

# Palms

Journal of the International Palm Society

Vol. 54(1) Mar. 2010



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### FRONT COVER

*Trachycarpus latisectus* in its natural habitat. Photo by T. Spanner. See article by B.S. Kholia, p. 43.

## 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, 810 East 10th St., P.O. Box 1897, Lawrence, Kansas 66044-8897, USA.

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Annual membership dues are US\$45.00 for Individuals (or US\$120 for three years) and include a subscription to the Journal. Donor memberships are US\$500 per year. Individual Lifetime memberships are available for a one-time fee of US\$1000. Benefactor memberships require a one-time payment of US\$2500. Subscription price is US\$45.00 per year for libraries and institutions. Dues include mailing of the Journal by airlift service to addresses outside the USA. Dues may be paid on-line at [www.palms.org](http://www.palms.org).

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**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 Lawrence, KS, USA.  
Postmaster: Send address changes to The International Palm Society Inc., 6913 Poncha Pass, Austin, TX 78749-4371 USA.

PALMS (ISSN 1523-4495)

Mailed at Lawrence, Kansas March 25, 2010  
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The full text of PALMS is available on EBSCO Publishing's database.

**This publication is printed on acid-free paper.**

## CONTENTS

# 5

### ***Lytocaryum*, Including a New Species from Bahia, Brazil**

L.R. NOBLICK AND H. LORENZI

# 18

### **New *Syagrus* Species from Brazil**

L.R. NOBLICK AND H. LORENZI

# 43

### **Is *Trachycarpus latisectus* Vanishing from its Natural Habitat?**

B.S. KHOLIA

## Features

Palm News	4
Photo Feature	51

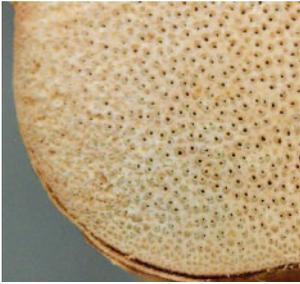


*Syagrus lorenzoniorum* (at left), one of 14 species described as new in this issue by L. Noblick and H. Lorenzi. See article p. 18. Photograph by L. Noblick.

## BACK COVER

*Lytocaryum insigne* infructescence. Photograph by H. Lorenzi. See article by L. Noblick and H. Lorenzi, p. 5.

# PALM NEWS



A team of researchers lead by Dr. Anna Tampieri at the Institute of Science and Technology for Ceramics, Faenza, Italy, has discovered a new method for **using rattans to manufacture artificial bones**. The technique uses rattan stems as a scaffolding on which to build an advanced ceramic material, which is analogous to human bone tissue. Preliminary research using sheep shows that the rattan-ceramic material is very strong and over time will completely fuse with bone. The porosity of rattan is crucial to the process: blood, nerves and real bone tissue must be able to enter and travel through the rattan-ceramic "bone."

Also making biomedical news, researchers reported that a simple, low-tech device **prevents the spread of lethal Nipah virus through palm sap** in Bangladesh (Luby, S.P. et al. 2009. *Emerging Infectious Diseases* 15:1229–1235.). Sugar tappers harvest the sweet sap of *Phoenix sylvestris* by cutting a groove in the trunk and attaching a collection pot, but researchers have determined that in recent years fruit bats are attracted to the sap oozing from the palm. As the virus-carrying bats feed, saliva or urine drips into the pots, thereby contaminating the sap with virus. In humans, nipah virus can cause viral encephalitis, which proves fatal in about three-fourths of cases. By convincing tappers to cover the trunk and collection pots with a skirt of woven bamboo, researchers found that the virus contamination could be virtually eliminated. Nipah virus is a relatively new pathogen carried by bats that was first identified in 1999. It was named after one of the Malaysian villages affected, Sungai Nipah.



M. Falzone

If you think pitted dates are a convenience of the modern world, think again. The **recent discovery of a carbonized mass of pitted dates in a burial pit from ca. 2200–2000 BC** at Hili, United Arab Emirates, demonstrates that ancient cultures appreciated the convenience of pitted dates just as we do. The date palm, *Phoenix dactylifera*, has played an important role in cultures of eastern Arabia for millennia, and its remains, in the form of seeds, fruits and stem fragments, are recorded from numerous archaeological sites. This finding is the earliest example of pitted dates and was published late last year by S. Mery and M. Tengberg (*J. Archaeological Sci.* 36: 2012–2017.).

The origin of the coconut has been a long-standing mystery that has preoccupied palm botanist from O. Beccari to H.E. Moore. Now, evidence from the coconut's own DNA points to an answer. A recent study by A. Meerow et al. published in the on-line journal PLoS ONE [4(10). 2009.] provides molecular evidence that ***Syagrus* is the closest living relative to the coconut**. They estimated that the ancestors of *Cocos* and *Syagrus* diverged from each other 35 million years ago.



# *Lytocaryum*, Including a New Species from Bahia, Brazil

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1. *Lytocaryum weddellianum*,  
a popular cultivated palm.  
Photo by H. Lorenzi.

With its gracefully spreading, delicate-looking, pinnate foliage, *Lytocaryum* is a very attractive genus. The glossy dark green foliage with the contrasting silvery, ashy gray or brownish undersides is visually very appealing. *Lytocaryum weddellianum* (Fig. 1) has been cultivated for years as an indoor plant. *Lytocaryum* is native to southeastern Brazil. Currently there are only two recognized species: *L. weddellianum* and *L. hoehnei* (Fig. 2). This paper will demonstrate that there should be four recognized species, including a species described here for the first time, *L. itapebiensis*.

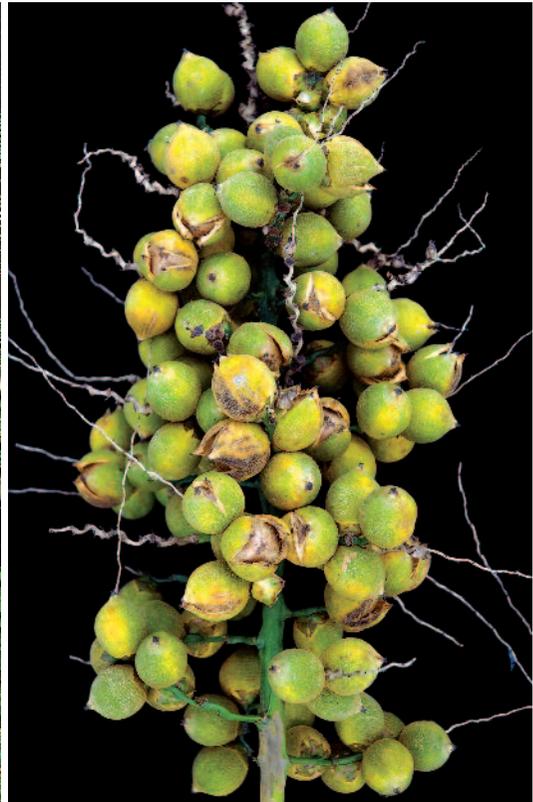
### What *Lytocaryum* species have in common

*Lytocaryum* palms have a solitary, columnar or rarely acaulescent stem and the above ground stems are usually rough, covered with persistent leaf sheath remnants. Leaves are pinnate, with closely evenly (regularly) spaced leaflets that are arranged in nearly the same plane, dark glossy green above with silvery gray or pale brownish pubescence beneath. The inflorescence is borne among the leaves and branched to one order. Like most Arecoids, flowers are unisexual and borne in triads (one female flower flanked by two males) near the base of the primary branches and dyads (two males) or single male flowers near the apices of the branches. Fruits are ovoid to ellipsoid with the rather uncommon character of the epicarp and mesocarp usually splitting (dehiscing) along several vertical sutures, exposing the endocarp beneath. Often described as splitting into two or three sections (Fig. 3), the outer layers of fruit can split into more than just three sections (Fig. 9). The endocarp or nut is very thin and fragile. For a more detailed description of the genus one should consult Dransfield et al. (2008).

### History of the Genus

In 1871, Hermann Wendland described the first species as *Cocos weddelliana*. Wendland wrote that "It was first discovered by Dr. Weddell [Hugh Algernon Weddell (1819–1877)] in 1831, on the southern slopes of the Sierra dos Órgãos, in Brazil, and subsequently by Riedel in 1832, in woods near Macaé [Macaé]." However, it is more likely that Weddell collected it much later (ca. 1843), when he was selected to join the scientific expedition of the naturalist, Comte F. de Castelnau (1810–1880) to South America. Weddell would have only been 12 years old in 1831. In the same paper Wendland further writes "It was introduced to the Belgium Gardens at the beginning of the last decennium [ca. 1860], by Mr. Louis Van Houte, of Ghent, and some years afterwards was imported by Mr. Linden, of Brussels, and distributed under the name of *Leopoldinia pulchra*, a genus with which it has nothing whatever to do. At still a later date it appeared under the name of *Glazioua elegantissima*. I am informed that Martius considered it as constituting a new genus and that to him the

2 (left). *Lytocaryum hoehnei* plant in habitat, a high altitude, rainforest palm from São Paulo. 3 (right). *Lytocaryum hoehnei* infructescence showing splitting of the epicarp and mesocarp layers into 2 or 3 sections. Photos by H. Lorenzi.



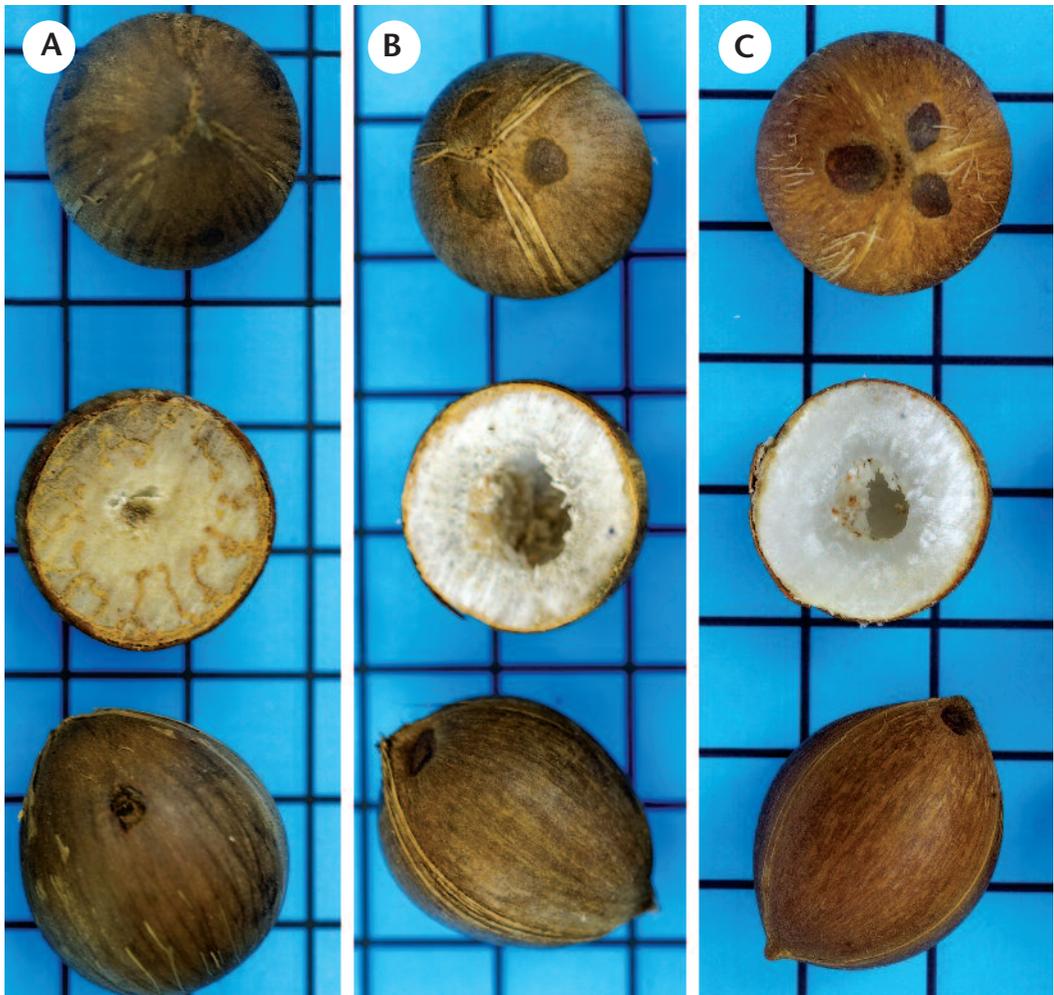
name *Glaziova* is to be referred, but I can see no difference between it and *Cocos*." By mentioning the name *G. elegantissima* in this 1871 paper, Wendland effectively published the name as a synonym. Drude (1881) redescribed the very same species under the name of *Glaziova martiana*, but he listed *Cocos weddelliana* as a synonym without a description, unaware that Wendland actually had described it in that earlier 1871 publication. By doing so, Drude automatically invalidated his own name and any other name based on *G. martiana*. In addition, the generic name *Glaziova* had already been used earlier by Bureau in 1868 as a genus in the Bignoniaceae family, giving that use of the name priority.

