PALMS

Journal of the International Palm Society Vol. 66(1) Mar. 2022

THE INTERNATIONAL PALM SOCIETY, INC.

The International Palm Society

Founder: Dent Smith

The International Palm Society is a nonprofit corporation engaged in the study of palms. The society is international in scope with worldwide membership, and the formation of regional or local chapters affiliated with the international society is encouraged. Please address all inquiries regarding membership or information about the society to The International Palm Society Inc., 1401 Lavaca St. #751, Austin, Texas 78701 USA, or by e-mail to info@palms.org.

Bookstore: www.palms.org

Chapters: www.palms.org

Website: www.palms.org

Palms (formerly PRINCIPES)

Journal of The International Palm Society

An illustrated, peer-reviewed quarterly devoted to information about palms and published in March, June, September and December by The International Palm Society Inc., 1401 Lavaca St. #751, Austin, Texas 78701 USA.

Editors: John Dransfield, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE United Kingdom, e-mail j.dransfield@kew.org.
Scott Zona, 1807 Seminole Dr., Hillsborough, North Carolina 27278 USA, e-mail scott.zona@yahoo.com.

Associate Editor: William J. Baker, Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE United Kingdom, e-mail w.baker@kew.org.

Guidelines for authors are available on request from the Editors, or on-line at: http://palms.org/wp-content/uploads/2020/05/Instructions-for-contributors-rev-Jan-2020.pdf

Membership Levels:

Free membership includes the monthly Newsletter delivered via email.

Electronic membership (US$40 per year or $100 for three years) includes the Newsletter and our journal, *PALMS*, in digital format.

Full membership (US$60 per year or US$150 for three years) includes the above plus a printed copy of *PALMS*. Dues include mailing of the journal by airlift service to addresses outside the USA

Benefactor and Lifetime memberships are also available. Dues may be paid on-line at www.palms.org. Subscription price is US$55.00 per year for libraries and institutions.

Change of Address: Send change of address, phone number or e-mail to The International Palm Society Inc., The International Palm Society Inc., 1401 Lavaca St. #751, Austin, Texas 78701 USA, or by e-mail to info@palms.org.

Claims for Missing Issues: Claims for issues not received in the USA should be made within three months of the mailing date; claims for issues outside the USA should be made within six months of the mailing date.

Periodical postage paid at Austin, TX, USA and additional mailing offices. Postmaster: Send address changes to The International Palm Society Inc., The International Palm Society Inc., 56 Autumn Oaks Drive, The Hills, Texas 78738 USA.

PALMS (ISSN 1523-4495)

Mailed at Lawrence, Kansas 15 Mar. 2022

The full text of *PALMS* is available on EBSCO Publishing’s database.

This publication is printed on acid-free paper.

Features

The flowers of *Geonoma cuneata* subsp. *irena*. See article by M. Couell et al, p. 22.

THE INTERNATIONAL PALM SOCIETY
Conserve. Learn. Grow.

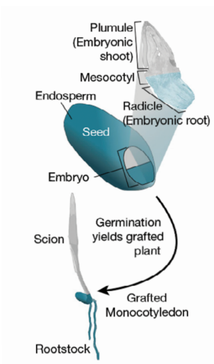
FRONT COVER

Geonoma undata, a much older individual of the morphotype with thick, bifid leaves that occurs on the plateau in the Cerro Plateado Biological Reserve, Ecuador. See article by T.L.P Couvreur et al., p. 5. Photo by T.L.P Couvreur.

BACK COVER

Geonoma tenuissima. See article by M. Couell et al., p. 22.

PALM NEWS



Gregory Reeves and coauthors described a protocol for doing something horticulturists long thought was impossible: **grafting of monocotyledonous plants** (*Nature* 602: 280–286. 2022. https://doi.org/10.1038/s41586-021-04247-y). Monocots, because their vascular tissue is in discreet bundles scattered throughout the stem, rather than in a ring produced by a vascular cambium as it is in conifers and broadleaf plants, were long thought to be ineligible for propagation through grafting. Reeves' research group performed grafts on isolated, immature embryos and grew the grafted plants in tissue culture. They obtained successful grafts with grasses, bromeliads, bananas, aroids and palms, notably date palms. The discovery represents not so much a horticultural technique but a proof-of-concept that all seed-bearing plant lineages have the competency to graft.

A revision of the genus *Lanonia* based on morphological data recognizes 19 species, six of which are newly described. The work, by Andrew Henderson and Nguyen Quoc Dung, was published in *Phytotaxa* (532: 209–245. 2022.). These elegant, *Licuala*-like palms have tremendous horticulture potential, but few are known in cultivation. Almost all the species are endemic to Vietnam.

FIGURE 11. Type of *L. honbaensis (Henderson et al. 3705).*

11. *Lanonia honheoensis* Henderson & Nguyễn Quốc Dựng *sp. nov.* Type:—VIETNAM. Khanh Hoa province, Ninh Hoa district, Tien Du commune, Hon Heo mountain, 12.450N 109.233E, 334 m, 6 July 2010, *A. Henderson & Bui Van Thanh 3672* (holotype HN!, isotype NY!). Fig. 12.

Stems 1.0 m long, 3.0 cm diameter, clustered. **Leaves** 8; ligules 5.0 cm long, soon disintegrating into fibers; sheaths and proximalmost part of petioles with scattered, brown scales; petioles 50.0 cm long, 0.7 cm wide at the apex; petiole thorns usually poorly developed, brown or black, more or less regularly arranged on proximalmost part of petiole; hastulas flat, rounded, not infolded; leaf blades 58.0 cm wide; costas 8.0 cm long, narrow, with a pulvinus at the apex abaxially, with the numerous segments free to the base except the middle pair joined at their bases; segments 15 per

230 • *Phytotaxa* 532 (3) © 2022 Magnolia Press HENDERSON & DỰNG

Jun Ying Lim, Huashen Huang and many co-authors have recently published a paper discussing the history of palms (The Cenozoic history of palms: Global diversification, biogeography and the decline of megathermal forests. *Global Ecology and Biogeography*. https://doi.org/10.1111/geb.13436). They focussed their analysis on four palm clades (Calaminae, Eugeissoneae, Mauritiinae and Nypoideae) and their fossil pollen record. For each focal palm lineage, **they compiled fossil pollen occurrence records to reconstruct their diversity and biogeographical distribution throughout the Cenozoic, i.e., the past 66 million years**. Climatic niche models were used to project the distribution of suitable areas for each lineage in the past, using palaeoclimatic data for the Cenozoic. For most palm lineages examined, pollen taxonomic diversity declined throughout the Cenozoic. Geographical ranges for each palm lineage contracted globally and experienced regional-scale extinctions (e.g., Afrotropics), particularly after the Miocene. However, climatic niche models (which are based on extant species of these palm lineages) often predict the presence of climatically suitable habitat in areas where these lineages became extinct. Although climatic trends are an important backdrop for the biogeography and diversity of palms at global scales, their continental- or regional-scale biogeographical trajectories might be more dependent on other factors.

Palms of the Remote Cerro Plateado Biological Reserve, Southeastern Ecuador

Thomas L.P. Couvreur[1,2], Rommel Montúfar[2], Nicolás Zapata[1], Claes Persson[3] and Álvaro J. Pérez[4]

The Cerro Plateado Biological Reserve is a remote, uninhabited and little-explored region of the palm-rich country of Ecuador. We undertook a joint botanical expedition to this southeastern Andean region to collect and document palms in order to complete our knowledge of the palm flora of Ecuador.

The Cerro Plateado Biological Reserve (CPBR) is located in southeastern Ecuador, Zamora-Chinchipe province (Fig.1). It is part of the southern Cordillera del Cóndor, one of the three Andean cordillera outliers in Ecuador, after Napo-Galeras and Cutucú (Neill 1999). The palms of the Napo-Galeras Cordillera were presented in an earlier article in PALMS (Couvreur et al. 2010). CPBR is part of the "Podocarpus - El Condor Biosphere Reserve" defined by UNESCO in 2013, referred to as one of the areas with the "greatest biological diversity in the Neotropics" (Schulenberg & Awbrey 1997). The Cordillera provides a natural border between Ecuador and Peru and was the scene of several episodes of war between the two countries, until 1998 when an international treaty was signed. No indigenous communities live or access CPBR, making its access complicated by the lack of used paths.

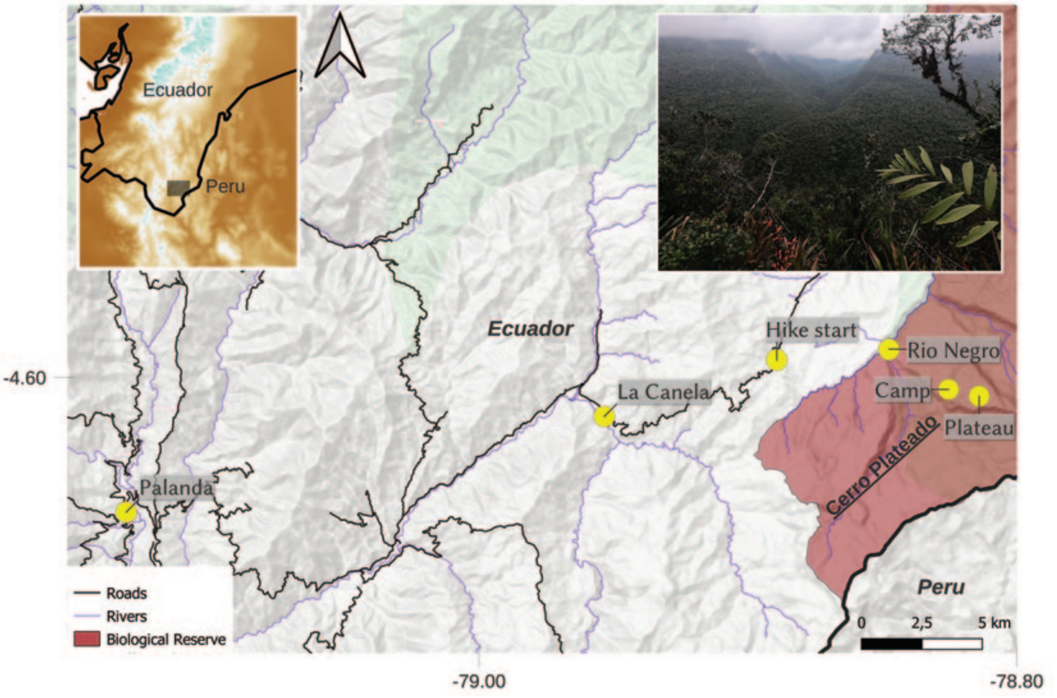
[1]*DIADE, Univ Montpellier, CIRAD, IRD, Montpellier, France. Thomas.couvreur@ird.fr, josenicozb@gmail.com*

[2]*Facultad de Ciencias Exactas y Naturales, Pontificia Universidad Católica del Ecuador (PUCE), Av. 12 de Octubre 1076 y Roca, Quito, Ecuador. RJMONTUFAR@puce.edu.ec*

[3]*University of Gothenburg, Dept. of Biological and Environmental Sciences, P.O. Box 461, S-405 30 Göteborg, Sweden. claes.persson@bioenv.gu.se*

[4]*Herbario QCA, Facultad de Ciencias Exactas y Naturales, Pontificia Universidad Católica del Ecuador (PUCE), Av. 12 de Octubre 1076 y Roca, Quito, Ecuador. AJPEREZC@puce.edu.ec*

The first leg of our expedition started with a long but scenic 16-hour drive along the Andes, from Quito to Palanda. This Andean village is world famous for having the earliest known archeological evidence of cacao utilization and thus a potential center for its domestication (Zarrillo et al. 2018). We departed Quito at 4 a.m. with the objective of arriving in Palanda by sunset. The weather was very good with almost no clouds and we were able to enjoy the majestic Andes in all their splendor with their snow-capped volcanoes, like Cotopaxi and Chimborazo. The famous Swedish



1. Map of Cerro Plateado Biological Reserve, Ecuador.

explorer, writer, photographer and filmmaker Rolf Blomberg once referred to Ecuador as a "crumpled piece of paper." This makes sense as you approach Palanda, nestled at some 1500 m at the intersection of the Andes and the Amazon, and surrounded by numerous mountaintops.

