mm at anthesis; calyx 2–2.3 mm diam., tubular in basal 3–4 mm, with 3 lobes to 1–1.5 × 1 mm, with abundant dark scales; corolla 3.5–4 × 1.5 mm, tubular in basal half, with 3 lobes, scales sometimes present at tips; staminodes 6, forming staminodial ring as a dark membranous cup 2 mm high; gynoecium 4–5 × 1.3–1.5 mm, ellipsoid, stigmas 1–1.5 mm long.

Sterile staminate flowers ca. 3.2 × 1.5 mm in bud, with empty anthers. **Fruit** ellipsoid, ca. 20 × 12.5 mm including beak ca. 1 × 1 mm, with ca. 17 longitudinal rows of orange-brown scales. **Seed** (sarcotesta removed) ca. 10 × 8 × 6 mm, ellipsoid, smooth, with deep lateral pit; endosperm homo-geneous; embryo basal.

Etymology: Naked (“nude”), referring to the inflorescence being devoid of a prophyll.

Distribution: Known from three locations in southern central New Guinea, near Mindiptana in Papua Province, Indonesia and in Western and Gulf Provinces of Papua New Guinea.

Habitat: Lowland rainforest at elevations of 30–146 m. In Gulf Province it is associated with hill forest on low hills along the Purari River growing in alluvial gravelly clay and humus-rich clay loam on limestone.

Uses: None recorded.

Vernacular names: *Alipoi* (Bamu), *Arompotto* (Kati).

Specimens examined: INDONESIA. Papua Province: Boven Digoel, south of Mindiptana, 30 August 1957, *Dijkstra* BW 6635 (holotype L!, isotype LAE). PAPUA NEW GUINEA. Western Province: Balimo Subdistrict, Muturo, Bamu River, near waterfall, 50 m, 9 May 1980,



Calamus nudus. 2 (left). Fan-like leaf. Purari River, Papua New Guinea. 3 (right). Primary branch of female inflorescence. Purari River, Papua New Guinea. Photos: Stephanus Venter.

Akivi & Zieck NGF 36324 (LAE!). Gulf Province: hills behind Staging Camp, along the Purari River, 13 km E of Wabo, 146 m, 15 July 2012, *S. Venter 14596* (CNS!, LAE!).

Calamus nudus belongs to a distinctive group of New Guinea rattans, which also includes the widespread *Calamus lauterbachii* Becc. and the more localized *C. cheirophyllus* J.Dransf. & W.J.Baker from the mountains of Papua New Guinea and *Calamus heatubunii* W.J.Baker & J.Dransf. from the Bird's Head Peninsula and Waigeo Island. The group is characterized by strongly grouped, rather broad, leathery leaflets, long and conspicuous ocreas and rather compact inflorescences, sometimes with congested primary branching systems.

This new species is unique among *Calamus* species (and indeed palms) in that its first primary inflorescence branch emerges directly from the inflorescence base and is not subtended by any primary bract. There appears to be no structure that can be interpreted as a prophyll. Primary bracts are evident in distal parts of the inflorescence (which is long and flagellum-like), which correspond in morphology to rachis bracts or the empty bracts

that are typical of a flagellum. Most inflorescences seen had only a single primary branch, though one contained two additional, rather reduced primary branches.

The absence of a prophyll at the base of the inflorescence is exceptional in palms. The prophyll is easily identified in any palm as the basal-most bract on the main inflorescence axis. It is characterized by two distinctive, longitudinal keels and in most palms tends not to subtend a branch. In some *Calamus*, the prophyll does sometimes subtend a primary branch. The absence of a prophyll has been reported elsewhere only the African rattan genus *Eremospatha* (all species), though in this case a vestigial scar may be visible (Sunderland 2012). Even in *Eremospatha*, though, the primary branches are always subtended by primary bracts, in the form of low rachis bracts. Unlike *Eremospatha*, *Calamus nudus* has no visible vestige of a prophyll, nor does it have any bract subtending the first primary branch; this combination of characters is unheard of in any other palm species. To produce a branch without a subtending bract truly breaks the rules of palm architecture.



Calamus nudus. 4 (left). Open flowers in female inflorescence, showing female flower and sterile staminate flower at anthesis. Purari River, Papua New Guinea. 5 (right) Base of female inflorescence in fruit showing the first primary branch (bearing ripe fruit) and the continuing flagelliform inflorescence axis (broken distally at the dry brown section). Also showing fan-like leaf. Purari River, Papua New Guinea. Photos: Stephanus Venter.