Carl Kuntze, a wealthy businessman, retired early and devoted himself to the study of botany. He traveled the world and collected

and described many plants. In 1891, Kuntze developed his own controversial nomenclatural system and attempted unsuccessfully to transfer all palms then in the genus *Cocos* L. to the genus *Calappa* Rumpf, thus creating the names *Calappa weddelliana* and *C. insignis*.

In 1916, Beccari described a variety *cinerea* of *C. weddelliana* that differed from var. *weddelliana* by unique ashy gray (cinereus) indument on the leaflets, but this variety was later rejected by Glassman (1987) as both taxa had this characteristic. Another variety was described from horticulture by Sander. Sander selected seedlings with very narrow leaflets in a nursery of Pynaert Van Gurt of Ghent and obtained a certificate from the Royal Horticulture Society for var. *pinaetii*. This variety was also rejected by Glassman (1987) because "palms vary considerably under

5. **A.** Seeds of *Lytocaryum hoehnei* with ruminant endosperm and non-basal endocarp pores. **B.** Seeds of *Lytocaryum insigne* with homogeneous endosperm and basal pores. **C.** Seeds of *Lytocaryum weddellianum* with homogeneous endosperm and basal pores. Grid = 0.5 cm. Photos by H. Lorenzi.



cultivation," but he indicated a need for further study.

A second species, *Cocos insignis*, first appeared in print in Wendland in Kerchove (1878). The name was later validated by Drude (1881) under the genus *Glaziova*, but he thought the name came from a cultivated origin and named it *Cocos insignis* Hort., unaware of Wendland's earlier mention of the name. In 1916, Beccari transferred the species to the genus *Syagrus*, creating *Syagrus insignis*.

In 1937, Max Burret described a third species, *Syagrus hoehnei*, from collections made in the state of São Paulo by Frederico Carlos Hoehne, a Brazilian botanist, and some collections made by A. Gehrt. Another Brazilian botanist, Joaquin Franco de Toledo (1944) later transferred all three species to his new genus, *Lytocaryum*, because he noticed that *S. hoehnei*, *S. weddelliana* and *S. insignis* had a number of characters in common: leaflets dark green with abundant silvery gray to pale brown pubescence beneath, epicarp and mesocarp splitting along vertical sutures and thin, fragile endocarps. In 1956, Burret and Potztl found that *L. hoehnei* had ruminant endosperm as opposed to the homogeneous endosperm observed in the other two (Fig. 4) and therefore they retained *L. hoehnei* in *Lytocaryum*, while transferring the other two species to their new genus, *Microcoelum*. Glassman (1972) made an unpopular move by resurrecting all of the species in the genus *Syagrus*. He had difficulty in getting his revision of the genus *Syagrus* accepted for publication with its broader concept for the genus. So in 1987, he reluctantly restored all to their former genera accepting the concept of one *Lytocaryum* and two *Microcoelum* species, following both Burret (1956) and Moore (1963). But in the same year, Uhl and Dransfield (1987) transferred all of the species back to *Lytocaryum*.

Both, Uhl and Dransfield (1987) and Glassman (1987) recognized three species in this complex. Henderson, Galeano and Bernal (1995) recognized only two, placing *L. insigne* in synonymy with *L. weddellianum* and so Govaerts and Dransfield (2005) also recognize only two. After conferring with Brazilian colleagues, and based on our own field work, we prefer to accept Uhl and Dransfield and Glassman's 1987 species concept and recognize three species, together with a new recently discovered one that is described here as *L. itapebiensis* Noblick & Lorenzi, making a total of four.

**Lytocaryum** Toledo, Arq. Bot. Estado São Paulo, n.s., f.m., 2: 6. 1944.

*Glaziova* Mart. ex H.Wendl., Florist & Pomol. 1871: 116. 1871.

*Microcoelum* Burret & Potztl, Willdenowia 1: 378. 1956.

The four species, from SE Brazil, can be differentiated by the following key:

#### Key to *Lytocaryum*

- 1a. Acaulescent palm, inflorescence far exceeding the length of the peduncular bract, rachillae lying in  $\pm$  one plane, fruit red, 1.2–1.5 cm long and the fleshy part (epicarp and mesocarp) not dehiscing (splitting) by vertical sutures at maturity ..... ***L. itapebiensis***
- 1b. Aborescent palm 1–10 m tall, inflorescence shorter than the peduncular bract, rachillae spiralled around the rachis in multiple planes, fruit greenish brown to yellowish green at maturity, 1.7–3.3 cm long and fleshy part dehiscing by vertical sutures at maturity (Figs. 2, 9) ..... 2.
- 2a. Trees to 5 m tall and to 10 cm in diameter, fruit 3–3.3 cm long, endocarp pores not basal but slightly above the base, and endosperm ruminant (Fig. 4A) (São Paulo) ..... ***L. hoehnei***
- 2b. Tree to 3–10 m tall and to 6–10 cm in diameter, fruit 1.7–2.3 cm long, endocarp pores basal and endosperm homogeneous (Fig. 4B, C) (Rio de Janeiro, Espírito Santo) ..... 3.
- 3a. Tree to 10–12 m tall, middle series pinnae to 1.5 cm wide (0.9–1.5 cm), peduncular bracts with dense dark brown to blackish brown tomentum (Fig. 5), seasonally dry forest ..... ***L. insigne***
- 3b. Tree smaller to 3 m tall, middle series pinnae to 0.8 cm wide (0.4–0.9 cm), peduncular bracts with chestnut brown tomentum (Fig. 6), humid forest ..... ***L. weddellianum***

Much of the descriptive data is placed in a table to make it easier to compare the differences between the species (Table 1).

**Lytocaryum hoehnei** (Burret) Toledo, Arq. Bot. Estado São Paulo, n.s., f.m., 2: 7. 1944. Holotype: Brazil, São Paulo, Barragem Nova de Cofia, A. Gehrt s.n. (SP)

*Syagrus hoehnei* Burret, Notizbl. Bot. Gart. Berlin-Dahlem 13: 678. 1937.



5 (left). *Lytocaryum insigne* densely covered with long, dark black-brown hairs. 6 (right). *Lytocaryum weddellianum* covered with less dense chestnut brown hairs. Photos by H. Lorenzi.

Stem 1–4 m tall and about 10 cm in diameter. Leaves 16–22 in the crown, pinnate and  $\pm$  straight, about 1.3 m long, leaflets 1.5–2.0 cm in width. Inflorescence with 34–50 primary branches. Staminate flowers 6–8 mm long. Fruits ovoid, 3–3.3 cm long, pale green to yellowish green and dehiscing at maturity. Seed with ruminant endosperm. Figs. 2, 3, 4A.

SPECIMENS: BRAZIL, PARANA, Parque das Lauráceas Mun. Tunas do Paraná, 5 Oct 1999, *J. M. Silva & L. M. Abe 3080* (FTG!, MBM); SÃO PAULO, *Gehrt s.n.* (SP 43163!); *Gehrt s.n.* (BH!, SP 2518!, SPF 10165!); *Hoehne s.n.* (SP 26520!); Mogi das Cruzes, in montane forest, 20 Jul 1994, *H. Lorenzi et al. 971* (HPL!); *Mattos 13844* (SP!).

This palm has the largest leaves, fruit and seeds in the genus. The ruminant endosperm and the location of the endocarp pores above its base easily distinguishes it from the others.

***Lytocaryum insigne*** (Drude) Toledo, Arq. Bot. Estado São Paulo, n.s., f.m., 2: 8. 1944.

*Cocos insignis* Mart. ex H. Wendl. in O.C.E. de Kerchove de Denterghem, Palmiers: 241. 1878. Lectotype: Brazil, Petropolis, a la Grande Roche de la Mamminha (*vide*

Glassman 1987), Novo Friburgo, Rio de Janeiro province (*vide* Drude, 1881) 1879 *Glaziou 11637* (C) cf. Dahlgren 1959, pl. 391.

*Glazioua insignis* Drude in C.F.P. von Martius & auct. suc. (eds.), Fl. Bras. 3(2): 398. 1881. *Calappa insignis* (Drude) Kuntze, Revis. Gen. Pl. 2: 982. 1891. *Syagrus insignis* (Drude) Becc., Agric. Colon. 10: 467. 1916. *Microcoelum insigne* (Drude) Burret & Potztl, Willdenowia 1: 388. 1956.

Stem to 12 m tall and about 10 cm in diameter. Leaves 8–20 in the crown, pinnate and  $\pm$  straight, about 1.3 m long, leaflets 0.9–1.5 cm in width. Petiole and rachis covered with dense blackish-brown hairs. Inflorescence with 35–50 primary branches. Fruits ovoid, 3–3.3 cm long, brownish green. Figs. 4B, 5, 7, 8, Back Cover.

SPECIMENS: BRAZIL, ESPIRITO SANTO, *Boone 403* (MBML!); *Boone 577* (MBML!); *Boone 750* (MBML!); *Fernandes 1110* (MBML!); *Fernandes 1665* (MBML!); *Fernandes 1967* (MBML!); *Fernandes 2546* (MBML!); *Fernandes 2744* (MBML!); *Fernandes 2762* (MBML!); *Vargem Alta*, in seasonally dry forest on very white-sandy soil at 990 m above sea level, 14 Nov 2008, *H. Lorenzi et al. 6538* (HPL!); Santa Teresa,



7 (above). *Lytocaryum insigne* plant. 8 (below).  
*Lytocaryum insigne* in habitat near Vargem Alta - ES.  
 Photos by H. Lorenzi.

cabeceira do Rio Bonito, Oct 1988, *Kollman 40* (MBML!, MO!); *Vimercats 295* (MBML!); RIO DE JANEIRO; *Brade 15877* (RB); *Brade 19307* (RB!); *Garbe 6198, 6199* (SP), *Garbe s.n.* (SP 12254!); Novo Friburgo (fide Drude 1881), without locality (fide Glassman, 1987), *Glaziou 2757* (FI!, MO, P, US), Glassman 1987, p. 160–161 fig. 15, 16; Santa Maria Madalena, Parque Estadual Desengano, Pedra do Desengano, Campos de Altitude. 6 Oct 1988, *G. Martinelli et al. 13172* (FTG! RB!); *Martinelli et al. 13381* (RB!); *Pereira 1329* (RB!); Nova Friburgo, Reserva Ecologica, Municipio de Macaé de Cima, nascente do Rio, Nov 1988, *S. de V.A. Pessoa et al. 350* (NY!).