After a short sleep and before dawn, we drove an extra two hours to reach the village of La Canela. There we met up with our team of porters (Fig. 2). After a copious breakfast of fried pork , rice and beans, followed by another short drive, we arrived at the drop-off point. It was all walking from here! The good weather

2. The Cerro Plateado team, ready for a two-day hike.

was holding up, and in the distance, we could see the Cerro Plateado (Fig. 3), located a mere two-day hike from the road. Our team thus set out with 11 porters carrying 225 kg of food and materials toward the Cerro. Two park rangers of the Ministerio del Ambiente, Agua y Transición Ecológica of Ecuador accompanied us on this expedition. The first leg of these hikes is always unpleasant because of the very muddy paths due to cattle. Progress was slow and frustrating. However, once far enough from civilization, the paths became easier to walk, and the trip was more pleasant.

Although palms were already present from the outset with the typical *Socratea* and *Wettinia* species, we started to see new ones, in particular individuals of *Euterpe* and *Dictyocaryum*. However, they were much smaller than the individuals usually seen at this altitude. *Dictyocaryum* in particular was quite small, reaching around 5–7 m at maturity (see below), a curiosity we planned to explore once we had arrived at our final destination. After several hours of hiking, we camped on a small hill at around 1600 m. The vegetation was luxuriant, typical of untouched mountain forest, with a low canopy and a very dense understory. Finding a place to pitch your tent was a challenge! We slept soundly, exhausted from a long day's hike.

The next day we continued our hike, but then trouble started… one of the guides was trying to take us in the wrong direction, suggesting it was a short cut to the final campsite located at the base of the Cerro Plateado. However, the path was not open because nobody had come this way for several years, and progress was slow and painful in the scrubby and dense understory. After a few minutes, we decided to turn back and rejoin one of the main paths we had left a few hours before. Backtracking would make us lose some time, but better take a path you know than getting lost with 11 porters you pay per day!

After a few hours in the right direction, we arrived at one of the larger rivers of the region, Rio Numpatakaime, or Rio Negro, which marks the limit of the CPBR. The color of the water in the region is quite incredible, resembling iced tea. This is due to the slow decomposition of leaves liberating secondary compounds in the process typical of black waters. This river is located at the bottom of a small valley at around 1400 m, surrounded by almost vertical cliffs. Arriving there was tedious, as we had to use all fours to climb down.

3 (left). The Cerro Plateado. Note the leaf of a young *Wettinia maynensis*. On the other side, *Wettinia minima* is the main species. 4 (right). *Wettinia minima* in fruit and with male flowers, growing along the flanks of the plateau. Note the distichous leaves.

5 (above). The Cerro Plateado *meseta*, or plateau, with three individuals of *Ceroxylon* cf. *parvifrons*. On the far left you can also see a tall individual of *Geonoma undata* with numerous pinnae. 6 (below). *Ceroxylon* cf. *parvifrons* occurring on the Cerro Plateado plateau with its erect inflorescence (here in fruit) above the crown. In the foreground, leaves of *Geonoma undata*.

After a refreshing sip of the iced-tea colored water, the porters decided to strike and renegotiate wages, to our huge irritation. We still had a 3-hour steep uphill hike to our camp. These situations are never pleasant. Discussing daily fees for 11 people with nowhere to camp and time running out before dark, left us little room for negotiation. During the discussions however, we enjoyed the sight of a unique fascinating palm occurring along the river: *Geonoma undata* var. *skovii*, one of the few rheophyte palms in the world. After almost two hours of diplomacy (one really has to keep one's nerves in check), the caravan slowly departed again. We arrived just before dark, and set up our camp located at 2000 m. After three days of traveling, we were finally ready to collect palms!

The next morning, we set out for a two-hour hike to the plateau ("*la meseta*"), a nearly flat area located at 2400 meters, but reaching 2900 m at its highest point. This plateau remains little explored, with just two botanical expeditions prior to ours. Along the flanks of this plateau, we collected the quite abundant

Wettinia minima (Fig. 4), a recently described species and known only from its type locality northwards in the Cordillera Cutucú (Bernal 1995). It is a small palm about 5 m tall, hence its name (R. Bernal, pers. com.). This species of *Wettinia* has leaves in a single plain (distichous phyllotaxy). Our observations confirmed that even in the juvenile state leaves are distichous. This adds to the small list of distichous palms known across the world (Dransfield et al. 2008), including the newly described *Mauritiella disticha* from Brazil (Torres

7. *Ceroxylon* cf. *parvifrons*. Detail of the inflorescence in flower (male phase) and in fruit.

8 (left). The single-stemmed *Prestoea* cf. acuminata, only seen on the plateau. It has a compact and robust inflorescence, here in fruit, different from the *Prestoea* found on the flank of the plateau (Fig. 17). Notice the *Ceroxylon* cf. *parvifrons* in the distance (left side). 9 (right). Detail of the inflorescence in fruit of *Prestoea* cf. *acuminata*, with its typical red color.

Jiménez et al. 2021). Interestingly, *W. minima* was not seen on the other flanks in the region, being replaced by *W. maynensis*.

As we reached the plateau, the vegetation changed, becoming knee-high in stature, full of bromeliads, grasses and other shrubby plants, some of them endemic or, amazingly, shared with the Guyana Shield. Although palms were not dominant, they did stand out. The first species that caught our eye was a *Ceroxylon*, or wax palm (Figs. 5–7). This species is quite small in size and diameter with small leaves when compared to other members of the genus (Sanin & Galeano 2011). The inflorescence is erect above the crown, only bending when in fruit. These individuals closely resemble *C. parvifrons* known to occur along the Andes (Sanin & Galeano 2011). However, this morphotype warrants closer morphological and genetic studies to confirm its identity (Sanin & Galeano 2011, M.J. Sanin, pers. com.). The species was quite abundant on the plateau, with a healthy community of adults, juveniles and immature individuals. In the rosette phase, the leaves are quite large, reaching 110 cm long, in contrast to the much smaller adult ones.

A second palm species occurring on the plateau belonged to the genus *Prestoea*, characterized by its reddish petioles, crownshaft and rachillae (Figs. 8, 9). This species has a single stem, reaching a maximum height of 5–7 m at maturity with small leaves. The pinnae are straight and occur in a single plain, while the inflorescence is rather short and robust. It is a beautiful palm. In some respects, it resembles *P. acuminata* (Henderson & Galeano 1996) but could potentially be a new species.

The next species we encountered belonged to the morphologically diverse species complex *G. undata* (var. *undata*) as defined by Henderson (2011). We identified two rather different morphotypes on the plateau (Figs 10, 11). The first one had extremely coriaceous and undivided bifid leaves with a stem varying in length between 0.3 to 2 m tall at maturity (Fig. 10). The taller individuals could potentially be very old given that the palm

10. Fruiting individual of *Geonoma undata* with coriaceous and bifid leaves, occurring on the Cerro Plateado plateau.

was already flowering when quite small. This morphotype also occurred higher up at around 2900 m. The other type of *Geonoma* (Fig. 11) differs from the previous one in having much thinner leaves and pinnately divided (5 to 11 pinnae per side). Both these types differ markedly, and it is hard to believe they would be part of the same species let alone the same variety. However, a recent densely sampled molecular phylogeny of *Geonoma* indicated

11. Another morphotype of *Geonoma undata* occurring on the plateau, with numerous thinner pinnae. Notice the *Ceroxylon* cf. *parvifrons* in the background.

that the taxonomic treatment of Henderson was quite robust (Loiseau et al. 2019). Thus, for now, and without further investigation, we shall identify these morphotypes as part of *G. undata*.

The next day we focused our collecting on the larger palms occurring on the flanks of the plateau and around our campsite, between 1800 and 2000 m. Two main larger palms occur there: *Euterpe precatoria* var. *longivaginata* (Fig. 12) and *Dictyocaryum lamarckianum* (Figs. 13, 14). Both these palms are quite abundant but differ from the other populations of the same species in the country by their smaller stature. Seeing a blooming *Dictyocaryum lamarckianum* at just 7 m tall is not a usual sight for this normally massive palm (Henderson 1990)! In fact, to make the botanical collection we simply climbed a small tree right next to it allowing us to be at eye level with the inflorescence (Fig. 13). We also collected another species of *Prestoea* (Fig. 15). This species differed from the one we collected on the plateau by its smaller stature, larger leaves and less compact inflorescences. Nevertheless, it is possibly a different morphotype of *P. acuminata*. In the understory, we encountered yet again individuals of *Geonoma undata* (Fig. 16). This morphotype resembled the one of the plateau with pinnate leaves but differed in its ecology.

On the third day of collecting, we decided to undertake the two-hour hike all the way down to the Rio Numpatakaime (at 1500 m) and make a good collection of *Geonoma undata* var. *skovii* (Figs. 17, 18). After seeing the diversity of *G. undata* individuals the days before, it came as no surprise that this variety was also very different, echoing the words of Henderson that *G. undata* is the second most variable species in the genus (Henderson 2011). It is an elegant palm with numerous thin pinnae and a smaller and less robust inflorescence. These are certainly adaptations to its rheophytic habitat. It was the dry season, and the Rio Numpatakaime was calm allowing us to collect and photograph the palm. As we hiked back up to the camp the weather changed, and it started to rain. A large cloud of fog fell upon us, and we really started to

12. *Euterpe precatoria* var. *longivaginata* at 1800 m along the flanks of the plateau.

feel the meaning of cloud forest. Everything became wet and cold, and the ground started to be clogged with mud, making camp life much less fun.