Vegetatively, *Calamus nudus* is most similar to *C. heatubunii* (Figs. 6 & 7) in the almost palmate leaves comprising very few leaflets and the pronounced, inflated ocrea armed with numerous solitary spines. However, the inflorescence of *C. heatubunii* is dramatically different, being short (up to 35 cm long) with numerous (up to 8) small primary branches. *Calamus cheirophyllus* also has fan-like leaves and a short erect inflorescence, but is of shorter stature and is only known from high elevations. *Calamus lauterbachii* (synonym: *C. humboldtianus* Becc.) has leaves with leaflets in multiple divaricate groups (Fig. 8) and an ocrea that is armed with fine spines in collars that resemble eye-lashes. Unusually, its inflorescences can be either flagelliform or erect and not flagelliform. Typically, it bears only one or two primary branches, which are very condensed and subtended by papery primary bracts that split and tatter (Fig. 9).

Acknowledgments

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LITERATURE CITED

- BAKER, W.J. AND J. DRANSFIELD. 2014. New rattans from New Guinea (*Calamus*, Arecaceae). *Phytotaxa* 163: 181–215.
- BAKER, W.J. AND J. DRANSFIELD. 2017. More new rattans from New Guinea and the Solomon Islands (*Calamus*, Arecaceae). *Phytotaxa* 305: 61–86.
- SUNDERLAND, T.C.H. 2012. A taxonomic revision of the rattans of Africa (Arecaceae: Calamoideae). *Phytotaxa* 51: 1–76.



6. *Calamus heatubunii*. Habit showing fan-like leaf, ocrea and short erect inflorescence. Vicinity of Sorong, West Papua, Indonesia. Photo: William J. Baker.



7. *Calamus heatubunii*. Female inflorescence in fruit, showing numerous short primary branches and prophyll at inflorescence base. Photo: William J. Baker.



8. *Calamus lauterbachii*. Habit showing leaf with leaflets in multiple divaricate groups. Vicinity of Finschhafen, Papua New Guinea. Photo: William J. Baker.



9. *Calamus lauterbachii*. Base of female inflorescence showing first primary branch subtended by a conspicuous, papery prophyll. The purplish tip of the ocrea is visible showing the distinctive eyelash-like collar of fine spines. Vicinity of Finschhafen, Papua New Guinea. Photo: William J. Baker.

Palm Collecting in Oklahoma

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Palms in Oklahoma? It sounds like a joke. At the very least a wild goose chase or a funny prank. Nevertheless, it is a fact that *Sabal minor*, otherwise known as the dwarf palmetto, reaches its northwestern-most limit in the United States in McCurtain County, Oklahoma (Fig. 1) at Beavers Bend State Park.

In September 2018, we traveled to Oklahoma in search of palms. In an effort to collect a genetically diverse sampling of seeds, we planned to collect *Sabal minor* in a number of different localities throughout the Red River valley, which separates Oklahoma and Texas, starting at Beavers Bend State Park, just south of Broken Bow Lake.

At Montgomery Botanical Center, a research garden in Miami, we have an interest in growing a genetically diverse collection of all US native palm trees. Permission was obtained to make collections in 2018, and the actual collecting started in late September of that year, when David Arbour of the Oklahoma Department of Wildlife Conservation and the US Forest Service informed us that the fruits were ready. He was concerned the birds would collect them before we did.