This species has been placed in synonymy with *L. weddellianum*. However, there is enough evidence to justify separating it as a distinct species. *Lytocaryum insigne*, by all reports (Drude 1881, Glassman 1987, Helio B. Fernandes pers. comm.), is larger than *L. weddellianum* (Table 1). The more robust *Lytocaryum insigne* can be distinguished from the more delicate *L. weddellianum* by its taller stem (10–12 m vs. 2.5–3 m), wider middle leaflets (to 1.5 cm vs. 0.8 cm), greater tolerance to full sun (persisting in forest clearings) and different habitats: seasonally dry forests (1000–1800 m alt.) (Fig. 8) vs. more humid



**Table 1.** A comparison among *Lytocaryum* species

Character	<i>L. hoehnei</i>	<i>L. insigne</i>	<i>L. weddellianum</i>	<i>L. itapebiensis</i>
Locality	Parana, São Paulo	Rio de Janeiro (Nova Friburgo) & Espirito Santo (V. Alta)	Rio de Janeiro, Serra dos Órgãos (Petropolis)	Bahia (Itapebi)
Habitat	Humid open montane forests 800–975 m	Low canopy montane forest often at higher altitudes (1000–1800 m); dryer forest on white sandy soil subjected seasonal dryness.	High canopy montane rain forest with heavy shade, high humidity and regular rainfall. Almost sea level to 800 m.	Upper slopes of forested hills (250–350 m) with seasonal rainfall.
Habit	Short under-story palm.	Rigid, more rugged palm capable of resisting dry periods. Resistant to full sun.	Delicate palm, requiring regular rainfall. Sensitive to full sun.	Moderately delicate, but capable of resisting dry periods, but not full sun.
Stem (m)	Caulescent to 4 m	Caulescent to 10 m	Caulescent to 1–3 m	Acaulescent
Leaf rachis (cm)	to 150	80–99	65–88	31–52
Leaflet number	56–60	58–60	33–45 (–60)	24–26
Leaflet length of middle series (cm)	38–40	24–30	18–25	11–16
Leaflet width of middle series (cm)	1.5–2	0.9–1.5	0.4–0.9 (–1.2)	1.2–1.9
Peduncular bract length of inflated portion (cm)	52–56	51–63	34–40	21–24 or not inflated, nearly inconspicuous
Inflorescence length – branched portion (cm)	38–40	34–37	32–36	7–9
Rachillae length	17–19	17–20	2.5–13	5–6.5
Rachillae number	34–50	35–50	20–35 (–62)	4–6
Staminate flower length (mm)	6–8	3–5	2.5–5	4–4.5
Pistillate flower length (mm)	6–8	3–4.5	2.5–5	3–5
Fruit length (cm)	3–3.3	1.8–2.3	1.7	1.2–1.5
Fruit diam. (cm)	2–2.3	1.6–1.7	1–1.5	0.9–1.1
Fruit	Splitting	Splitting	Splitting	Not splitting
Endosperm	Ruminate	Homogeneous	Homogeneous	Homogeneous

forests (to 800 m alt.). The velvety indument that covers the peduncular bracts and petioles is denser in *L. insigne* and Glassman (1987) and Drude (1881) claim that it is a darker black-brown color, darker than *L. weddellianum*. Glassman (1987) describes the indument on *L. weddellianum* as a chestnut brown, lighter or redder brown than *L. insigne* (Fig. 5). On younger specimens of *L. insigne* the indument may initially appear reddish on the young emerging spear leaves, but soon turns to a dark black-brown color. According to some Brazilian nurserymen, *L. insigne* adult plants transplant very well even with naked roots, while *L. weddellianum* adult plants do very poorly.

There is some discrepancy in the literature concerning the locality of the collection of the designated lectotype for *L. insigne* (*Glaziou 11637*). Drude 1881 writes “*Crescit in cacuminibus elevatis prope Nova Friburgo prov. Rio de Janeiro, 1800 m supra mare: Glaziou n. 2757 et 11637*” [Grows at the extreme top elevations close to Nova Friburgo, Rio de Janeiro province, 1800 m above sea level: *Glaziou 2757 and 11637*]. However Glassman 1987 writes that the label for *Glaziou 11637* says “Brazil, Petropolis, à la Grande Roche de la Mamminha.” [Brazil, Petropolis, near the Big Rock of the Mamminha]. Petropolis, unfortunately is the locality often quoted for *L. weddellianum*. However, we know that *L. insigne* is found near Nova Friburgo and north into Espírito Santo and that Drude’s description of the habitat “at extreme top elevations” also fits our own observations for this species. Therefore *Glaziou’s* locality is more likely to be the correct locality. One can only speculate why the label says something different today than it did more than 100 years ago.

***Lytocaryum weddellianum*** (H.Wendl.)

Toledo, Arq. Bot. Estado São Paulo, n.s., f.m., 2: 8. 1944. Lectotype: Brazil, Rio de Janeiro (G, Glassman 1987 p. 158 fig. 13) Serra dos Orgãos, 1832, *M. Lhotsky 8*

*Cocos weddelliana* H. Wendl., Florist & Pomol. 1871: 114. 1871. *Syagrus weddelliana* (H. Wendl.) Becc., Agric. Colon. 10: 468. 1916. *Microcoelum weddellianum* (H. Wendl.) H.E. Moore, Gentes Herb. 9: 267. 1963.

*Glazioua elegantissima* H. Wendl., Florist & Pomol. 1871: 116. 1871.

*Glazioua martiana* Glaz. ex Drude in C.F.P. von Martius & auct. suc. (eds.), Fl. Bras. 3(2):

397. 1881. *Microcoelum martianum* (Glaz. ex Drude) Burret & Potzta, Willdenowia 1: 388. 1956.

*Calappa elegantina* Kuntze, Revis. Gen. Pl. 2: 982. 1891.

*Cocos pynaertii* auct., Gard. Chron., III, 1891(1): 683. 1891.

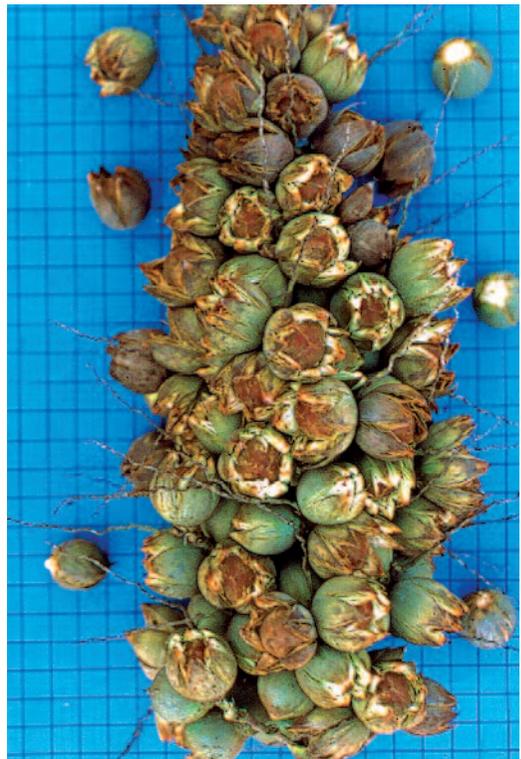
*Cocos weddelliana* var. *pinaertii* G. Nicholdon & Mottet, Dict. Prat. Hort., 5: 754. 1899. *Lytocaryum weddellianum* var. *pinaertii* (G. Nicholdon & Mottet) A.D. Hawkes, Arch. Bot. São Paulo, n.s., 2: 190. 1952.

*Cocos weddelliana* var. *cinerea* Becc., Agric. Colon. 10: 471 (1916). *Lytocaryum weddellianum* var. *cinereum* (Becc.) A.D. Hawkes, Arch. Bot. São Paulo, n.s., 2: 190 1952.

*Cocos weddelliana* var. *pinaertii* Becc., Agric. Colon. 10: 468. 1916.

Stem 1–3.5 m tall and about 3–6 (–10) cm in diameter. Leaves are 7–25 in the crown, pinnate and more or less straight, about 1.3 m long, leaflets 0.4–0.9 (–1.2) cm in width. Petiole and rachis is covered with dense chestnut-

9. *Lytocaryum weddellianum* infructescence showing splitting of the epicarp and mesocarp fruit layers into many sections. Grid = 1 cm. Photo by H. Lorenzi.





10. *Lytocaryum itapebiensis* in its understory habitat in Itapebi, Bahia, Brazil. Photo by L. Noblick.

brown hairs. Inflorescence with 20–62 (20–30 *vide* Glaziou, 23–34 *vide* Noblick, 58–62 *vide* Glassman) primary branches. Fruits are ovoid, 1.7 cm long, brownish green when mature. Figs. 1, 4C, 6, 9.

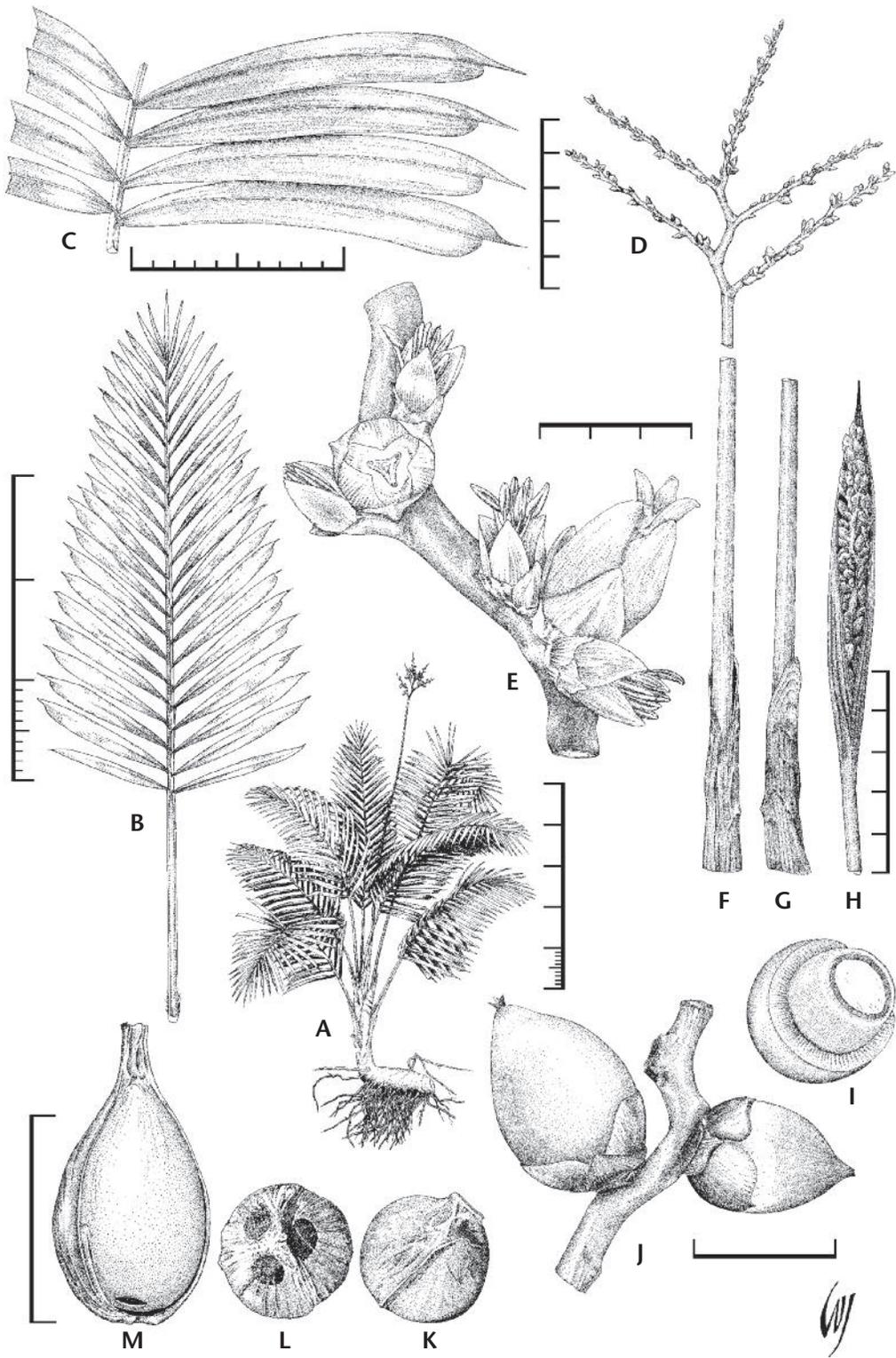
Specimens: BRAZIL, RIO DE JANEIRO, Petropolis, *Burchell* 2530 (K, P); Rio de Janeiro mountains Serra dos Orgãos and Serra d'Estrella, in medium altitude 800 m above sea level: 1862, *Glaziou* 288 (P), 2758 (FI, holotype of *S. weddelliana* var. *cinerea*; MO), 3635 (C!, P), *Dahlgren* 1959, pl. 397 and 8051; *Glaziou* 8057 (K!); Petropolis, 1886 *Glaziou* 16478 (B, M, F, NY!, P); *Lima* 2200 (GUA!, K!, MBM!, RB!); Rio de Janeiro in Atlantic forest, 14 Oct. 2004, *Lorenzi et al.* 4959 (HPL!); *Schenck* 2957 (RB!). CULTIVATED, USA, MIAMI, Fairchild Tropical Garden, 4 Apr 1979, *Fantz* 4117 (FTG!).