The next day, having collected all the palms of the area, we decided to hike back out and visit a different area lower down in the reserve. We needed to cross the Rio Numpatakaime again before it grew and trapped us in the reserve for an undetermined amount of time! The hike out was as enduring as the hike in. One of the guides suggested a shortcut back to the road. He estimated it would take us four hours… However, no sooner had we crossed the river, we found ourselves face to face with a vertical wall of around 8 meters. Apparently, it was part of a path as there was a rope to help us climb. The guide explained that it was part of the short cut and that it would be worth our effort, implying that once we passed that hurdle, we would be home and dry… so there we were, transformed into rock climbers. It took us around one hour to get our belongings and ourselves up the cliff. To our great despair, we still had a steep climb of about two hours to reach the top of the hill. From there, things got worse as the trail disappeared, and we had to navigate our way using GPS across dense forest. Finally, after eight hours and a half we made it to our destination, the village of Plateado at the end of the Palanda–La Canela road. We spent the final three days in this little-collected region.

We collected seven different species in six genera in the Cerro Plateado Biological Reserve (Table 1). In addition, we collected four quite different morphotypes of *Geonoma undata*, which will necessitate a closer look. Most of the species we collected exhibited some kind of morphological difference with typical populations in the country (e.g., *Dictyocaryum*). In some cases, we thought we had collected new species (e.g., the *Ceroxylon* and *Prestoea* from the plateau). However, the current description of these species includes this variation, and thus we shall not describe them as new until we have more concrete evidence, e.g., molecular data. Overall, this expedition has contributed towards a better under-standing of Ecuador palm diversity and its

13. *Dictyocaryum lamarckianum* with its erect inflorescence along the flanks of the plateau around 1800 m.

14. Washington Santillan holding the relatively small leaf of *Dictyocaryum lamarckianum*.

15 (left). The characteristic red inflorescence of *Prestoea* cf. *acuminata* occurring in the understory of the mountain forest surrounding the plateau. Note the difference in morphology with the one of the plateau higher up. 16 (right). *Geonoma undata*, at 1700 m, in the dense understory of the mountain forest surrounding the plateau.

variation and documented palm richness in this remote but spectacular region.

A short video of the expedition can be found on YouTube: https://youtu.be/lTNIa78Up40

Acknowledgments

The International Palm Society (IPS) Endowment Fund and the University of Gothenburg mainly funded this expedition. The expedition also received partial funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (grant agreement No. 865787, GLOBAL project). The Pontificia Universidad Católica del Ecuador and Herbario QCA provided logistic and technical facilities after the trip. Washington Santillan is thanked for his assistance in the field, without whom several palm and tree species would not have been collected. We thank Rene Cabrera and Rene Paqui from the Ministerio del Ambiente, Agua y Transición Ecológica de Ecuador for their help and guidance in the field. We are also grateful to the people of the La Canela and Plateado communities for logistic support. Finally, we thank Rodrigo Bernal and Maria José Sanin for assistance in naming some of the palms we collected. Palms and plants were collected under permit number MAE-ARSFC-2020-0473 delivered to Thomas Couvreur, Alvaro Perez, Nicolas Zapata and Claes Persson.

Literature Cited

Bernal, R. 1995. Nuevas especies y combinaciones en la subtribu Wettiniinae (Palmae). Caldasia 17: 367–377.

Couvreur ,T.L., M.L. Jeanson, J.E. Guevara and A.J. Henderson. 2010. Palms of the south-west Cordillera Galeras, a remote premontane rain forest in eastern ecuador. Palms 54: 94–103

Dransfield, J., N.W. Uhl, C.B. Asmussen, W.J. Baker, M.M. Harley and C.E. Lewis. 2008. Genera Palmarum: The Evolution and Classification of Palms. Kew: Kew Publishing.

17. *Geonoma undata* var. *skovii*, a rheophyte species growing along the Rio Negro, at the limit of the Cerro Plateado Biological reserve. The species has numerous thin pinnae, certainly an adaptation to life along fast flowing rivers. Notice the black waters along which it grows.

18. Detail of the inflorescence, here in flower, of *Geonoma undata* var. *skovii*.

Henderson, A. 1990. Arecaceae. Part I. Introduction and the Iriarteinae. Flora Neotropica 53: 1–100.

Henderson, A. 2011. A revision of *Geonoma* (Arecaceae). Phytotaxa 17:1–271.

Henderson, A. and G. Galeano. 1996. *Euterpe*, *Prestoea*, and *Neonicholsonia* (Palmae). Flora Neotropica 72: 1–89.

Loiseau, O., I. Olivares, M. Paris, M. de La Harpe, A. Weigand, D. Koubínová, J. Rolland, C.D. Bacon, H. Balslev, F. Borchsenius, A. Cano, T.L.P. Couvreur, C. Delnatte, F. Fardin, M. Gayot, F. Mejía, T. Mota-Machado, M. Perret, J. Roncal, M.J. Sanin, F. Stauffer, C. Lexer, M. Kessler and N. Salamin. 2019. Targeted capture of hundreds of nuclear genes unravels phylogenetic relationships of the diverse neotropical palm tribe Geonomateae. Frontiers in Plant Science 10: 864.

Neill, D.A. 1999. Geology. In: Jørgensen, P.M. and S. Leon-Yanez (eds.). Catalogue of the Vascular Plants of Ecuador. Missouri: Missouri Botanical Garden Press. p. 2–4.

Sanin, M.J. and G. Galeano. 2011. A revision of the Andean wax palms, *Ceroxylon* (Arecaceae). Phytotaxa 34: 1–64.

Schulenberg, T.S. and K. Awbrey. 1997. The Cordillera del Condor Region of Ecuador and Peru. Conservation International.

Torres Jiménez, M.F., E.M.B Prata, A. Zizka, M. Cohn-Haft, A.V.G, de Oliveira, T. Emilio, N. Chazot, T.L.P. Couvreur, S. Mogue Kamga, B. Sonké, A. Cano, R.G. Collevatti, B.G. Kuhnhäuser, W.J. Baker, A. Antonelli and C.D. Bacon. 2021. Phylogenomics of the palm tribe Lepidocaryeae (Calamoideae: Arecaceae) and description of a new species of *Mauritiella*. Systematic Botany 46: 863–874.

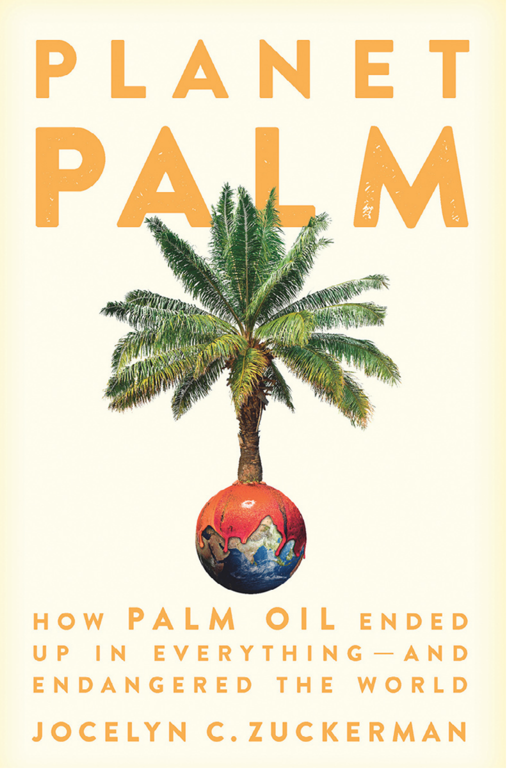
Zarrillo, S., N. Gaikwad, C. Lanaud, T. Powis, C. Viot, I. Lesur, O. Fouet, X. Argout , E. Guichoux, F. Salin, R.L. Solorzano, O. Bouchez, H.Vignes, P. Severts, J. Hurtado, A. Yepez, L. Grivetti, M. Blake and F. Valdez. 2018. The use and domestication of *Theobroma cacao* during the mid-Holocene in the upper Amazon. Nature Ecology & Evolution 2: 1879–1888.

Table 1: List of botanical collections made within the Cerro Plateado Biological Reserve, Zamora-Chinchipe, Ecuador. fl: flowering; fr: fruiting. QCA: Specimen deposited at the herbarium of the Pontificia Universidad Católica del Ecuador. Altitude refers to the range and is based on our own observations during the expedition, and not to the general range of the species. When possible, duplicates of most botanical collections were also sent to Royal Botanical Gardens, Kew (K) and Naturalis "National Biodiversity Centre" (WAG) herbaria.

Genus	Species epithet	Area	Altitude (m)	Reference specimens
Wettinia	*minima*	Flanks of plateau	1700–2200	*Couvreur 1420* (fl), *1421* (fl, fr), *Pérez 10459* (fr), QCA
Dictyocaryum	*lamarckianum*	Flanks of plateau	1500–2000	*Couvreur 1433* (fl), QCA
Ceroxylon	*parvifrons* (cf)	Plateau	2500–2400	*Couvreur 1422* (fr), *1424* (fl), *1426* (fl, fr), *Pérez 10101* (fr), QCA
Prestoea	*acuminata* (cf)	Plateau	2500–2400	*Couvreur 1425* (fr), QCA
Geonoma	*undata* (morphotype with bifid & coriaceous leaves)	Plateau	2700–2400	*Couvreur 1423* (fl, fr), *Pérez 11705* (fl), QCA
Geonoma	*undata* (morphotype with divided & papyraceous leaves)	Plateau	2500–2400	*Couvreur 1427* (fr), QCA
Geonoma	*undata* (morphotype with divided & papyraceous leaves)	Flanks of plateau	1700–2200	*Couvreur 1429* (fl), QCA
Geonoma	*undata* var. *skovii*	Along the river	1500–1600	*Couvreur 1438* (fl, fr), *Pérez 10437* (fl), QCA
Prestoea	*acuminata* (cf)	Flanks of plateau	1700–2200	*Couvreur 1430* (fr), QCA
Euterpe	*precatoria* var. *longivaginata*	Flanks of plateau	1500–2200	*Couvreur 1428* (fl, fr), QCA

PALM LITERATURE

PLANET PALM: HOW PALM OIL ENDED UP IN EVERYTHING – AND ENDANGERED THE WORLD – Jocelyn C. Zuckermann. 2021. The New Press, New York. ISBN 978-1-62097-523-7. Hardcover. 352 pp. US$27.99.



To be completely honest, the prospect of reading a 300+ page book written by a New York-based foodie journalist on a subject as rehashed and over-hyped as palm oil did not really excite me. The polemics circulating through the public domain and civil society have been self-maintaining on their own for years, continually fuelled by partisan and truncated information, making the scientist quite reluctant to devote time and energy to publications that do not exactly belong to the scientific sphere. The design of the book's cover itself and its rather provocative subtitle made me fear the indigestible and repetitive reading of another advocacy exercise, published for an already convinced public, uninformative and ultimately useless.

I must admit that I found Zuckerman's book much better than I expected. It reads easily, and it really interested me and kept me going, even if it ultimately disappointed me.