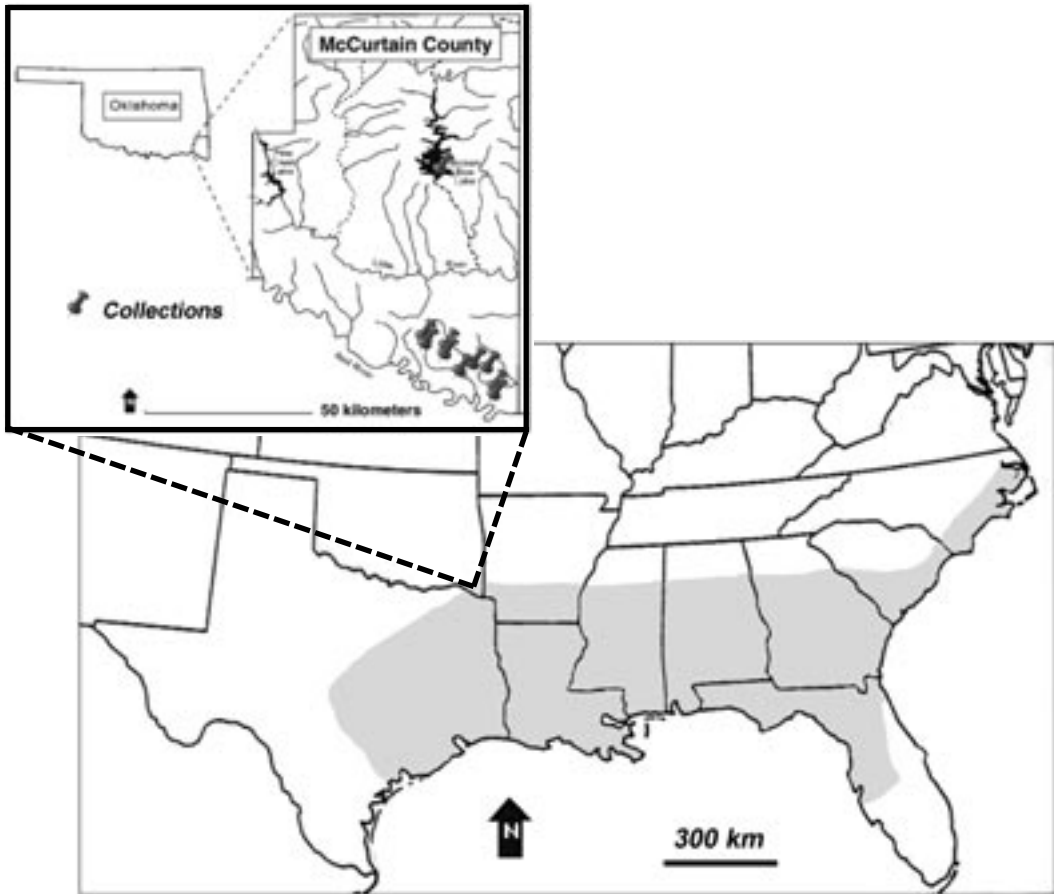
Itinerary

20 Sep 2018: Beavers Bend State Park, Pleasant Hollow and Batey Road, Red Slough Wildlife Area 57–58, Otter Lake and Bittern Lake.

On September 20, we met up with our biological assistant, David Arbour in Idabel at his favorite Italian restaurant. His main job site is in the Red Slough Wildlife Management Area in the Red River Valley region. However,

he suggested that we first drive north to Beavers Bend State Park to check out the population there. The state park is famous for being a great place to fish, and many anglers flock to Broken Bow Lake to test their luck. There is also good hunting to be had in the surrounding Ouachita National Forest. Within the state park boundaries and just below the main spillway of the dam, we spotted our first population of palms spread out along the stream bank (Fig. 2). The plants (perhaps 20 in number) were very healthy, with green immature fruits (Fig. 3). We marked some plants with GPS coordinates for David to return at a later date in October to make a collection for us. We collected a herbarium voucher and then drove to our next site.

We reached our next site at the intersection of Pleasant Hollow and Batey Road, where we collected from a small forested area dominated by dwarf palmettos in the understory. We also collected along an exposed fence line, where we talked with the Bateys, who have lived in that region for several generations and thus had a road named in their honor. We collected samples of mature fruit from several different mother plants. The plants growing adjacent to the fence line were obviously the work of birds that perched on the fence and spread the seeds. It was here that we first noticed that the



1. Map of the distribution of *Sabal minor* in the United States (distribution in northeastern Mexico not shown). Inset: Map of McCurtain County in the southeastern corner of Oklahoma and our collection sites

fruits we were sampling were small and often had tiny, cottony dots contrasting with their black fruit coats, a sight that would become suspiciously common throughout this area.

Our next stop was at area 58–59 within the Red Slough Wildlife Area that David helps manage. We pulled our cars off to the side of the road and followed David back through the vegetation to a very dense population of plants flourishing in the shade of Osage Orange (*Maclura pomifera*). The palms and fruits looked better than at the previous site, where we had suspected some predation of the fruits.

Next we visited the Eastern side of Otter Lake, also within the Red Slough Wildlife area. This site contained one of the largest and densest stands of *Sabal minor* that we had yet seen in the area (Fig. 4), but very few were with fruit.

Finally, not far from Otter Lake on the western levee of Bittern Lake, we collected more fruits. David helps manage these lakes for attracting water fowl in the fall. He could only spend

one day with us, so this was our last collection of the day with David.