This species grows in the humid rainforests at low to medium altitudes (50–800 m). Its shade tolerance makes this palm desirable for indoor landscaping.

***Lytocaryum itapebiensis*** Noblick & Lorenzi **sp. nov.** Palma caudice solitario, prostrato, subterraneo; inflorescentia rachillis 4–6 in uno plano portatis; fructibus maturitate aurantiacis

ad rubris et 0.8–1.1 cm longis; inflorescentia super bracteam peduncularem exserta; bractea pedunculi brevioribus plerumque non ventricosa distincta. Typus: BRAZIL, Bahia, Municipio de Itapebi, [details of exact location have been withheld because of the vulnerable state of this population] 23 Jun 2008, *H. Lorenzi, L. Noblick, et al.* [ *C. A. Guimaraes, J. E. dos Santos*] 6496 (Holotypus: HPL; isotypi: FTG, NY, K, CEPEC, R, SP). (Figs. 10–15).

*Stem* subterranean ca. 8–9 × 2.5 cm, whole plant usually less than 60 cm tall, but varying from 35–65 cm. *Leaves* 4–11 in crown; sheathing leaf base ca. 8–11 cm long; true petiole 3–7 cm long and 0.5–0.6 cm wide by 0.4 cm thick, channelled adaxially and rounded abaxially, pseudopetiole (true petiole plus part of the sheath) 12–25 cm long; rachis 31–52 cm long; leaflets dark, shiny green, discolorous, abaxial surface with a silvery tomentum, leaflets numbering 21–26 along one side, regularly distributed along rachis in nearly a flat plane, rammenta scales or tomentum present lacking at the leaflet insertion on the rachis and none along the abaxial midvein; basal leaflets 10–13.5 cm long by 0.2–0.6 cm wide, middle leaflets 11–16 cm long and 1.2–1.9 cm wide, apical leaflets 5–7



11. *Lytocaryum itapebiensis* diagnostic plate: A. Habit; B. Leaf; C. Leaflets; D. Inflorescence; E. Flowers; F. Prophyll front-view; G. Prophyll side-view; H. Peduncular bract with emerging inflorescence; I. Fruit showing layers with fleshy mesocarp, white fibrous layer, thin endocarp and central endosperm; J. Fruit; K. Endocarp apex; L. Endocarp base; M. Endocarp side view. All scales are in centimeters, except A and B in decimeters and E in mm. Drawn by Wes Jurgens.



12. *Lytocaryum itapebiensis* showing its growth habit as a potted plant. Note young emerging inflorescence at the base and typical long, peduncled infructescence with bright red to red-orange fruits. Photo by H. Lorenzi.

cm long and 0.4–0.5 cm wide with an asymmetric tip and long drip tip. *Inflorescence* interfoliar; prophyll 4–8 cm × 1.3–1.5 cm; peduncular bract very narrow, thin, woody, slightly sulcate, exterior with scattered thin indumentum, total length 21–24 cm and usually with no expanded or inflated portion (Fig.13) (one exception measured 5–12 cm long including a 1 cm beak, 0.6 cm diameter and a 1.5 cm perimeter and a 0.5 mm thickness); peduncle glabrous ca. 32–66 cm long (much longer than the peduncular bract in fruit, see note below) and nearly round in cross-section with a 3 × 2.5 mm diameter, zig-zag rachis 2–4 cm long, with 4–6 glabrous primary branches lying in nearly the same plane (Fig. 14), with a total length of 7–9 cm from the first basal primary branch to the apex, 5–5.5 cm long at the apex, 6.5 cm long at the base; staminate flowers green to yellow, arranged in triads on the lower portion or in staminate dyads or singly on the upper portion of the primary branch, 4–4.5 mm long and 2 mm wide, sepals 3, 1.7–2.5 mm long and 1–1.5 mm wide, glabrous, with raised nerves, keeled and

connate at the base; petals 3, valvate, 3.5–4 mm long and 2 mm wide with acute tips, nerves indistinct to slightly raised; stamens 6, 2–3 mm long, anthers 1.5–1.8 mm long, filaments 1–2 mm long; pistillode trifold, 1.8–2 mm long; basal pistillate flowers elongate conical, glabrous, 5 mm long and 3 mm wide (apical flowers 3 × 2 mm), sepals 3, green, imbricate 2.5–3 mm long and 3 mm wide; petals 3, glabrous, imbricate at the base but slightly valvate at the tips, 3–5 mm long and 3 mm wide, pistil glabrous, 4 mm long and 2 mm diam., stigmas 3 in number, and less than 0.5 mm long, but sitting above a stigmatic cap with a total length of 1.3–1.5 mm long including the stigma, glabrous; staminodial ring ca.1 mm high, 6-dentate. *Fruit* red or red-orange when mature (Fig. 15), glabrous, conical, 1.2–1.5 cm long by 0.9–1.1 cm diam. with a 2–2.5 mm thick fleshy-fibrous mesocarp, composed of two layers, an outer red or orange fleshy part ca. 1.5 mm thick and an inner white fibrous layer ca. 0.8–1 mm thick and finally a very thin (less than 0.5 mm thick) endocarp; endocarp ca. 1.2–1.3 × 0.6–0.7 cm. with 3 visible pores on the basal end. *Seed* ellipsoidal, ca. 10–12 × 5–6 mm.

13. *Lytocaryum itapebiensis* showing an inconspicuous peduncular bract at the base of the inflorescence and leaflets with silvery undersides. Photo by L. Noblick.





14. *Lytocaryum itapebiensis* with typical zig-zag inflorescence and leaflets with drip tips. Photo by L. Noblick.

COMMON NAME: none known

ETYMOLOGY: The specific epithet honors the municipality of Itapebi, Bahia, Brazil where the only known population of this species is found.

DISTRIBUTION AND ECOLOGY: Brazil, rare on the drier upper shaded slopes of a rainforest in clay soils. The plant is only known from one forest valley, but has not been searched for extensively in adjacent forest valleys, where there may be other populations in the Município of Itapebi, Bahia, Brazil.

CONSERVATION: Much of the area has been converted into pasture. The area is unprotected and owned by cattle ranchers who annually torch their pastures, burning deeper into the adjacent forest with each burn cycle threatening the adjacent forest where this palm grows. The only known population is extremely threatened with only about 20–25 plants left in the wild. From our current knowledge, we would rank this plant as Critically Endangered. This species grows well as a potted plant and continues to flower and fruit more vigorously in a pot than it does in the wild. Therefore *ex situ* conservation is a potential conservation strategy, and recent

successes in germinating the seed have sparked new hope for the species (Guimaraes, pers. comm.).

PHENOLOGY: Flowering in the wild in June with some plants having immature fruit at that time. Potted plants appear to flower and fruit year around.

USES: This palm has great ornamental potential with its small size and very attractive foliage and fruit. It grows well in shade and thrives as a potted plant.

NOTES: Carlos Alex Guimarães, a palm enthusiast and plant collector from Bahia, Brazil, was visiting his friend, when he noticed an attractive potted palm that had shiny dark green foliage with silvery undersides and beautiful red fruit (Fig. 12). He inquired where his friend had purchased the plant and his friend responded that the palm was native. Alex then sent images to us and in June 2008, we went to look at this palm and confirmed that it was new to science.

*Lytocaryum itapebiensis* has all of the main generic characters as listed near the beginning of this paper, except for the splitting or dehiscing of its epicarp and mesocarp into



15. Showy infructescence of *Lytocaryum itapebiensis* with its bright red to red-orange fruits. Photo by L. Noblick.

sections; one of the characters that set this genus apart from *Syagrus*. The leaf anatomy (unpublished Noblick) and cladistic analysis of the DNA (*vide* Alan Meerow) show that this new species belongs in *Lytocaryum*. Only *L. itapebiensis* is caulescent. The inflorescence is unique in that the branches appear to be oriented in nearly the same plane and the peduncular bract often tightly hugs the peduncle, which is very atypical of most Attaleinae palms. As the inflorescence emerges from the peduncular bract and some of the staminate flowers begin to open, the peduncle is still shorter than the leaves; but then as the female flowers become receptive and the fruits mature to a reddish color, the peduncle expands far above the peduncular bract and often above the leaves themselves (Fig. 12).

#### Acknowledgments

Special thanks Carlos Alex Guimarães and João Eduardo dos Santos, who arranged for us to see this new species in the field. Sincere thanks to Helio Q.B. Fernandes (MBML) for answering many of our questions concerning *Lytocaryum* in Espírito Santo. Thanks to Alan Meerow for DNA confirmation in placing this species in *Lytocaryum*. Final thanks to Fairchild Tropical Botanic Garden, where LN is a research associate, for use of their herbarium and especially to their volunteer, Wes Jurgens, who furnished the drawings for the diagnostic plate.

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# New *Syagrus* Species from Brazil

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Several new *Syagrus* species have been discovered during an effort to update the next edition of *Palmeiras Brasileiras* (Lorenzi et al. 2004). Most are “acaulescent” palms, many of which would have formerly been dismissed as *Syagrus petraea* (Mart.) Becc., but leaflet anatomy and field experience with the plant’s habit reveal distinct species that should be recognized. This is an attempt to make sense of some of these puzzling acaulescent *Syagrus* “*petraea*” species.

**How characters are measured:** There is a need to clarify the measured characters in *Syagrus*. Not everyone defines nor measures characters in the same way. One of the most misunderstood characters in *Syagrus* has been the petiole. The true petiole always has smooth margins and is measured from the base of the leaf blade (lamina) to the beginning of the fibrous remnants or remnant scars marking the beginning of the leaf sheath. The leaf sheath is measured from those same remnant scars to its attachment on the tree. The pseudopetiole (false petiole) is often simply called the “petiole” in many *Syagrus* descriptions. It includes the true petiole and that portion of the leaf sheath that is arching away from the stem and should only be measured on the older leaves. It will often have teeth and fibrous or membranous sheath remains. The rachis of the inflorescence is herein measured from the lowest branch to the bottom of the apical primary branch. A

spicate inflorescence is defined as a terminal primary branch (Tomlinson 1990) and therefore a spicate inflorescence has no measureable rachis, just an inflorescence axis. The inflorescence axis is measured from the first primary branch or lowest flowers to the tip of the terminal primary branch. The width of the peduncular bract is measured from edge to edge around the outside perimeter of the bract and not simply across it.

**Characters common to all of the *Syagrus* species described here:** The petiole and pseudopetiole are channeled adaxially (on the upper surface) and rounded abaxially (on the lower surface). Normally there are no rammenta (tufts of scales or wooly tomentum) present along the lower abaxial vein and none where the leaflets are inserted on the rachis (except in *S. lorenzoniorum* and *S. rupicola*). The inflorescence is interfoliar, androgynous (containing both male – staminate – and

female – pistillate – unisexual flowers in the same inflorescence), and on the lower portion of primary branches flowers are arranged in triads (one female flanked by two males) and upper portion with male dyads or singly. Male flowers open first and fall off before female flowers become receptive. The peduncular bract is always woody and sulcate (with longitudinal grooves and furrows). There are normally 3 sepals and 3 petals in both male and female flowers (with the exception of *S. gouveiana* and *S. minor* with as many as 4 of each). Male flowers have 6 stamens and the pistillode is trifid and less than 1 mm long. All male flower petals are valvate and all female petals are imbricate (overlapping) at the base but valvate at the tip. All flowers are some shade of yellow. The nut or endocarp has three visible pores near its base and has only one seed with homogeneous endosperm.

**Uses.** Many of the species described here have edible sweet tasting mesocarps (in spite of the pulpy fiber and mucilage) and edible endosperm or seeds. Several of the species described below could be used in landscaping and the smaller ones would be particularly valuable in the landscaping of small rock gardens. Many of the higher altitude species are probably frost resistant.