The perspective chosen by the author to tell the story of a worldwide saga built around a tropical agricultural commodity is interesting. Regarding tropical products, the gap between producing and consuming countries still exists, and very few people know the real story behind familiar products like tea bags or a chocolate bars (or even car tires). One cannot take away from the author her passionate interest in palm oil production, and her desire to describe all its facets, including its colonial history. Yes, palm oil is everywhere, and its large-scale cultivation has huge ecological and social impacts.

The book undoubtedly meets its target as an eye-opener, opting for a dramatic tone supported by small grainy black and white pictures that add to the dramatic effect. However, one cannot be a specialist in everything, and the resolutely pro-environmentalist bias taken by the author has often led her to take damaging shortcuts. Indeed, Zuckerman unfortunately does not avoid the usual pitfall of describing an agricultural commodity as another "Devil's plant" (as it has long been the case for cotton or sugar cane). The effect on media and the public is predictable in these times of COP26 when many people are questioning the basics of sustainable development, climate change mitigation and food security.

During most of the steps of her worldwide tour, Zuckermann often presents a simplistic view of the sector, in which the good guys and the bad ones are easy to spot, with a naive bias that is very unproductive for those looking for real solutions. This naivety and her penchant for simple solutions is also found in the simplistic proposal to ban palm oil as the remedy for junk food and for the global standardization of our diets. Multi-stakeholders' initiatives for a more sustainable production such as RSPO (the Roundtable for Sustainable Palm Oil), which are not perfect but important for understanding changes and recent developments in the sector, are not described in detail and swept from the narrative in a negative way and far too quickly, based on a single, partisan testimony.

Zuckermann's book does a good job of explaining the present success of oil palm cultivation through its historical context, primarily its colonial and post-colonial history. It is in the chapter of solutions that the book falls short. The author did not show a real desire to explore current and future initiatives to develop palm-based production systems. She also did not take the time to directly address questions to the main political and social leaders in producing countries on the geostrategic stakes linked to the oil palm. This is a real pity, because the historical study and the geographical panorama described by Zuckermann is of great interest. The idea of blending history, science, politics and food was an original one, and the author showed real talent in exploring their intertwining.

One would have liked to find the same determination in complementing this journalistic approach with prospects for changes and development in the sector, supported by recent advances provided by non-governmental organizations and research institutions acting on the ground.

Alain Rival
CIRAD,
Jakarta, Indonesia

International Palm Society Biennial in Hawaii

October 9th–15th, 2022

Experience the lush, tropical Hawaiian Islands with the International Palm Society (IPS).

The IPS will host its 32nd Biennial meeting on Oahu and the Big Island with an optional pre-Biennial tour to Maui. We shall tour the most important private and public palm collections and gardens, enjoy knowledgeable and entertaining evening speakers, visit a world-renowned nursery, and re-connect with palm and tropical horticulture enthusiasts from all over the world. It will be a week-long immersion in tropical horticulture at its best!

Registration opens March 15th, 2022 and is limited to the first 150 participants. For more information and the full itinerary, please visit the IPS website, www.palms.org.


Photo by Dean Ouer

Selva Chi: A Unique Integration of Education and Palm Conservation

MARTIN COUELL[1], ROMMEL MONTÚFAR[2] AND THOMAS L.P. COUVREUR[2,3]

As a part of the Chocó Biogeographic region, Western Ecuador harbors high biodiversity and endemism. Ecosystems in Western Ecuador have suffered heavy modification since the middle of the 20th century becoming a critical ecosystem for conservation and a biodiversity hotspot (González-Jaramillo et al. 2016). This has had drastic effects on the conservation status of plants in general and especially palms.

The coastal area of Ecuador harbors a rich and endemic palm flora, which is now highly threatened by human activities such as overharvesting, cattle grazing and deforestation (Copete et al. 2019, Cincotta et al. 2000). Although small patches of forest remain, the local biodiversity of this region is one of the most threatened in the world.

Selva Chi: Holistic Education with Palms at Heart

Less than two kilometers from the Pacific Ocean, near the small village of Tongorachi, in the province of Esmeraldas, Ecuador, a magical place for plant and palm lovers now exists: Selva Chi. This patch of some 40 hectares of reforested and primary lowland tropical forest is a sanctuary for wildlife, a living library and open-air classroom for anyone from campesino schoolchildren to researchers. It invites young Ecuadorians to fall in love with nature and see its true value, to discover a new world view and to learn skills allowing them to live sustainably within their local ecosystem. This holistic project is defined by the first author as the only effective means of reversing the disintegration of personal lives, societies and ecosystems. Because palms are such an important aspect of coastal Ecuadorian ecosystems, palms are one of the keystone families within Selva Chi. The first author has been collecting and growing palms, native and non-native, for over a decade in Selva Chi, making it a hotspot of palm conservation and education.

How it Started

Selva Chi is the result of thirteen years of research and planning by an Australian educator, missionary and biologist, the first

[1]*Selva Chi, Foundation Inetgridad Selffinity, Esermaldas, Ecuador. selvachi@gmail.com*

[2]*Facultad de Ciencias Exactas y Naturales, Pontificia Universidad Católica del Ecuador (PUCE), Av. 12 de Octubre 1076 y Roca, Quito, Ecuador. corresponding author: RJMONTUFAR@puce.edu.ec*

[3]*DIADE, Univ Montpellier, CIRAD, IRD, Montpellier, France. Thomas.couvreur@ird.fr*

author, Martin Couell (Fig. 1). After experimenting with educational work in town, he decided to purchase a cacao farm along Ecuador's north coast in 2006. He was very interested in "intelligent landscapes" that stimulate curiosity, creativity, adventure, compassion, surprise, wonder and awe.

A Palmetum, an Arboretum, a Food and Natural Materials Forest all in One

The arboretum was designed as an introduction to nature. Even in its early stages of growth, the 30-m high canopy in many parts creates a sense of being in the depths of various habitats. Unlike most botanical gardens that contain show-case species in organized rows or garden beds, the Selva Chi arboretum tries to recreate the full sensation of a natural environment. The planted palm species are carefully planted amongst the tall softwoods of mostly Coral Trees (*Erythrina poeppigiana*), figs (*Ficus* spp.) and ice-cream beans (*Inga* spp.) and with smaller tree species native to western Ecuador.

Behind this apparent natural disorder, there is careful landscape planning and organization by the first author. Selva Chi is divided into three main sections separating, "useful" plants, native species and non-native educational species located at opposite sides of a valley separated by a small creek.

In one part of the Arboretum there is a food forest, more than one hundred species of fruit trees plus other food and spice plants interplanted in their ecological niches and an extension of this area for natural materials less visited such as timber, canes, thatches, fibers, vegetable ivory from the naturally occurring palm *Phytelephas aequatorialis* (*tagua* in local terms), beads, pods, pigments, waxes, gums and latexes. These two sections are living storehouses for the kitchen, laboratory and crafts workshop of the learning center, which will commence as an alternative to the formal educational system in 2022.

The two-hectare non-native Palmetum section contains 164 palm species, covering 25 of the 29 tribes described in Genera Palmarum (Dransfield et al. 2008). This includes important palms from South America such as species of *Mauritiella*, *Leopoldinia*, *Reinhardtia*, *Chelyocarpus* and the lowland *Ceroxylon* species, *C. amazonicum*; species from Madagascar such as *Lemurophoenix halleuxii*, *Bismarckia nobilis*, and *Ravenea glauca*, mainland Africa such as *Raphia sudanica*, and various Asian-Pacific palms such as *Metroxylon vitiense*, *Nypa fruticans*, *Licuala orbicularis*, *Arenga undulatifolia*, *Caryota no*, *Carpoxylon macrospermum* and *Johannesteijsmannia altifrons*. In addition, there is a small area dedicated to the palms of the Seychelles Islands, which lacks

1. The author and founder of Selva Chi, Martin Couell.

Table 1. Native palms in the Selva Chi Arboretum. (E) Endemic to W. Ecuador, (L) Locally occurring in or around Selva Chi.

Aiphanes bicornis		*Geonoma cuneata* subsp. *linearis*	
Aiphanes chiribogensis	E	*Geonoma cuneata* subsp. *procumbens*	
Aiphanes eggersii		*Geonoma cuneata* subsp. *soderoi*	E
Aiphanes erinacea		*Geonoma cuneata* various morphotypes	E, L
Aiphanes gelatinosa		*Geonoma deversa*	L
Aiphanes grandis	E	*Geonoma interrupta*	E, L
Aiphanes hirsuta subsp. *forsteriorum*	L	*Geonoma lanata*	L
Aiphanes macroloba		*Geonoma paradoxa*	
Aiphanes multiplex		*Geonoma tenuissima*	E
Aiphanes tricuspidata		*Hyospathe elegans*	
Asterogyne martiana		*Iriartea deltoidea*	L
Astrocaryum standleyanum	L	*Manicaria saccifera*	
Attalea colenda	L	*Oenocarpus bataua*	L
Attalea cuatrecasana		*Oenocarpus minor*	L
Bactris coloradonis	L	*Phytelephas aequatorialis*	L
Bactris gasipaes var. *gasipaes*	L	*Phytelephas tumacana*	
Bactris gasipaes var. *chichagui*	L	*Prestoea acuminata*	
Bactris hondurensis		*Prestoea decurrens*	L
Bactris maraja		*Prestoea ensiformis*	
Bactris pilosa		*Pholidostachys dactyloides*	
Bactris setulosa	L	*Pholidostachys synanthera*	
Chamaedorea deneversiana		*Socratea exorrhiza*	L
Chamaedorea linearis	L	*Socratea rostrata*	
Chamaedorea pinnatifrons		*Syagrus sancona*	
Desmoncus cirrhiferus		*Synechanthus warscewiczianus*	
Dictyocaryum lamarckianum		*Welfia regia*	
Euterpe oleracea		*Wettinia aequalis*	
Euterpe precatoria var. *longevaginata*		*Wettinia kalbreyeri*	
Geonoma calyptrogynoidea		*Wettinia oxycarpa*	
Geonoma chococola subsp. *awaensis*		*Wettinia quinaria*	
Geonoma cuneata subsp. *cuneata*		*Wettinia verriculosa*	
Geonoma cuneata subsp. *irena*	L		

only the famous double coconut, *Lodoica maldivica*.

However, the real gem of Selva Chi is on the other side of the creek, where one can spend the day strolling through a nine-hectare arboretum of native west Ecuadorian tree and palm species. This area is divided into sections. These sections represent different western Ecuador botanical localities, each with its own plant and palm composition. This side of the creek slopes gradually from 10 m to 100 m above sea level, and this change in altitude is used as a proxy for altitudinal gradients of the western Andean foothills. Thus, lowland species, naturally occurring between 0 and 100 m are planted at the bottom of the valley, near the creek, while species naturally occurring at 1000 m, for example, are planted near the top of the hill, around 100 m above sea level. In doing so, we can recreate the phytogeography of palms at a smaller scale. For example, the spectacular *Manicaria saccifera*, known to grow in some of the wettest places across the Choco (ca. 8000 mm of rain per year) in western Colombia and northwestern Ecuador, was planted near the creek, an area constantly humid throughout the year and where the species thrives.