21 Sep 2018: Jasper Hollow Road, and various sites on the road south of Tom.

The next day, we collected on our own and visited sites that we had found from reading the labels of herbarium specimens. However, the very first site was one that we had found accidentally while exploring the area using Google Earth street view. Botanizing using Google Earth is uncommon, and we were certainly surprised to find that it was possible. Using Google street view, we discovered *Sabal minor* growing at a sharp bend in Jasper Hollow Road and decided to visit the spot. We discovered that it was not a very large population, and we barely found enough mother plants from which to collect fruits. One elderly woman with a small friendly dog sitting in her lap, stopped her car to ask what we were doing, and even offered her place a short distance up the road as a collection site,



2 (left). *Sabal minor* with Larry Noblick (left) and David Arbour (right) at Beavers Bend State Park near the spillway. 3 (right). Part of an immature infructescence from Beavers Bend State Park.

but since we had already collected from a sufficient number of roadside plants, we politely declined her generous offer.

We continued to the intersection known as Tom and then turned south on Granite Ridge Road, having seen some herbarium collection records from that area. About 2.7 km (1.7 mi) south of Tom, we found a few plants, which displayed the characteristic split leaf. Again about 7.1–7.9 km (4.4–4.9 mi) south of Tom we collected from several more roadside and fence line plants.

A severe thunderstorm ended our collecting and forced us to begin the drive back to Dallas. The storm produced flash flooding in the area that afternoon and evening and made for some hazardous driving conditions. Luckily we made it safely to the hotel that evening and to the airport the next morning for our flight back to Miami.

Disappointing Results

We collected eight herbarium vouchers and over 700 seeds of *Sabal minor*. It appeared to be a very successful trip. That is, appeared to be, because none of the palm seeds we collected from the various localities throughout the southern portion of McCurtain County germinated. Nearly all seeds were heavily parasitized (Fig. 5) by a seed predator,

which we were later to identify. David had reported that he had experienced low or no germination from seed he had collected from the Wildlife Management Area. He was convinced that he was doing something wrong.

Placing some of the parasitized seed in a jar, we managed to incubate some of the larvae into adult weevils and send them for identification. Knowing their destructive nature, we took extra precautions not to release any in Florida and especially not at Montgomery Botanical Center, where they could devastate our seed bank program. The identification came back as the very appropriately named “palm seed weevil,” *Caryobruchus gleditsiae* L. (Fig. 6). *Caryobruchus gleditsiae* is a beetle already in Florida, as well as Texas, so Oklahoma was not a surprise. We were just amazed by the extreme abundance and thoroughness of the pestilence in southeastern Oklahoma. It is the largest member of the subfamily Bruchinae native to the U.S. It is an odd-looking beetle, easily recognized by its lack of a rostrum (“snout”), which is common in most weevils. It is especially distinguished by its extremely large hind leg femurs or thighs (Fig. 6). Although the Bruchinae breed predominately in legume seeds and are often called “pea and bean



4. The authors in a dense stand of *Sabal minor* in the Red Slough Wildlife Management Area near Otter Lake.



5 (left). Parasitized seeds of *Sabal minor*. Note the internal cavities in each seed, some with beetle larvae.
6 (right). Dorsal view of the palm seed weevil, *Caryobruchus gleditsiae*.

weevils," this species breeds in palm seeds. It was originally thought to breed in the seeds of the honey locust (*Gleditsia triacanthos* L.), and therefore was given a misleading specific name *gleditsiae*. The adults can jump a considerable distance with the aid of their hind legs. The size of the adult is partially dependent on the size of the host seed. They have been found to breed in the seeds of at least eleven different palm species (Woodruff 1968). The tiny white cottony dots seen on the fruits were weevil eggs. It was no wonder that David had such poor germination success from seed collected from the Red Slough Wildlife Management Area.

Good Finish

We still had one last chance of getting viable *Sabal minor* seeds from Oklahoma and that was from Beavers Bend State Park. Beavers Bend had a much smaller population. We presumed that we had a good chance of finding viable seeds from that area. David checked on the population again in mid-October, when the fruits were just beginning to turn black, and

made the collection at the end of the month. With no sign of the weevils, we had successful germination from Beavers Bend State Park.

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LITERATURE CITED

- WOODRUFF, R.E. 1968. The palm seed "weevil," *Caryobruchus gleditsiae* L., in Florida (Coleoptera: Bruchidae). Florida Department of Agriculture, Division of Plant Industry. Entomology Circular No.

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