#### NEW SPECIES WITH CONSPICUOUS ABOVE-GROUND STEMS

***Syagrus deflexa* Noblick & Lorenzi, sp. nov.**, *S. flexuosae* similis sed foliis deflexis, rhachillis inflorescentiae plerumque spiraliter dispositis et dissimilibus anatomiis foliolorum differt. Typus: BRAZIL, Goiás, Alto Paraíso de Goiás, ca. 7 km from the town of Alto Paraíso de Goiás in the direction of Tocantins, entrance for the Hotel Fazenda Agua Clara. 14°04'16.7"S, 047°30'26.1"W, altitude: 1360 m, 19 Jun 2008, *Rodrigo Tsuji, H. Lorenzi, L.A. Ventura, L.R. Noblick* 2691 (holotypus HPL; isotypi R, SP, UB, UFG, FTG, NY, K, AAU, CTES). Fig. 1.

Palm caespitose, rarely solitary, stems generally arched, ringed but often covered with leaf base remains, 2–3 m in height and 6–10 cm diam. **Leaves** 5–7 in the crown, a little more than 1 m long; sheath with fibrous margin 25–38 cm long; pseudopetiole 14–33 cm long, petiole ca. 12–22 × 0.7–0.9 cm; rachis 52–85 cm long; leaflets, coriaceous, 39–50 along each side, irregularly spaced, the majority in clusters of 2–5 (–6) inserted in different planes, all strongly bent or deflexed downward, initially glaucous on the lower surface, later wax

wearing off; basal leaflets (6.5–) 21–34 × 0.1–0.4 cm, middle leaflets 16–37 × 1–2 cm, apical leaflets (7–)14–25 × 0.3–0.5 cm. **Inflorescences** with a slightly flattened peduncle covered with silver lepidote indument, 12–16 × 0.6–0.9 cm, 0.4–0.6 cm thick, prophyll 12–14 × 1.4–1.5 cm; peduncular bract glaucous, 34–48 cm long, expanded portion 22–30 × 4–7 cm; inflorescence axis 22–33 cm long; rachis 12–25 cm; primary branches 8–17, the upper ones especially spiraled around the rachis (in younger plants only with smaller inflorescences branches arranged unilaterally similar to *S. flexuosa*), 7–13 cm long at the apex, 15–29 cm at the base; **staminate flowers** ca. 15 × ca. 3–4 mm (apical ones ca. 8–10 mm long), sepals ca. 2–3 × 1–1.5 mm, glabrous, keeled and connate at the base, petals 6–9 × 2–3 mm with acute to acuminate tips, nerves indistinct to slightly raised, stamens 4.5–5 mm long, anther ca. 4 mm long, filaments ca. 2 mm long, basal; **pistillate flowers** elongate pyramidal, lepidote, 15–19 × 8–10 mm (apical flowers 9–12 × 5–7 mm), sepals imbricate 15–19 × 7–7.5 mm, petals slightly to distinctly nerved, sparsely lepidote, imbricate at the base but slightly valvate at the tips (upper 5–9 mm), 14–17 × 6.0–8.5 mm, pistil with lepidote indument from the base to nearly the base of the stigmas, 12–14 × 6 mm, stigmas 3, 3–4 mm long, staminodial ring ca. 3–3.5 mm high, 6-dentate. **Fruits** lepidote or somewhat tomentose at the tip but otherwise glabrous, ellipsoid with an apical beak, yellowish-green, 3.0–4.0 × 1.5–2.0 cm (still immature, probably a bit larger), with a thick, sweet, fibrous-fleshy mesocarp ca. 2 mm thick, endocarp ca. 3.2 × 1.6–1.7 cm and 3–4 mm thick; seed elliptical ca. 12–15 × 10 mm.

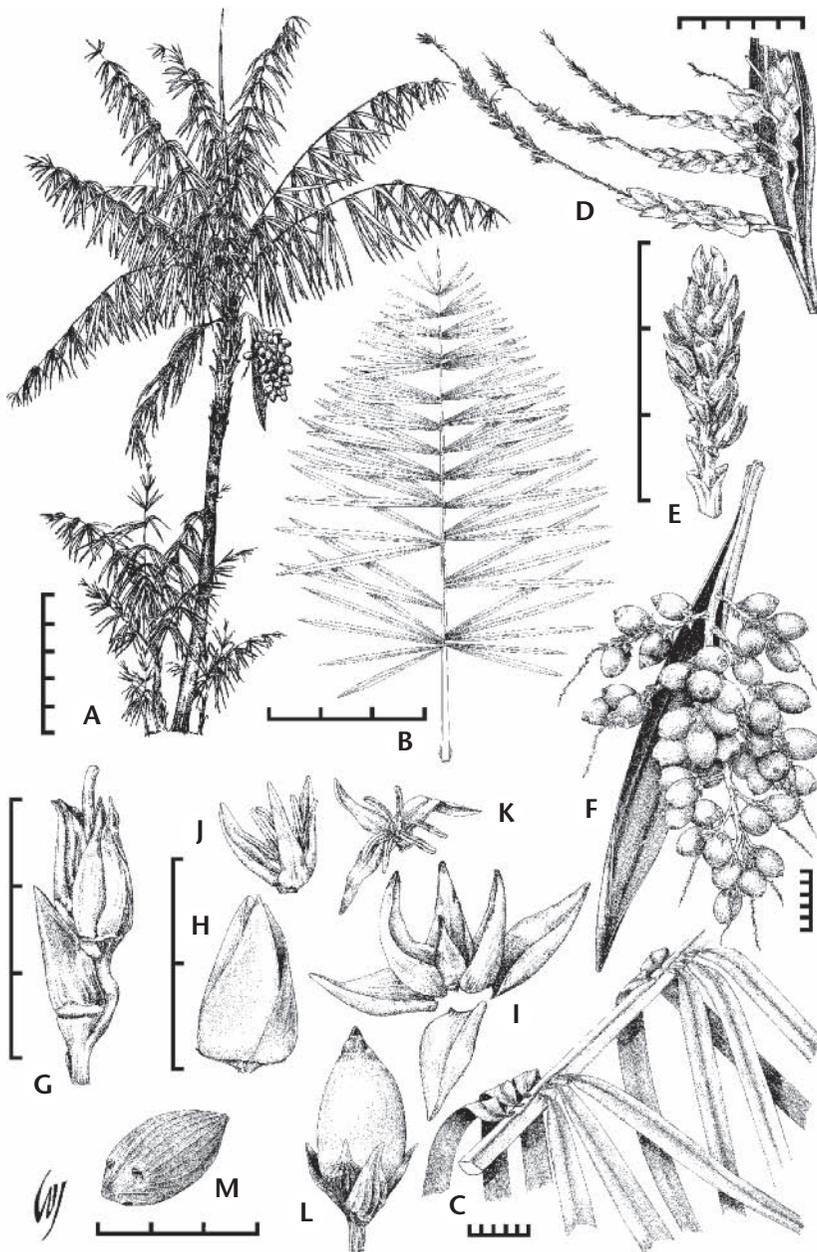
COMMON NAME: *acumã-branco*.

ETYMOLOGY: The name is derived from the fact that all of the leaflets are bent downwards; deflexed.

DISTRIBUTION AND ECOLOGY: This palm is endemic to northern Goiás in the Chapada dos Veadeiros region, in the *campo rupestre* and *cerrado* vegetation in the sandy, rocky soils between Alto Paraíso de Goiás and Teresina de Goiás.

PHENOLOGY: There are flowers and somewhat immature fruit in June.

OTHER SPECIMENS EXAMINED: BRAZIL, Goiás, Chapada dos Veadeiros, Municipio de Alta Paraíso de Goiás, *J. A. Rizzo* 7256 (UFG!); *R. Tsuji & R. Pimenta* 2726 (HPL).



1. *Syagrus deflexa*: A. Habit; B. Leaf; C. Leaflets; D. Inflorescence; E. Portion of a primary branch with staminate flowers; F. Inflorescence; G–I. Pistillate flowers; J–K. Staminate flowers; L. Fruit; M. Endocarp. A–F drawn from images taken by L.R. Noblick, E–L drawn from R. Tsuji *et al.* 2691. All scales are in centimeters except A and B which are in decimeters.

NOTES: Harri Lorenzi first discovered this palm in the Chapada dos Veadeiros region, in the Município of Alto Paraíso de Goiás. In 2005, he brought this new species to Larry's attention; the species has probably been collected and misidentified in most herbaria as *Syagrus flexuosa* (Mart.) Becc. However on a pressed specimen, one would have no appreciation for the deflexed leaflets that so

easily separate this new species from *S. flexuosa*, which may be a close relative. Finding this species has forced us to re-examine the *S. flexuosa* complex. Perhaps *S. campestris* is a good species after all, even though Glassman (1969) synonymized it. Although Glassman examined over 50 dried herbarium specimens, there are important differences in the habit and in the texture of the leaves that cannot be

easily seen on a herbarium sheet. In our experience, *Syagrus campestris* and *S. deflexa* have restricted ranges (eastern Minas Gerais for *S. campestris* and northern Goiás for *S. deflexa*), while *S. flexuosa* has a larger range. *Syagrus campestris* and *S. deflexa* have more coriaceous leaflets that tend to stay rigid and straight on the live plant and even after drying, while *S. flexuosa* has thinner membranaceous leaflets which tend to curl in from the sides when drying and are more pendulous on the plant. In *S. deflexa*, the primary branches of the inflorescence are spirally arranged on the rachis (with the exception of younger plants where they are sometimes unilaterally arranged). In both *S. flexuosa* and *S. campestris* the primary branches are always unilaterally arranged, giving it that distinctive “wind blown” appearance. In short, not only is *S. deflexa* a good species but, there are some reasons to possibly resurrect *S. campestris* as well.

***Syagrus kellyana*** Noblick & Lorenzi, *sp. nov.*, *S. picrophyllae* similis sed caule brevi, fructu omnino lepidoto, rhachillis inflorescentiae marcescentibus vel canescentibus vel fuscentibus (non viridis), flexis vel tortis (non rectis), bracteis rachillae conspicuis differt.

Typus: Brazil, Minas Gerais, Padre Paraíso, 22 km N of the city on BR-116 at Ponte de Dois Valante, 16°55'8.6"S, 41°28'32.2"W, elevation 500–600 m. Garden accession number 97289 and 97290. 23 Jul 1997 L. R. Noblick & L. Cline 5156 (holotypus IPA; isotypus FTG). Fig. 2.

Palm with solitary, columnar stem, 2–5 m tall and 16–18 cm diam. **Leaves** 8–12 in the crown, somewhat plumose, spirally arranged and divergent in the crown, ca. 3 m long; sheath fibrous on the margins 70–138 cm long, pseudopetiole 27–64 cm long, true petiole short, absent to 11 × 3.5–4 cm and 1.5–2 cm thick; rachis 2.4–4 m long; leaflets 104–131 on each side of the rachis, linear with acuminate, nearly symmetrical apex, distributed irregularly in clusters of 2–4 (–5) and inserted in more than one plane, basal leaflets 58 × 0.8 cm, middle leaflets 57–72 × 3.3–4.5 cm and apical leaflets 26 × 0.6 cm. **Inflorescences** branched with peduncle 56–82 cm long, slightly flattened, 3–4 cm wide and 2–2.5 cm thick with the lower portion covered with a lepidote indument; prophyll 40–67 × 6–8 cm, peduncular bract 110–160 cm long and expanded part 62–97 × 15–35 cm; inflorescence axis 53–88 cm long; rachis 42–70 cm long; primary branches 47–69, 8–47 cm long; **staminate flowers** 11–21 × 4–7 mm,

sepals 3–7 × 1–2 mm, glabrous, keeled and connate at the base, petals 12–17 × 5–6 mm with acute tips, nerves indistinct to slightly raised, stamens 7 mm long, anther 6 mm long, filaments 2.5–3.0 mm long; basal **pistillate flowers** pyramidal, glabrous, 16–21 × 9–13 mm (apical flowers 8–15 mm by 7–13 mm), sepals imbricate 10–21 × 7–13 mm, petals glabrous, imbricate at the base (upper 4–5 mm) slightly valvate at the tips, 11–13 × 5–8 mm, pistil with short white indument on the lower half becoming brownish lepidote on more mature ovaries, 7–11 × 4–9 mm, stigmas 3, 2–3 mm long, glabrous, staminodial ring ca. 2–3 mm high, 6-dentate. **Fruits** ovoid, 3.5–4 × 2.6–2.8 cm, with rougher brownish-yellow epicarp splitting a little at the apex when mature, endocarp 3.3–3.5 × 2.4–2.6 cm, 5–6 mm thick.