This section concentrates an incredible diversity of native west Ecuadorian palms (Table 1), from the delicate knee-high *Geonoma* species to the potentially 40 m tall *Iriartea deltoidea*, providing a unique setting to learn about palm diversity, morphology and conservation. There are thirteen *Geonoma* taxa and nine *Aiphanes*. The former genus has its greatest concentration along the Chocó region of Colombia and Ecuador with 16 species at <1000 m above sea level (Henderson 2011). While 15 species have been reported from the

2. *Geonoma tenuissima*.

Colombian Chocó, the tiny area of western Ecuador is home to the other 11 species (Henderson 2011). Of these one is an endemic species, *G. tenuissima* (Fig. 2) and many subspecies, which are restricted to this region. *Aiphanes* is the least widely distributed of the six local genera of the Cocoseae tribe, with almost all species restricted to Ecuador and Colombia. There are two endemic species in Western Ecuador such as the genus' largest species, *A. grandis*, with its dense spines up to 40 cm long, giving the appearance from a

3. *Aiphanes bicornis*.

distance that the trunk is much thicker than it is. Three more species spill across the northern border into Colombia. This is the case of one of the smallest species of the genus, *A. bicornis* (Fig. 3), with its often umbrella form, whitish spines when young and narrow two-pronged pinnae, and one that barely enters Peruvian territory, namely *A. eggersii*. This species is the only Ecuadorian *Aiphanes* adapted to arid conditions and is appreciated for its fruit which are an excellent source of carotene. Another elegant palm is *A. macroloba* (Fig. 4), which with its delicate spines on its entire leaf can easily be seen in this area.

4 (below, left). *Aiphanes macroloba*. 5 (below, right). *Geonoma chococola* subsp. *awaensis* with its bright red new leaf.

Geonoma is one of the most diverse genera of the New World (Galeano & Bernal 2011, Henderson, 2011). Here you can see *G. chococola* subsp. *awaensis* with its glossy red new leaves (Fig. 5) and *G. cuneata* represented by at least eight subspecies. The redefined *G. cuneata* subsp. *irena* (previously known as *G. irena*) is an endangered palm taxon, growing naturally in Selva Chi (Fig. 6). The subspecies *G. cuneata* subsp. *sodiroi* and subsp. *cuneata* also grow in this area. For rare species buffs, the greatest curiosity must be the endemic and certainly Critically Endangered *Geonoma tenuissima,* know only from a single natural locality in the Ila Mountains, near Santo Domingo de los Tsáchilas. The first author was able to visit this species in a fast-degrading forest remnant. He was able to translocate

6. *Geonoma cuneata* supbsp. *irena*

some individuals to Selva Chi, where it now grows happily in a sort of "*ex situ/in situ*" situation (Fig. 2). Other interesting species include *G. paradoxa* and *G. lanata*, both small bifid-leaved taxa limited to NW Ecuador and SW Colombia. All these are little-known and little-studied species. There are also some other members of the Geonomateae such as the beautiful *Asterogyne martiana* and *Pholidostachys dactyloides* and the tribe's only canopy species, *Welfia regia*, one of the most durable thatching materials of all New World palms.

7. Bactris coloradonis.

Bactris is well represented in Selva Chi with the fully domesticated and tall palm *B. gasipaes* var. *gasipaes*, known locally as *chonta*, here, the delicious "coconutted pumpkin"-tasting fruit referred to as *chontaduros* come in red, yellow and red and green and with white striped forms. Also, there are many examples of its wild parent var. *chichagui*. *Bactris setulosa*, a close relative of the *chonta*, is also present, as is the naturally occurring *B. coloradonis* (Fig.

8. *Wettinia aequalis*.

7). Two other palms present in the region and this arboretum, the slender-stemmed *B. hondurensis* and *B. maraja* are at their natural distribution extreme points from the type-sites

9. *Oenocarpus minor* and Martin Couell. Photo by Estefania Reyes Demera.

of Honduras and Rio de Janeiro, Brazil, respectively.

Species of *Socratea* are easily spotted in the forest by their tall cone of barbed stilt roots that are separated enough for a child to walk through. *Socratea exorrhiza* grows naturally in Selva Chi, but some individuals, grown from seeds from other areas, were also planted to include morphological and genetic variation. Unfortunately, many of the *Socratea rostrata* individuals died in 2017 due to a dry season that extended ten weeks into the wet season, but more will be planted in moister areas.

10. *Desmoncus cirrhiferus.*

There are also five species of *Wettinia* which remind the observer they are in one of the wetter habitats of the Arboretum (Fig. 8).

Undoubtedly, the most valuable tribe of palms to humans in the region is Euterpeae. This includes food palms such as *Euterpe oleracea* and *E. precatoria*, the fruit of which are used to make a rich oily drink like chocolate, locally known as *palmicha* and internationally known as asaí. These and the *Prestoea* species are also excellent sources of palm heart. While the smallest member, *Hyospathe elegans* subsp. *sodiroi* (Henderson 2004), is of interest for its rarity, the largest, *Oenocarpus bataua*, is appreciated for being one of the most useful plant species in the Americas (Balick 1986, Galeano & Bernal 2011). *Oenocarpus minor* (Fig. 9) was at the brink of extinction locally when the project commenced in 2006. The last known adult plant in the region was destroyed during forest clearing in 2009, but some seeds collected and replanted ensured the survival of this local population.

Another local curiosity to see is the only palm liana of the region, *Desmoncus cirrhiferus* (Fig. 10), suspended in the undergrowth. One may hesitate before recognizing it as a palm, seeing an elliptical leaf-blade attached to a vine with venation perhaps more reminiscent of the laurel family yet with attractive inter-vein undulations and a fine 5-cm long whip extending from the apex. This species is rapidly disappearing from Ecuadorian forests due to its slow seed production and the tendency for local people to cut it out because of its sharp hooks that lacerate the passersby, or they harvest it for constructing fish traps and basketry.

Challenges for palm conservation at Selva Chi

The first phase of this project has been the collection of material, raising it in the nursery, designing and planting. In Ecuador this has been far more complicated than expected. There is very limited information on the local forests and plant species; most forests in healthy condition are only that way because access is difficult or sometimes restricted by indigenous groups. An educational policy of the project is to cultivate palms organically, without the use of pesticides, fertilizers or an irrigation system, relying only on the principles of microclimate creation. This has meant there have been many casualties along the way. Since most plants are less than eight years old, the collection will not be fully appreciable for a few years yet, and this is slowed by plant deaths.

The second phase is changing the present mentality that sees nature only in terms of its usefulness in generating an income or food. This requires a new model of education for Selva Chi. The first author proposes an educational model to liberate, to help us overcome our fear of nature and learning itself, and find our path in life, using our forests sustainably. By this definition, education is the only vehicle that combats poverty at the personal, social and environmental levels, and palms can be a valuable tool to interconnect people with our greater identity.

For more information on Selva Chi, visit the foundation Integridad Selffinity's web site: www.selffinity.org

Literature Cited

Balick, M.J. 1986. Systematics and economic botany of the *Oenocarpus-Jessenia* (Palmae) complex. Advances in Economic Botany 3: 1–140.

Copete, J., R. Cámara-Leret, M. Sanchez, J. Carlos-Copete and H. Balslev. 2019. Relación entre la composición florística y los nutrientes del suelo en comunidades de palmas del Chocó biogeográfico en Colombia y Ecuador. Revista de Biología Tropical 67: 716–732. https://doi.org/10.15517/rbt.v67i4.34044

Cincotta, R.P., J. Wisnewski and R. Engelman. 2000. Human population in the biodiversity hotspots. Nature, 404(6781): 990–992. https://doi.org/10.1038/35010105

Dransfield, J., N.W. Uhl, C. Asmussen, W. Baker, M. Harley and C. Lewis. 2008. Genera Palmarum. The Evolution and Classification of Palms. Kew Publishing, Royal Botanic Gardens, Kew.

Galeano, G. and R. Bernal R. 2011. Palmas de Colombia-Guía de campo. Universidad Nacional de Colombia.

González-Jaramillo, V., A. Fries, R. Rollenbeck, J. Paladines, F. Oñate-Valdivieso and J. Bendix. 2016. Assessment of deforestation during the last decades in Ecuador using NOAA-AVHRR satellite data. Erdkunde 70: 217–235. https://doi.org/10.3112/erdkunde.2016.03.02

Henderson, A. 2004. A multivariate analysis of *Hyospathe* (Palmae). American Journal of Botany 91: 953–965. https://doi.org/10.3732/ajb.91.6.953

Henderson, A. 2011. A revision of *Geonoma* (Arecaceae). Phytotaxa 17: 1–271.

The Uncertain History of an Early Illustration of *Chamaedorea ernesti-augusti*

John Leslie Dowe[1] and Boris O. Schlumpberger[2]

A high-quality, unattributed illustration of *Chamaedorea ernesti-augusti* is held in the archives of the Gottfried Wilhelm Leibniz Bibliothek, Hannover, Germany. We investigate its possible creator, its purpose and connection to the palm botanist Hermann Wendland.

During the course of our research on the great German palm botanist Hermann Wendland (1825–1903), we accessed the archives and library holdings of a number of institutions in Germany. One of the major archival collections relating to the Royal Gardens of Herrenhausen at Hannover, where Wendland was the Royal Gardener and where he undertook all his work on palms, is held in the Gottfried Wilhelm Leibniz Bibliothek (here after as GWLB). There we located an unattributed illustration, produced as a steel engraving, of *Chamaedorea ernesti-augusti* H.Wendl. (Fig. 1) and two fragmentary preliminary drawings, in pencil, associated with it (Figs. 2, 3). The working drawings were annotated by Wendland and include the species name and numbering on individual flowers, parts of flowers, fruits and seeds. The unattributed illustration is of exceptional quality and is certainly the work of an accomplished illustrator. Although there are superb contemporaneous illustrations of *C. ernesti-augusti*, such as those by Walter Hood Fitch in *Curtis's Botanical Magazine* of plants grown at Kew Gardens (Hooker 1855a, 1855b), the high quality of the unattributed illustration has prompted us to investigate the identity of the artist, the purpose of the illustration and the connection to Hermann Wendland.

[1]*Australian Tropical Herbarium, James Cook University, Smithfield, Qld 4878, Australia john.dowe@jcu.edu.au*

[2]*Herrenhäuser Gärten, Herrenhäuser Str. 4, 30419, Hannover, Germany boris.schlumpberger@hannover-stadt.de*

To commence the investigation, we established some historical context of the palm including details of its discovery, early cultivation and taxonomic description. Wendland (1852) described and named *C. ernesti-augusti* in honor of the then recently deceased King Ernst August of Hannover (1771–1851) (Fig. 4) who had reigned from 1838 to 1851 and was personally supportive of both botanical and horticultural activities undertaken at Herrenhausen Gardens. In the protologue, Wendland (1852: 74) wrote that (translated from German):

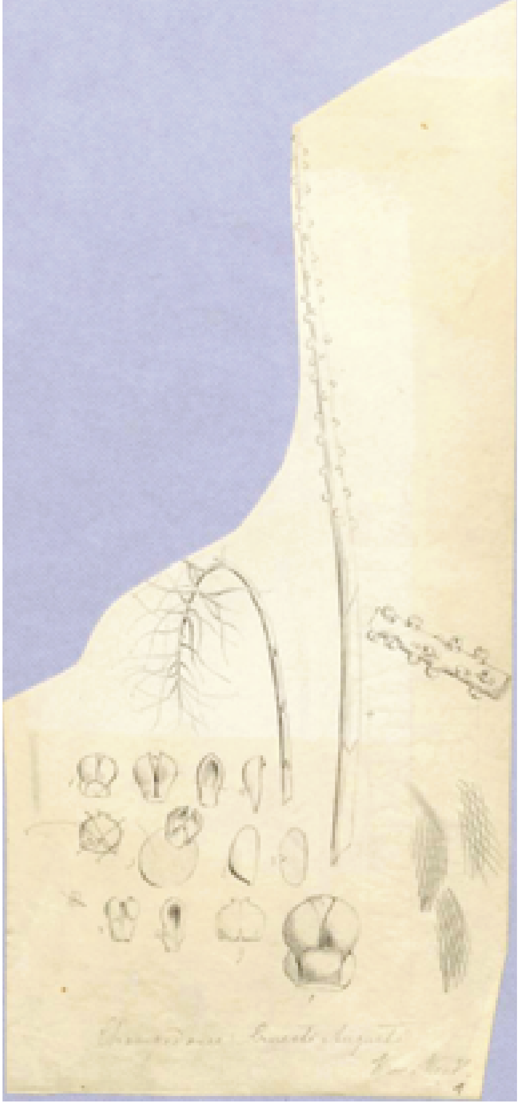
1. Illustration of *Chamaedorea ernesti-augusti* (steel engraving on paper, 390 × 280 mm). Gottfried Wilhelm Leibniz Bibliothek, Hannover, Germany: Catalogue no. KGBH 43.4.

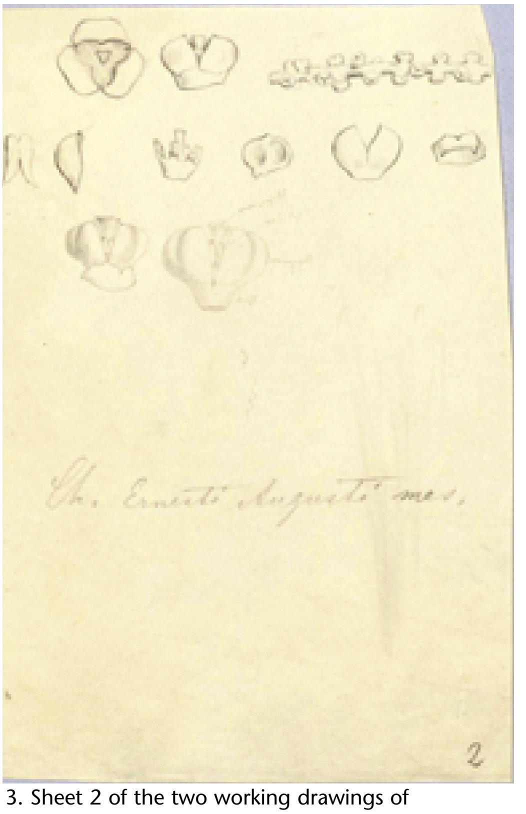
According to Mr. J. Linden of Brussels, he found this species at Tabasco in New Granada [correctly Mexico] and introduced it into European gardens. This species occurs in the French and Belgian gardens under the names *Chamaedorea simplicifrons*, *Geonoma latifrons* and *Hyospathe elegans*. Both sexes are cultivated in the royal Berggarten at Herrenhausen near Hanover. I have considered this palm,

> one of the most beautiful and splendid Chamaedoreas cultivated in the gardens, worthy of bearing the name of His Majesty the most blessed King Ernst August of Hanover. A look at the Royal Gardens teaches us how garden art and especially the plant collection in Herrenhausen owes its thanks to the illustrious deceased. May the recognition that he has received for it be as well expressed through this humble sign of my homage.

The recorded natural range of *C. ernesti-augusti* is in southern Mexico, northern Guatemala, southern Belize and north-western Honduras (Hodel 1992, Cibrián-Jaramillo et al. 2009). The first scientific collection was made by Belgian botanist Jean Jules Linden, although there is some vagueness regarding exactly when but certainly within the 1830–1840s. In the protologue of *C. ernesti-augusti*, Wendland (1852) stated that the palm was collected by Linden in Tabasco, New Granada, though correctly Mexico. New Granada was the term used for the northern part of South America and parts of Central America encompassing Nicaragua, Costa Rica, Panama, Colombia, Ecuador and Venezuela, areas where *C. ernesti-augusti* is not known to occur. Linden visited Mexico in 1837–40 and 1844. According to field notes on botanical specimens of other plants collected by him, he was active in Tabasco 1839–40. It was during this period that he would most likely have first collected the palm and facilitated its establishment in many collections and gardens. Wendland (1852, 1854) wrote that it was also cultivated under the names *C. latifrons*, *C. simplicifrons*, *Geonoma latifrons* and *Hyospathe elegans*. In

2. Sheet 1 of the two working drawings of *Chamaedorea ernesti-augusti*, with annotations by Hermann Wendland. Gottfried Wilhelm Leibniz Bibliothek, Hannover, Germany. Catalogue no. KGBH 43.5.





3. Sheet 2 of the two working drawings of *Chamaedorea ernesti-augusti*, with annotations by Hermann Wendland. Gottfried Wilhelm Leibniz Bibliothek, Hannover, Germany. Catalogue no. KGBH 43.5.

4 (left). Portrait of King Ernst August of Hannover. Ernst August Album (Molthan et al. 1862). 5 (right). Plate by Carl W.E. Fink in the Ernst August Album (Molthan et al. 1862). An exact rendition of the unattributed illustration (see Fig. 1) can be seen in the lower left sector.

time it was exhibited at horticultural exhibitions in Europe (Anon. 1869, 1884, Morren 1878) and described as an exceptionally ornamental palm suitable for indoors and glasshouse cultivation (Seemann 1856, Williams 1870, Schaedtler 1875, Kerchove 1878, Robinson 1879). It was also used in hybridization, a discipline that became very active in the horticultural sphere during the late nineteenth century. Hybrids between *C. ernesti-augusti* and *C. schiedeana* were reported on in detail and claimed to be fertile (Hildebrand 1889, 1890). Presently, *C. ernesti-augusti* is used commercially in horticulture as an indoor plant and in floriculture for its decorative cut leaves. In some countries in Central America, the extraction of leaves from the wild has led to over exploitation and presents a considerable threat to population stability and viability (Bridgewater et al. 2007, Williams et al. 2012).

The taxonomy and nomenclature of the species is relatively straightforward. In the 1852 protologue, Wendland provided a detailed description of both staminate and pistillate plants. It is most plausible that Wendland described the species from cultivated plants at Herrenhausen Gardens as he referred to it as one of the most beautiful palms in the collection. Hodel (1992) accepted the holotype as a specimen held at the Herbarium of the University of Göttingen (GOET). This specimen consists of 12 separate sheets under a single barcode number and includes a mixture of both staminate and pistillate plants. There are two labels associated with the 12 sheets, both of which are in Wendland's hand and he is therefore accepted as the collector. One label is for staminate plants and the other is for pistillate plants. The parts appear to have become mixed in the remounting process. Both labels are headed as *Morenia ernesti-augusti*, a name published in 1853, and which suggests that these specimens post-date the publication date (i.e., 1852). However, there is no evidence to directly connect the specimen with Wendland's protologue and a reassessment of typification status is warranted, but investigation of this is beyond the scope of this present work.

Solving the mystery

In regard to solving the mystery of the creator of the unattributed illustration of *C. ernesti-augusti*, it is pertinent to note that there are four identical copies of the steel engraving in the GWLB collection, and of which only one

6. "A view of a tropical winter garden with palm trees and exotic birds" [oil on canvas, 430 × 510 mm] by Carl W.E.Fink (1862) features *Livistona australis* as the centerpiece. (Private collection).

has an inscription, this being "CFl 43" placed within a circle in the lower right corner. This type of inscription, differing only in having a different number for individual items, is found on other objects held at GWLB and is thought to be a catalogue number associated with auction listings, and is in no way related to the artist or being initials pertaining to any person (pers. comm, Werner Ganske).

Coincidentally at this time, the artist Carl W.E. Fink (1814–1890) was actively involved with projects at Herrenhausen Gardens (Peters 2013). He had been commissioned by Hofgärtner Heinrich Ludolph Wendland (Hermann's father) to produce illustrations of unusual or rare plants then cultivated at Herrenhausen Gardens between 1856 and 1866, at the rate of 10–12 annually. According to surviving documents, Fink completed an album of 131 illustrations of plants (KGBH 2021). These were to be prepared as lithographs and published with accompanying text. Despite having proofs prepared by Klindworth lithographers of Hannover the project was never completed. Recent searches by staff at Herrenhausen Gardens and the Welf archives in Göttingen have failed to locate either the originals or the proofs, and they must be presumed to have been lost or destroyed at least until information about their existence proves otherwise. Evidence of the names of species that were illustrated was also searched for, but similarly nothing in this regard appears to have survived. It must be noted that the mystery illustration lacks numbering on the flower and fruit details, thus indicating that it was most likely a proof that was yet to be approved for final printing. There is also no evidence to suggest that it was one of the 131 lost illustrations prepared by Fink.

Ostensibly, it is possible that Fink was the artist, but there is as yet no definitive proof of this. However, one piece of evidence that circumstantially links Fink with the illustration is to be found in some of the graphic design work that he completed for a dedicatory album

7. "Tropical landscape or palm garden" (pencil on paper board, 570 × 435 mm) by Carl W.E. Fink ([18]73), depicts Central American palms. Clockwise from lower left: *Geonoma* sp. or *Calyptrogyne* sp., *Synechanthus fibrosus*, *Hyospathe elegans*, *Socratea* sp., *Cryosophila warscewiczii*, *Welfia regia*, *Geonoma* sp. or *Pholidostachys pulchra*, *Bactris obovata*, *Reinhardtia gracilis*, *Asterogyne spicata*, *Geonoma* sp. or *Calyptrogyne* sp., *Geonoma* sp., *Chamaedorea ernesti-augusti*. Gottfried Wilhelm Leibniz Bibliothek, Hannover, Germany. Catalogue no. KGBH 29.

for King Ernst August that was published as part of the commemorations associated with the inauguration of a monument 10 years after the king's death (Molthan et al. 1862). In that work, Fink provided the artwork for many of the plates, one of which incorporates an exact rendering of the unattributed illustration of *C. ernesti-augusti* as part of the design (Fig. 5).