COMMON NAME : *coco-de-quarta*.

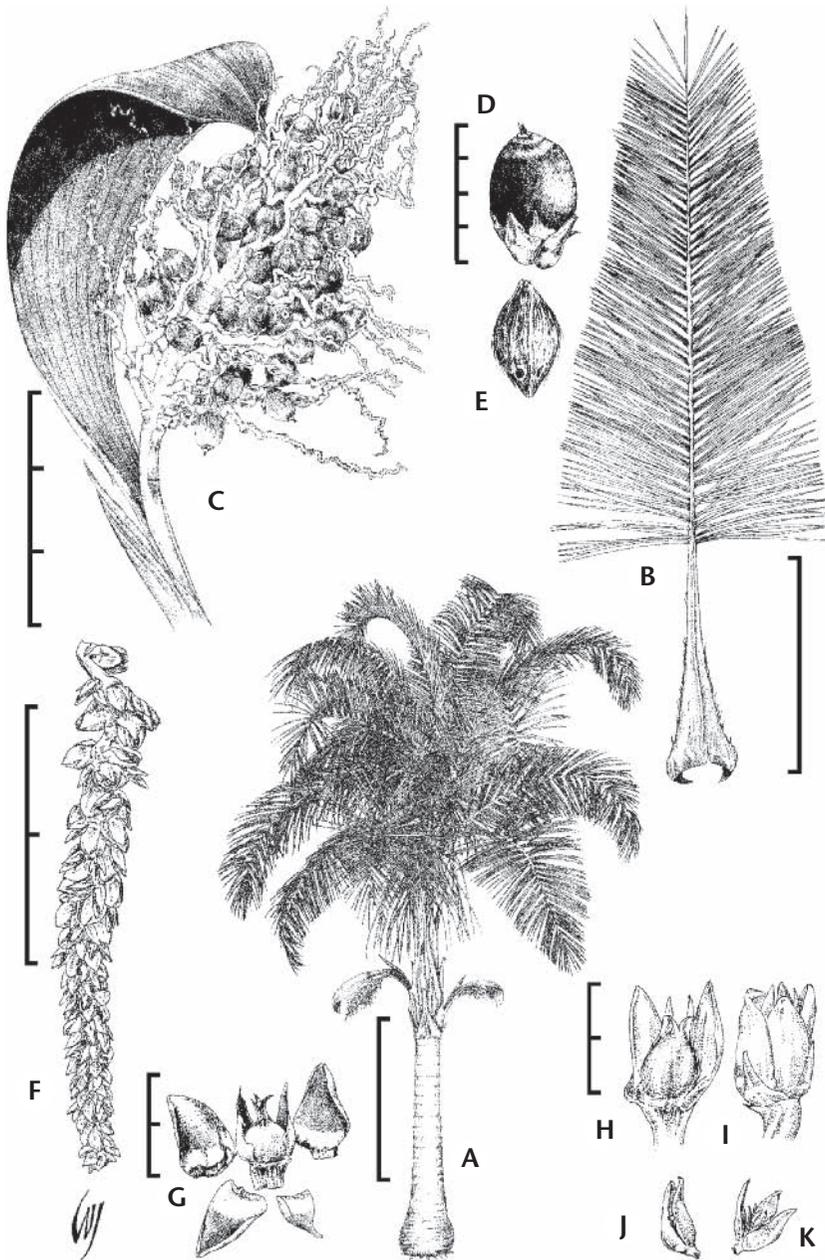
ETYMOLOGY: The specific epithet honors Loyd Kelly and his family who have so generously supported the Montgomery Botanical Center and my research over the years.

DISTRIBUTION AND ECOLOGY: Minas Gerais in the Atlantic forest, old Atlantic Forest vegetation, in well-drained soils, usually growing on granitic rock or in shallow or thin soils on rock outcrops at an elevation of ca. 550 m.

PHENOLOGY: Flowering and fruiting in July.

OTHER SPECIMENS EXAMINED: BRAZIL, Minas Gerais, Municipio de Ponto dos Volantes, 16°54'53,1"S, 41°28'04,4"W, H. Lorenzi, R. Campos & R. Pimenta 6628 (HPL).

NOTES: When we first collected this species, we thought that it was a short *Syagrus oleracea* (Mart.) Becc. Then we noticed the *S. picrophylla*-like petals with their distinctive wide overlapping base abruptly terminating in an acute apiculate tip and so we identified this palm under that name. The *S. picrophylla* complex has caused much confusion among earlier botanists. *Syagrus kellyana*, *S. picrophylla*, *S. lorenzoniorum* and *S. cearensis* all have a seed with a large central cavity like a coconut, which may have led J. Barbosa Rodrigues (1903) to write that the species grew from Ceará to Rio de Janeiro. His 1903 publication had two drawings of this species, neither of which resembles the other, causing more confusion. However we do know his original description was from palms growing in the state of Rio de Janeiro and southern Espírito Santo and so after examining specimens of these, we were able to do more informative comparisons. *Syagrus kellyana* differs from *S.*



2. *Syagrus kellyana*: A. Habit; B. Leaf; C. Inflorescence; D. Fruit; E. Endocarp; F. Primary branch with flowers; G. Pistillate flower opened; H-I. Pistillate flowers; J-K. Staminate flowers. Drawn fresh from MBC accession 97290 (Noblick 5157). The scales are as follows: A-B are in meters, C and F are in decimeters and all others are in centimeters.

*picrophylla* and *S. lorenzoniorum* in being a stouter, thicker stemmed palm with spreading, more arching leaves in healthy plants (rather than straighter more ascending leaves). The fruit are completely covered by a thin scaly lepidote, but *S. picrophylla* and *S. lorenzoniorum* are only covered at the tip or on the upper third. The tips of the inflorescence die, dry up and become twisted and shriveled during fruit

development, but stay alive, nearly straight and turn a dark green in *S. picrophylla*. The primary branch tips also have conspicuous subfloral rachillae bracts that are nearly absent in *S. picrophylla* giving it a more ragged appearance. Anatomically, the abaxial (lower) surface of the leaflet has several distinct nonvascular fiber strands, which are missing in both *S. lorenzoniorum* and *S. picrophylla*.

***Syagrus lorenzoniorum*** Noblick & Lorenzi, **sp. nov.**, *S. picrophyllae* affinis sed lente crescenti, caule brevi, tenui et leviter ventricosus (non tereto), eupetiolus plerumque carens vel usque ad 2 cm longo, endocarpius globosus (non ovoideo vel fusiforme), foliis rigidioribus et valde ascendentibus, ramento praesenti prope foliolorum insertionem differt.

**Typus:** BRAZIL, Espírito Santo, São Gabriel da Palha, collected in Corrego Comprido, Sitio Pedro Castela. 19°02'01.9"S, 46°29'33.0"W, 200 m altitude. 22 Jun 2008. *R. Tsuji, H. Lorenzi, L. Noblick et al.* 2713 (holotypus HPL; isotypi R, SP, MBML, FTG, NY, K, AAU). Fig. 3.

Palm with stem solitary, short, ringed, 2–4 m in height and 9–16 cm diam., with the apical part of the trunk (area where leaves inserted) swollen or dilated. **Leaves** ascending and slightly arched, 8–17 in the crown, 1.5–2.5 m long; sheath 28–70 cm long, with dark chestnut-brown fibrous margins or a fabric matting of the same fibers; pseudopetiole with fibrous margins also, 15–50 cm long; true petiole nearly always absent or to less than 2 cm long × 2–2.5 cm wide; rachis (90–) 160–270 cm long; leaflets 55–84 along each side of the rachis, distributed irregularly in clusters of 2–4 (–6) and inserted in one plane or forming a V, linear, rigid, concolorous, medium green to slightly paler on the lower surface, with acute apex, ramenta (tufts of scales or wooly tomentum) present along the lower abaxial vein and where leaflets inserted on the rachis, basal leaflets 28–52 × 0.3–0.8 cm, middle leaflets 31–56 × 2.1–3.3 (–4.0) cm, and apical leaflets 10–19 × 0.3–0.6 cm. **Inflorescences** branched with peduncle 60–110 cm long; prophyll 34–57 × 3–4.5 cm; peduncular bract 80–160 cm, expanded part 46–80 × 4–10 cm; inflorescence axis 33–50 cm long; rachis 17–24 cm long, with 25–47 primary branches 11–35 cm long; **staminate flowers** 9–11 × 3–4 mm, sepals 1.0–1.3 × 0.5 mm, glabrous, keeled and connate at the base, petals 8–10 × 3 mm with acute tips, nerves indistinct to slightly raised, stamens 5 mm long, anther 4.0–4.5 mm long, filaments 2 mm long; **basal pistillate flowers** elongate conical, glabrous, ca. 11 × 5 mm (apical flowers ca. 8 × 4 mm), sepals imbricate 10–11 × 3–5 mm, petals glabrous, imbricate at the base but slightly valvate at the tips, 8 × 4 mm, pistil glabrous, 5 × 2 mm diam., stigmas 3, 3 mm long, glabrous, staminodial ring ca. 1 mm high and 6-dentate. **Fruits** globose to oblong, 2.5–3.0 × 2.5–2.8 cm, yellowish-green when mature, endocarp nearly globose 2.4–2.6

cm in diameter and 3–4 mm thick; seed 1.0–1.1 diam. with a large central cavity.

**COMMON NAME :** *coco-de-quarta-mirim*.

**ETYMOLOGY:** This palm is named for the Lorenzoni family of the state of Espírito Santo who first brought the differences of this palm to the attention of Harri Lorenzi.

**DISTRIBUTION AND ECOLOGY:** This species occurs in Espírito Santo, over rocks, especially on the top of rock monoliths in very thin soils.