Although Fink was most active as a graphic artist and theatre designer in Germany and Italy, a small number of conventional paintings and illustrations by him have survived. Two works unequivocally attributed to Fink directly relate to the palm collections at Herrenhausen Gardens, with both having been signed by him. Both include what appears to be *C. ernesti-augusti* in the compositions, as circumspectly identified by us. One, dated 1862, depicts the interior of the Laves Palm House at Herrenhausen Gardens featuring *Livistona australis* and bears the title "A view of a tropical winter garden with palm trees and exotic birds" (Fig. 6). In this painting, Fink presents a distinctly theatrical arrangement of the Palm House, replete with balconies, effect lighting and rare birds perched on palm petioles. A palm resembling *C. ernesti-augusti* is positioned left of center in the composition. Interestingly, the individual of *L. australis* depicted as centerpiece of the painting has a comprehensive historical record covering its acquisition, growth and eventual death and was one of the prized plants of the Herrenhausen Gardens collection for well into the twentieth century having survived a number of major relocations (Dowe & Schlumpberger 2018, 2019). This painting was sold in 2005 when art works held by the House of Hannover at Marienburg Castle went to auction (Pesendorfer 2020), and it was acquired by an anonymous buyer.

The other work, in pencil on paper, is titled "Tropical landscape or palm garden" (Fig. 7), and depicts Central American palm species and is putatively dated as [18]73 by the library archivists, though this date is questionable considering Fink was most active in the preceding decades. Many of the individual palm species in this illustration are readily identifiable, with the central subject being *Welfia regia*. What we tentatively identify as *C. ernesti-augusti* is positioned in the right-side of the painting and recognized by the distinctive leaves. This illustration is held at the GWLB.

Although we have not been able to definitively conclude that the unattributed illustration was prepared by either Fink or Wendland, or possibly another artist, there is certainly circumstantial evidence to connect Fink most closely with it. In addition, the working drawings are undoubtedly associated with Wendland, given that he numbered and made some corrections to them in his distinctive handwriting. Without clear evidence, the mystery must remain unsolved for the present but for the illustration to be otherwise appreciated for its technical merits and as a fine representation of one of the special palms that was held in the Herrenhausen Gardens collection.

Acknowledgments

We thank the following for their invaluable assistance: Werner Ganske, curator of special collections at GWLB; Rebecca Engelhardt, Digitization Department, GWLB; Donald R. Hodel for identifying the species of Central American palms depicted in "Tropical landscape or palm garden." Gabriela Katzer and Patricia Plagemann, Niedersachsische Hauptstaatsarchiv [Lower Saxony Main State Archives], facilitated access to archives related to Carl Fink, and Hendrik Weingarten (Managing Director) and Christian Helbich (Team Leader Archival Collection) at Niedersächsisches Landesarchiv Abteilung Hannover [Lower Saxony State Archives, Hanover Department], facilitated access to the Royal Hanoverian Archives.

Literature Cited

ANON. 1869. Catalogue de l'exposition internationale d'horticulture a St. Petersbourg. St. Petersburg.

ANON. 1884. Catalogue de l'exposition internationale d'horticulture a St. Petersbourg. St. Petersburg.

BRIDGEWATER, S., N. GARWOOD, H. DUPLOOY, H.P. MORGAN AND N. WICKS. 2007. Belize's *Chamaedorea* conundrum. Palms 51: 187–196.

CIBRIÁN-JARAMILLO, A., C.D. BACON, N.C. GARWOOD, R.M. BATEMAN, M.M. THOMAS, S. RUSSELL, C. DONOVAN BAILEY, W.J. HAHN, S.G.M. BRIDGEWATER AND R. DESALLE. 2009. Population genetics of the understory fishtail palm *Chamaedorea ernesti-augusti* in Belize: high genetic connectivity with local differentiation. BMC Genetics 10: 65. doi: 10.1186/1471-2156-10-65

DOWE, J.L. 2019. Wendland's Palms. Hermann Wendland (1825–1903) of Herrenhausen Gardens, Hannover: his contribution to the taxonomy and horticulture of the palms (Arecaceae). Englera 36: 1–137.

DOWE, J.L. AND B.O. SCHLUMPBERGER. 2018. *Livistona australis* in 19th Century Europe, a horticultural VIP. Palms 62: 161–173.

DOWE, J.L. AND B.O. SCHLUMPBERGER. 2019. The Australian cabbage palm at Herrenhausen Gardens. Australian Garden History 30: 16–19.

HILDEBRAND, F. 1889. Bastardierungen zwischen *Chamaedorea schiedeana* und *Chamaedorea ernesti augusti*. Jenaische Zeitschrift für Naturwissenschaft 16: 445–460.

HILDEBRAND, F. 1890. Bastarde zwischen *Chamaedorea schiedeana* und *Chamaedorea ernesti augusti*. Gartenflora 39: 355–357.

HODEL, D.R. 1992. *Chamaedorea* palms: the species and their cultivation. International Palm Society, Lawrence, Kansas.

HOOKER, W.J. 1855a. *Chamaedorea ernesti-augusti* (foem.). Curtis's Botanical Magazine 81: Tab. 4831.

HOOKER, W.J. 1855b. *Chamaedorea ernesti-augusti* (mas.). Curtis's Botanical Magazine 81: Tab. 4837.

KERCHOVE DE DENTERGHEM, O., COMTE DE. 1878. Les palmiers; histoire iconographique, géographie-paléontologie-botanique-description-culture-emploi, etc., avec index général des noms et synonymes des espèces connues. J. Rothschild, Paris.

KGBH. 2021. Tropenlandschaft oder Palmengarten. Königliche Gartenbibliothek Herrenhausen. https://kulturerbe.niedersachsen.de/objekt/isil_DE-35_finkpalm_00052392/1/LOG_0000/#isil_DE-35_finkpalm_00052392.

MOLTHAN, J.H.J., W.A. DEGÈLE AND C.W.E. FINK. 1862. Ernst August Album. Klindworth's Verlag, Hannover.

MORREN, E. 1878. Les floralies de Gand en 1878; rapports sur la 10e Exposition internationale de la Société Royale d'Agriculture et de Botanique de Gand.

PESENDORFER, G. 2020. 50 years of Sotheby's in Germany: remembering the Royal House of Hanover. https://www.sothebys.com/en/articles/50-years-of-sothebys-in-germany-remembering-the-royal-house-of-hanover

PETERS, K. 2013. Die Hofgärtner in Herrenhausen. Werk und Wirken unter besonderer Berücksichtigung der "Gärtnerdynastie" Wendland. CGL–Studies 12. Akademische Verlagsgemeinschaft, München.

ROBINSON, W. 1879. The subtropical garden, or, beauty of form in the flower garden. J. Murray, London.

SCHAEDTLER, G. 1875. Die Palmen des Königl. Berggartens zu Herrenhausen bei Hannover. Hamburger Garten- und Blumenzeitung 31: 110–118.

SEEMANN, B. 1856. Popular history of the palms and their allies, containing a familiar account of their structure, geographical and geological distribution, history, properties, and uses. L. Reeve, London.

WENDLAND, H. 1852. Beschreibung einer neuen *Chamaedorea*. Allgemeine Gartenzeitung 20: 7374.

WENDLAND, H. 1854. Index Palmarum, Cyclanthearum, Pandanearum, Cycadearum, quae in hortis europaeis coluntur, synonymis gravioribus interpositis. Hannover.

WILLIAMS, B.S. 1870. Choice stove and greenhouse ornamental-leaved plants: comprising descriptions of upwards of eleven hundred species and varieties, accompanied by instructions for their cultivation and mode of management. London.

WILLIAMS, S.J., J.M. GIBBONS, C. CLUBBE, A. DIBBLE, A. MARROQUÍN AND J.P.G. JONES. 2012. Who harvests and why? Characteristics of Guatemalan households harvesting Xaté (*Chamaedorea ernesti-augusti*). Economic Botany 66: 357–369.

Chamaedorea tacanensis: A Climbing Species from Mexico and Guatemala

MIGUEL ANGEL PÉREZ-FARRERA[1], JOSÉ SAID GUTIÉRREZ-ORTEGA[2] AND DONALD R. HODEL[3]

Recently, *Chamaedorea tacanensis*, the second climbing species in the genus, was identified and named (Peréz-Farrera et al. 2021). Here we provide an illustrated account of this newly named species and discuss its discovery, confirmation of its status as a new species, distribution and ecology, conservation, and how it differs from *C. elatior*, the other climbing species in the genus.

One of the rarest growth forms in *Chamaedorea*, and perhaps the most unusual across the palm family in general, is the climbing, vine-like habit. Until recently, only one species in the genus, the variable *C. elatior*, was documented as a climber (Fig. 1). However, in the last few years, a second climbing species in the genus was identified on the Pacific slope of southern Mexico and Guatemala in the vicinity of the great Volcán Tacaná, which straddles the border of the two countries.

[1]*Laboratorio de Ecología Evolutiva, Herbario Eizi Matuda, Instituto de Ciencias Biológicas, Universidad de Ciencias y Artes de Chiapas, Tuxtla Gutiérrez 29039, Mexico*
perezfarreram@gmail.com

[2]*Institute for Excellence in Educational Innovation, Chiba University, Chiba 263-8522, Japan*
josesgo@gmail.com

[3]*University of California, Cooperative Extension, 700 W. Main St., Alhambra, CA 91801, U.S.A.*
drhodel@ucanr.edu

During a floristic inventory in the El Tacaná Biosphere Reserve from 2012 to 2015, which the Mexican government's National Commission for the Knowledge and Use of Biodiversity (CONABIO) financed, a team from the Eizi Matuda Herbarium, Institute of Biological Sciences, University of Sciences and Arts of Chiapas (UNICACH,) discovered and collected several samples of a climbing *Chamaedorea* (Fig. 2) growing in a moist mountain forest that at first glance seemed to correspond to *Chamaedorea elatior*.

However, further searches and field investigations and analyses showed that this new discovery had glaucous emerging petioles (Fig. 3) and finely divided pinnate leaves as a juvenile (Fig. 4), making it appear more like a juvenile *Chamaedorea glaucifolia*. These characters are in sharp contrast to the simple and bifid leaves of juvenile *C. elatior*. Later, in December 2014, co-authors Pérez-Farrera and Hodel conducted field work on the slopes of Volcán Tacaná in Chiapas, where they studied the morphology of this unusual climbing taxon in greater detail, enabling them to discern and appreciate some significant

Table 1. Some morphological and ecological differences between the two climbing species, *Chamaedorea elatior* (solitary form) and *C. tacanensis*.

Character	***C. elatior***	***C. tacanensis***
Stem diameter (cm)	1.5–2	5.2–8.4
Leaf blade seedling and juvenile state	Simple, bifid	Pinnate
Emerging petiole indumentum	Glabrous	Glaucous
Petiole length (cm)	0–30	13–70
Leaf blade length (cm)	50–150	170–245
Quantity of pinnae on each side of rachis	10–35	42–60
Pinnae length (cm)	15–35	26-48
Pinnae width (cm)	2.5–5	1.8–3
Pinnae shape	Lanceolate	Linear to linear-lanceolate
Peduncle length (cm)	10-20	20–50
Prophyll length (cm)	Up to 10	1.5–3
Inflorescence rachis length (cm)	5–25	20–50
Quantity of staminate rachillae	Up to 35	Up to 50

differences with *C. elatior* (Table 1). For example, the newly discovered climbing taxon had larger stems, longer leaf blades, more pinnae, linear to linear-lanceolate pinnae (rather than lanceolate), proximal pinnae strongly reflexed (rather than weakly reflexed to spreading), middle pinnae plumose (rather than in the same plane), distal pinnae irregularly inserted (rather than regularly), longer inflorescences, a shorter prophyll, and many more staminate rachillae than *C. elatior*.

These substantial differences suggested that this newly discovered, climbing taxon could be a new species. Molecular data using two, low-copy nuclear DNA regions (RPB2 and PRK genes), which Thomas et al. (2006) and Cuenca and Asmussen-Lange (2007) had used in their studies, confirmed its status as a new species. Peréz-Farrera et al. (2021) described and named it *Chamaedorea tacanensis* in honor of Volcán Tacaná where it was discovered and first documented. The molecular data showed that *C. tacanensis* and *C. elatior* form separate monophyletic groups, suggesting that the climbing habit might have originated twice in the genus although more work is needed to confirm this hypothesis. It also showed that they share a common ancestor with several related species in the "Elatior" clade, a branch of the phylogenetic tree that includes well known species such as *C. elatior*, *C. frondosa*, *C. geonomiformis*, *C. glaucifolia*, *C. klotzschiana*, *C. oblongata*, *C. pochutlensis* and *C. tenella*, among several others. This clade is mostly congruent with the "Klotzschiana" clade of Thomas et al. (2006) and the "D" clade of Cuenca and Asmussen-Lange (2007).

Chamaedorea tacanensis is a solitary, slender, climbing, understory palm to 8 m tall or long, with a rather robust stem 5.2–8.4 cm diameter (Figs. 5–10). It typically holds 6–14, spreading, arching, long-pinnate leaves, which are pinnate even as seedlings (Fig. 6). Leaf sheaths are to 60 cm long and persistent on the stem. Emerging petioles are covered with a glaucous bloom (Fig. 3) and typically reach 13–70 cm long. Leaf blades are 170–245 cm long and hold 42–60 pinnae on each side of the rachis (Fig. 5). In pre-adult leaves pinnae are linear, spreading, not much reflexed, and mostly in the same plane. In adult leaves pinnae are mostly linear to linear-lanceolate, the largest 26–48 cm long and 1.8–3 cm wide, straight, sub-opposite to alternate and reflexed proximally, sub-opposite to alternate and spreading to reflexed and plumose mid-blade (Fig. 7), spreading and opposite distally where they are strongly indurate-calloused at the very

1. Until recently, the only climbing species in the genus *Chamaedorea* was *C. elatior*, as here on limestone at Temazcal, Veracruz, Mexico, *Hodel 921*. Note the lanceolate pinnae. Photo by D.R. Hodel.

2. At first glance *Chamaedorea tacanensis* appears simillar to *C. elatior*. Chiquihuite, Volcán Tacaná, Chiapas, Mexico. Photo by D.R. Hodel.

3. *Chamaedorea tacanensis* has glaucous emerging petioles. Photo by M.A. Pérez-Farrera.

narrow attachment and become progressively but weakly downward-pointing, spreading to reflexed, and hooklike.

Inflorescences are interfoliar, breaking through the persistent or deteriorating leaf sheaths and have peduncles 20–50 cm long. Peduncles are clothed in 5–7, tubular, stout, brown bracts with the prophyll 1.5–3 cm long and the most distal peduncular bract 8–19 cm long. Staminate inflorescences have a rachis 20–50 cm long and with up to 50, simple, green, spreading rachillae to 27 cm long (Fig. 8). Pistillate inflorescences are somewhat smaller, with a rachis 5–11 cm long and 10–20, rigid

4. Juvenile plants of *Chamaedorea tacanensis* have finely divided, pinnate leaves. Chiquihuite, Volcán Tacaná, Chiapas, Mexico. Photo by D.R. Hodel.

5. A plant of *Chamaedorea tacanensis* extracted from the forest to show its distinctive leaf morphology that gives it the climbing nature. Photo by M.A. Pérez-Farrera.

rachillae 8–22 cm long, these green in flower and black in fruit. The greenish yellow to bright yellow, strongly aromatic staminate flowers have the lightly nerved petals connate basally and adnate apically to the pistillode and the corolla opening by lateral slits (Fig.

6. Seedling leaves of *Chamaedorea tacanensis* are pinnate. Chiquihuite, Volcán Tacaná, Chiapas, Mexico. Photo by D.R. Hodel.

7 (top). In adult leaves of *Chamaedorea tacanensis*, mid-blade pinnae are mostly linear to linear-lanceolate, straight, and sub-opposite to alternate and spreading to reflexed and plumose. Aguacaliente, Barrio a Laguna, Volcán Tacaná, Chiapas, Mexico. 8 (bottom). Inflorescences of *Chamaedorea tacanensis* are interfoliar, breaking through the persistent or deteriorating leaf sheaths and have peduncles 20 to 50 cm long. The staminate here has up to 50, simple, green, spreading rachillae to 27 cm long. Chiquihuite, Volcán Tacaná, Chiapas, Mexico. Photos by D.R. Hodel.

9. The greenish yellow to bright yellow, strongly aromatic staminate flowers of *Chamaedorea tacanensis* have the lightly nerved petals connate basally and adnate apically to the pistillode and the corolla opening by lateral slits. Chiquihuite, Volcán Tacaná, Chiapas, Mexico. Photo by D.R. Hodel.

9). The yellow pistillate flowers are followed by globose, black fruits 7–11 mm diameter and with a slight glaucous bloom.

Chamaedorea tacanensis is restricted to the slopes of Volcán Tacaná in Chiapas, Mexico and adjacent San Marcos in Guatemala, where it occurs as an understory element in tropical montane cloud forest at 1200–1900 m elevation. Several species of *Quercus* (oak) dominate this vegetation type, which can reach 35 m tall. It occurs on granitic substrates in Mexico and well-structured clays in Guatemala. It flowers from December to February and fruits from March to May. Hodel (1992a) included collections now recognized as *C. tacanensis* in the broadly circumscribed *C. elatior* (Fig. 10). Unfortunately, intact, undisturbed and unfragmented forest in the range of *C. tacanensis* is fast disappearing and, while we have no data, we suspect that this new species is threatened.

The description of *Chamaedorea tacanensis* implies that *C. elatior*, as currently circumscribed, might represent a group of lineages still defined under the same taxon. Hodel (1991, 1992a, 1992b) interpreted *C. elatior* as a broadly circumscribed and highly variable species incorporating solitary or clustered forms or populations, the latter of which sometimes branch aerially, and another form that has more than one-meter long, simple and bifid leaves into maturity, only after which does it begins to display its climbing habit (Hodel 2005, 2013, Hodel & Castillo-Mont 1995). Some of these various forms might be explained by elevation and/or substrate variation. For example, forms from Atlantic slope, lowland tropical rainforest are typically solitary, robust, and occur on limestone while forms from middle and higher elevation tropical montane cloud forest are slender and sometimes clustered and/or have aerially branched stems and occur on clay soils derived from basalt. Further molecular, morphological, and ecological work is needed to tease out these differences and determine if these different forms of *C. elatior* represent separate species, as is the case of *C. tacanensis*.

Literature Cited

Cuenca, A. and C.B. Asmussen-Lange. 2007. Phylogeny of the palm tribe Chamaedoreeae (Arecaceae) based on plastid DNA sequences. Systematic Botany 32: 250–263.

Hodel, D.R. 1991. The cultivated species of *Chamaedorea* with cespitose habit and pinnate leaves. Principes 35: 184–198.

Hodel, D.R. 1992a. *Chamaedorea* Palms. The Species and their Cultivation. The International Palm Society, Lawrence, KS. 358 pp.

Hodel, D.R. 1992b. *Chamaedorea*: diverse species in diverse habitat. Bulletin de l'Institut Français d'Études Andines 21: 433–458.

Hodel, D.R. 2005. What's new in *Chamaedorea*. Palm Journal 182: 4–10.

Hodel, D.R. 2013. *Chamaedorea Palms* 20 years after. Palms 57: 161–175.

Hodel, D.R. and J.J. Castillo-Mont. 1995. An unusual simple-leaved form of *Chamaedorea elatior*. Palm Journal 121: 27–33.

Pérez-Farrera, M.A., J.S. Gutiérrez-Ortega, D.R. Hodel, D. Villar-Morales, N.G. Santos-Hernández and R. Martínez-Camilo. 2021. A new species of climbing *Chamaedorea* (Arecaceae) from Chiapas, Mexico. Phytotaxa 522: 94–108. https://doi.org/10.11646/phytotaxa.522.2.2

Thomas, M.M., N.C. Garwood, W.J. Baker, S.A. Henderson, S.J. Russell, D.R. Hodel And R.M.

BATEMAN. 2006. Molecular phylogeny of the palm genus *Chamaedorea*, based on low-copy nuclear genes PRK and RPB2. Molecular Phylogenetics and Evolution 38: 398–415.

10. Juan José Castillo-Mont holds a collection of *Chamaedorea tacanensis* (*Hodel & Castillo-Mont 914*) from San Marcos, Guatemala that was included as *C. elatior* in *Chamaedorea Palms* (Hodel 1992a).

The IPS is grateful for the support of the following patrons

2021

Platinum ($10,000 and up)

Drs. Thomas Jackson & Kathy Grant, California, USA,
in support of the production of PALMS

Ms. Glenn Franklin, North Carolina, USA

Gold ($5000 to $9999)

Mr. Leland Lai, California, USA

Ms. Faith Bishock, Florida, USA

Silver ($1000 to $4999)

Mr. Jeff Brusseau, California, USA

Mr. Anthony Glomski, California, USA

Dr. Andy Hurwitz, California, USA

Ms. Mary Lock, Hawaii, USA

Ms. Jill Menzel, Florida, USA

Mr. Darold Petty, California, USA

Dr. Laz Priegues, Florida, USA

Mr. Haresh, Tamil Nadu, India

Mr. Colin Wilson, New South Wales, Australia

If you would like to make a gift, however large or small, please contact IPS President Robert Blenker, Robert.Blenker@gmail.com or any IPS Board member. To give on-line, visit www.palms.org.