**PHENOLOGY:** Flowering and with a few mature fruits in June. Fruiting probably takes place a little later in the year.

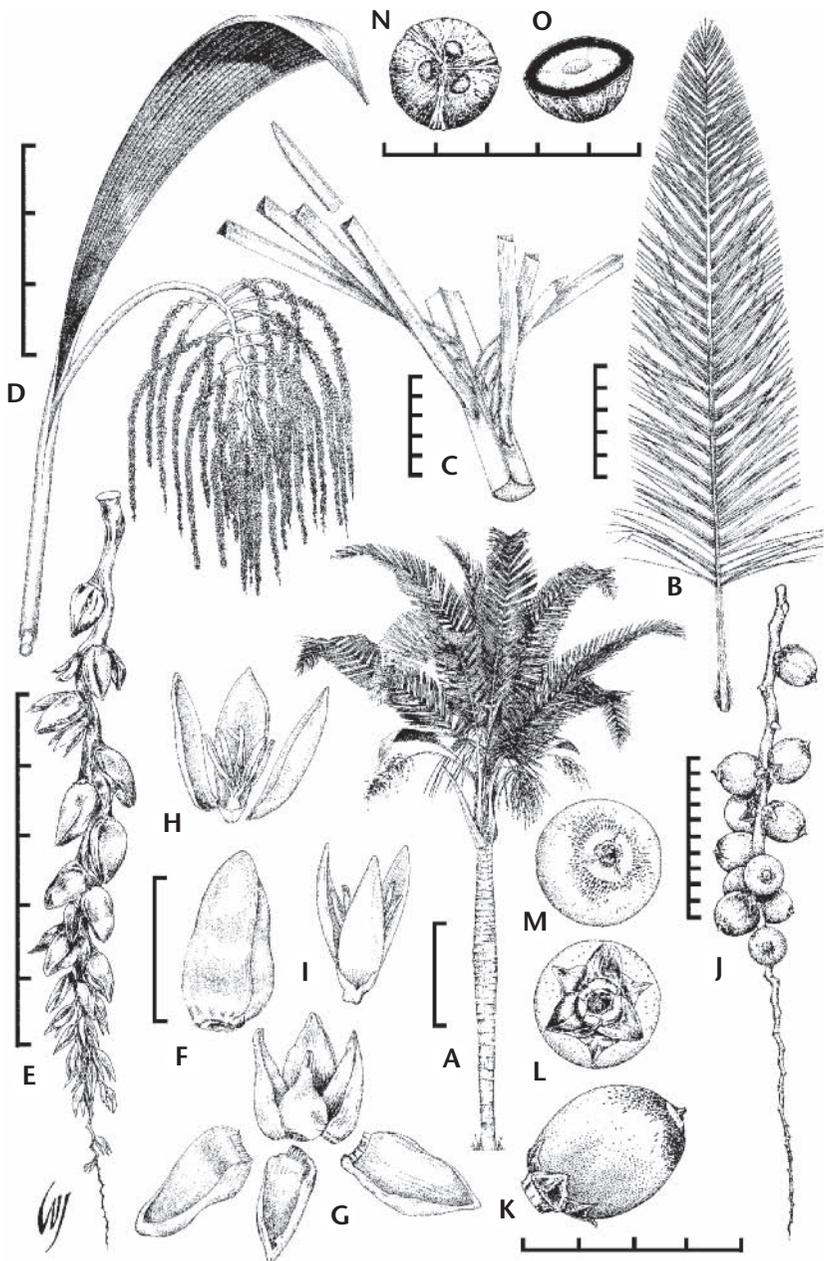
**OTHER SPECIMENS EXAMINED:** BRAZIL, Espírito Santo, Santa Teresa, *H.B. Fernandes 2088* (MBL); São Gabriel da Palha, *H. Lorenzi et al 5018* (HPL).

**NOTES:** This palm is referred to as *Syagrus* sp. nov. 2 in the last edition of *Palmeiras Brasileiras* (Lorenzi 2004). Both *S. picrophylla* and *S. lorenzoniorum* are rock loving palms. Some key identifying characters that separate *S. lorenzoniorum* from the closely related *S. picrophylla* with which it has long been confused are: a slower growing tree with a slightly swollen trunk, more strongly ascending leaves, a shorter (0–2 cm vs. 13 cm) true petiole, the presence of ramenta on the base of the abaxial veins (absent in both *S. picrophylla* and *S. kellyana*), a long pendant inflorescence and nearly globose (vs. ovate or elliptical) fruits with roundish endocarps or nuts, rather than ellipsoid or fusiform endocarps.

**NEW SUBTERRANEAN TO SHORT-STEMMED SPECIES**

***Syagrus allagopteroides*** Noblick & Lorenzi, **sp. nov.**, palma acaulis, usque ad 50 cm alta, foliis *Allagopteram* simulantibus, foliolis effusis 3–4 aggregatis, inflorescentia spicata. *S. petraeae* affinis sed valde anatomia foliolorum dissimili cum fasciculis vascularibus parvis prope adaxialem et abaxialem paginam et uno magno filo fibrarum differt. **Typus:** BRAZIL, Bahia, São Desiderio, on the BA 463 highway that connects the city of São Desiderio to the BR-020 highway, ca. 7 km from the last round about, coordinates: 12°49'55.3"S, 45°53'09.7" W, 840 m. 13 Dec. 2009, *H. Lorenzi, K. Soares & R. Campos 6792* (holotypus HPL; isotypi R, SP, BHCB, CEPEC, UB, NY, FTG, K, AAU). Fig. 4.

Palm with stem generally solitary, short or subterranean ca. 4 cm diam., the whole palm



3. *Syagrus lorenzoniorum*: A. Habit; B. Leaf; C. Leaflets; D. Inflorescence; E. Portion of a primary branch with flowers; F-G. Pistillate flowers; H-I. Staminate flowers; J. Primary branch of an infructescence; K-M. Fruit with basal and apical view; N-O. Endocarp endview showing pores and x-section showing interior cavity. A-D drawn from images taken by L.R. Noblick, E-L drawn from *R. Tsuji et al. 2713*. All scales are in centimeters except A which is in meters and B and D which are in decimeters.

less than 50 cm in height. Leaves 2-8 in the crown; sheath 6-14 cm long; pseudopetiole with nearly smooth to fibrous margins, 6-22 cm long, true petiole 5-16 × 0.5-1.0 cm; rachis 23-52 cm long; leaflets 21-47 along each side of the rachis, linear, stiff, green on both sides of the leaflet to glaucous on the abaxial side, with long acuminate and asymmetrical apex,

often rounded on one half, distributed irregularly in clusters of 2-4 and inserted in various planes, basal leaflets 11 × 0.2 cm, middle leaflets 12-20 × 0.8-2.6 cm, and apical leaflets ca. 10 × 0.3 cm. Inflorescence erect and spicate or branched, with peduncle 8-22 (-46) × 0.4-0.6 cm; prophyll 5.0-14.5 × 1-3 cm; peduncular bract 10-32 cm long,

expanded 7–20 × 1.2–4.5 cm; inflorescence axis 6–17 cm long, rachis 0–5 cm long with 1–6 primary branches 3–19 cm long; **staminate flowers** 9 × 4 mm, sepals 1.5 × 1 mm, glabrous, keeled and briefly connate at the base, petals 7–8 × 3 mm with acute tips, nerves indistinct to slightly raised, stamens 3 mm long, anther 1.5–2.0 mm long, filaments 1.0–1.5 mm long, basal **pistillate flowers** elongate conical, glabrous, 12–13 × 8 mm (apical flowers 11 × 6 mm), sepals imbricate 10–12 × 5–6 mm, petals glabrous, imbricate at the base but slightly valvate at the tips, 10–11 × 4–6 mm, pistil with white pubescence on the lower third, 7.5 × 4.0 mm diam., stigmas 3, 2.5 mm long, staminodial ring ca. 2 mm high, 6-dentate. **Fruits** ovoid, ca. 2.2–3.3 × 1.8–2.2 cm with fibrous-fleshy mesocarp, endocarp 2.4–3.1 × 1.4 cm and 1.5–2.2 mm in thickness. Seed ca. 1 cm diam. with no internal cavity.

COMMON NAME : *huri-falso*.

ETYMOLOGY: The specific epithet "*allagopteroides*" means like or similar to *Allagoptera* and refers to how similar the leaves of this palm are to leaves of palms in the genus *Allagoptera*.

DISTRIBUTION AND ECOLOGY: It is endemic to the state of Bahia (Serra Geral de Goiás), Goiás and Minas Gerais, in low shrubby to sparsely vegetated *cerrado*, generally in fine, light brown to reddish sandy soils sometimes mixed with iron rich rocks usually above 600 m elevation in a very flat or undulating terrain and often associated with *Astrocaryum campestre* and *Attalea barreirensis*. It has been collected from directly west of Barreiras, Bahia to Formoso, Minas Gerais and near Posse, Goiás. Its survival is threatened by the soybean plantations in western Bahia.

PHENOLOGY: Flowering in June.

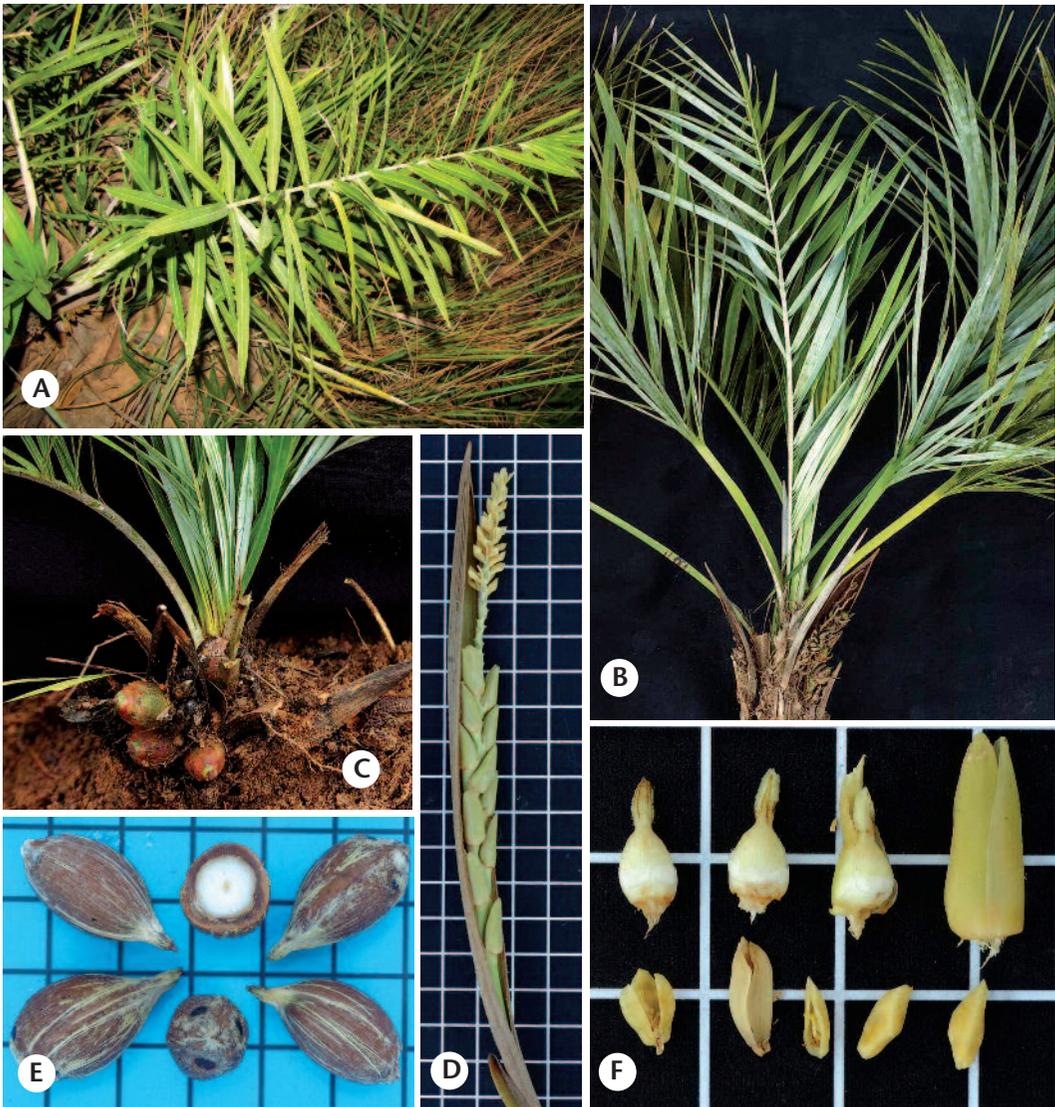
OTHER SPECIMENS EXAMINED: Brazil, Bahia, Municipio of Barreiras, *Noblick & Lima 4665* (BAH, CEPEC, CPATSA, F); *Noblick & Lima 4669* (ALCB, CEPEC, CPATSA, F, K, U); Municipio of Côcos, *Noblick & Lima 4652* (CAS, CEPEC, CPATSA, F); Municipio of Correntina, *Noblick & Lima 4655* (F); locality called Rosário, 13°56'27.1"S 46°11'40.2"W, *H. Lorenzi 6642* (HPL); Municipio of São Desidério, Roda Velha, *Medeiros-Costa et al. 261* (CPATSA); 12°22'S 44°58'W, 24 Oct 1988, *Noblick & Lima 4659, 4660* (CPATSA, F, FTG), *4662* (CEPEC, CPATSA, F, FTG); Minas Gerais, Formoso, 14°56'15.6"S 46°14'28.2"W, *H. Lorenzi 6640* (HPL).

NOTES: A small leaved, acaulescent palm with tightly clustering leaflets that are displayed

somewhat like that of an *Allagoptera* and a spicate inflorescence. We first collected this palm several times throughout western Bahia in the 1980's, but dismissed it as another growth form of *S. petraea*. However, after having the opportunity to examine Bolivian material of *S. petraea*, we found that its leaflet anatomy is significantly different than the true *S. petraea* from Bolivia, having a very large marginal fiber strand (absent in *S. petraea*) and many small vascular bundles along the upper and lower surface of the leaf (vs. only along the lower surface of the leaf in *S. petraea*).

**Syagrus angustifolia** Noblick & Lorenzi, **sp. nov.**, palma humilis, acaulis, foliolis angustis et plerumque inflorescentiis multiplis; *S. graminifoliae* similis sed caespe maiore et brevior, rachillis et floribus unilateraliter dispositis, rachillis brevioribus et congestioribus, fructibus ellipsoideis angustioribus differt. Typus: BRAZIL, Minas Gerais, João Pinheiro, collected on the road towards Brasilândia de Minas (km 167), 41 km from João Pinheiro, 17°21'17.8"S, 46°04'29.6"W (altitude: 820 m). 4 Mar 2009. *H. Lorenzi, R. Pimenta & R. Campos 6636* (holotypus HPL; isotypi R, SP, BHCB, NY, K). Fig. 5.

Palm less than 50 cm tall, stem clustering and very short or subterranean. **Leaves** 3–7 in the crown; sheath 13–15 cm long, pseudopetiole 17–20 cm long with fibrous and smooth margins; true petiole ca. 13–14 cm long, rachis 29–45 cm long, whitish indument covering the abaxial surface of the pseudopetiole and rachis and even the margins of some of the lower leaflets; leaflets 16–21 along each side of the rachis, distributed irregularly in clusters of 2 and inserted in different planes, lanceolate, medium green, glabrous on both sides, except for the tomentum already mentioned on the lower leaflets, with acuminate and asymmetrical apex, basal leaflets ca. 10–12 × 0.1–0.2 cm, middle leaflets 18–22 × 1.0 cm, and apical leaflets 18–19 × 0.4 cm. **Inflorescence** spicate or unilaterally branched with peduncle, glabrous to covered with a thin white indument, 14–18 cm long; prophyll 8–13 × 1.0–2.5 cm; peduncular bract covered with a white to grayish white indument on its exterior, 20–30 cm long, the expanded part 11–22 × 2.7–6.0 cm; inflorescence axis 7–18 cm long, rachis 2–10 cm long with 1–8 primary branches measuring 3.5–11 cm long; **staminate flowers** 6.0–11.5 × 4 mm, sepals 1.0–2.5 × 1.0–1.3 mm, glabrous, keeled and connate at the base, petals sometimes 4 on the



4. *Syagrus allagopteroides*: A. Leaf showing the *Allagoptera* form leaf; B. Habit with an inflorescence; C. Inflorescence; D. Spicate inflorescence; E. Endocarps; F. Pistil and pistillate flowers above and staminate flowers below. All grids are in centimeters.

basal flowers 10–11 × 2.0–2.5 mm with acute tips (apical flowers 4.5–6.0 mm long), nerves indistinct to slightly raised, stamens 3–4 mm long, anther 2.5–3.0 mm long, filaments 1.5–2 mm long, basal **pistillate flowers** elongate pyramidal, glabrous, 14–15 × 7 mm (apical flowers 11 × 5–6 mm), sepals imbricate 8.5–9.0 × 4–5 mm, petals glabrous, imbricate at the base but slightly valvate at the tips, 9–10 × 2.5–3.0 mm, pistil glabrous, 8 × 4 mm, stigmas 3, 2 mm long, glabrous, staminodial ring ca. 1.0–1.5 mm high, 6-dentate. **Fruits** ellipsoid 3.0–3.5 × 1.5 cm, reddish brown, endocarp hard, 2.2–2.9 × 0.8–1.1 cm and 0.8–1.5 mm thick containing a single seed. Seed 8–9 mm diam. with no internal cavity.

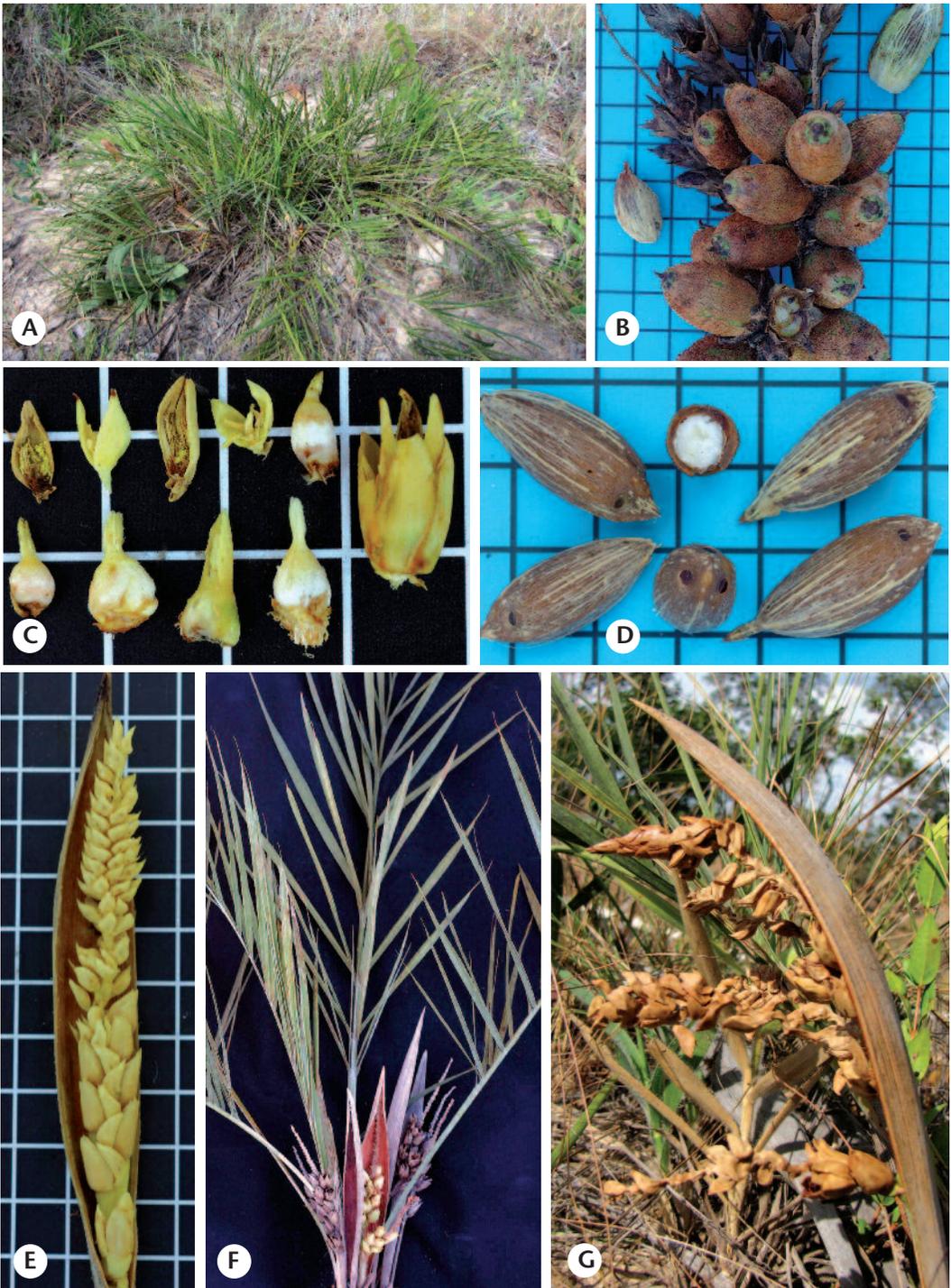
COMMON NAME : *coco-de-vassoura*.

ETYMOLOGY: The specific epithet "*angustifolia*" means narrow leaf, one of the characters that one first notices about this species.

DISTRIBUTION AND ECOLOGY: Endemic to the state of Minas Gerais, in open or sparsely vegetated *cerrado*, generally in fine grained, sandy soils (talcum powder-sized sand) of high altitude (ca. 800 m).

PHENOLOGY: Flowering with immature developing fruits in June.

NOTES: This is a low clustering acaulescent palm with narrow leaflets, often with multiple



5. *Syagrus angustifolia*: A. Habit in habitat; B. Infructescence; C. Flowers. The first four flowers in the top row are staminate, followed by a pistil and a pistillate flower. The second row are all pistils, however the third one still has the petals attached; D. Endocarps; E. Spicate inflorescence; F. Crown with inflorescences showing leaf shape; G. Older branched inflorescence. All grids are in centimeters.

inflorescences, but similar to *Syagrus graminifolia*. However this species has larger and shorter caespitose clumps than *S. graminifolia*, with unilaterally arranged

rachillae and flowers, and with shorter and more closely spaced primary branches and with more congested flowers, and with a narrower ellipsoid fruit and endocarp.

***Syagrus caerulescens*** Noblick & Lorenzi, **sp. nov.**, palma foliis *Allagopteram* simulans, desuper saturate viridis, inferne pruina glauca obtecta, inflorescentia spicata brevi, bractea pedunculari concava 4–6 cm lati. Typus: BRAZIL, Goiás, Município of Alto Paraíso de Goiás on the GO-118 highway to Teresina de Goiás on a side road to the right [East side], 5 km from the town of Alto Paraíso, towards the locality of Cachoeira dos Cristais, a little more than 500 m from the GO-118 highway, in a grassy field with sandy soil. 14°05'17.0"S 47°30'59.7"W. Altitude of 1,370 m, in a region called the "Chapada dos Veadeiros". 7 Mar 2009. *H. Lorenzi, R. Pimenta e R. Campos 6649* (holotypus HPL; isotypi R, SP, UB, NY, K). Fig. 6.

Palm with stem generally solitary, short or subterranean. **Leaves** less than 1 m long and 2–4 (–6) in the crown; sheath 12–20 cm long; pseudopetiole with fibrous margins, 9–17 cm long, true petiole 6–14 cm long; rachis with white tomentum along the abaxial side, 53–87 cm long; leaflets 40–56 along each side of the rachis, linear, stiff coriaceous, dark green on the upper surface and bluish green on the lower, with acute and asymmetrical apex, distributed irregularly in clusters of 2–3 and inserted in various planes, basal leaflets measuring 12–22 × 0.1–0.4 cm, middle leaflets 13–24 × 1.0–1.9 cm, apical leaflets 4.5–6 × 0.2–0.5 cm. **Inflorescence** erect and mostly spicate or rarely branched, with peduncle 11–14 cm long × 0.5–0.8 cm in diameter; prophyll 8–12 × 1.8–3 cm long; peduncular bract 17–20 cm long, expanded part 8–15 × 4–6 cm; inflorescence axis 8–10 cm long, rachis absent with 1 terminal primary branch 8–10 cm long; **staminate flowers** 13.6–15.7 × 6.0–8.3 mm, sepals 1.4–2.1 × 1.1 mm, glabrous, keeled and connate at the base, petals 12.0–13.6 × 2.8–4.3 mm with acute tips, nerves indistinct to slightly raised, stamens 6.4–8.0 mm long, anther 4.3–6.4 mm long, filaments ca. 1.5 mm long; basal **pistillate flowers** elongate conical, glabrous, ca. 11 mm long and 10 mm wide, sepals imbricate 10 × 9.3 mm, petals glabrous, imbricate at the base but slightly valvate (to 4 mm) at the tips, 9 × 6.7 mm, pistil slightly lepidote, 8.6 × 5 mm diam., stigmas 3, less than 3 mm long, glabrous, staminodial ring ca. 1 mm high, 6-dentate. **Fruits** ovoid, 2.0–2.5 × 1.5–2.0 cm, epicarp reddish brown lepidote and with fibrous-fleshy mesocarp, endocarps nearly globose to obovate 1.2–1.5 × 1.2–1.3 cm and 0.8–1.3 mm thick.

COMMON NAME : *palmeirinha-azul*

**ETYMOLOGY:** The specific epithet means bluish which reflects its common Brazilian name "*palmeirinha-azul*" or little blue palm.

**DISTRIBUTION AND ECOLOGY:** This species is endemic to the state of Goiás in the rocky, sandy soils of the *campo rupestre* vegetation of the Chapada dos Veadeiros.

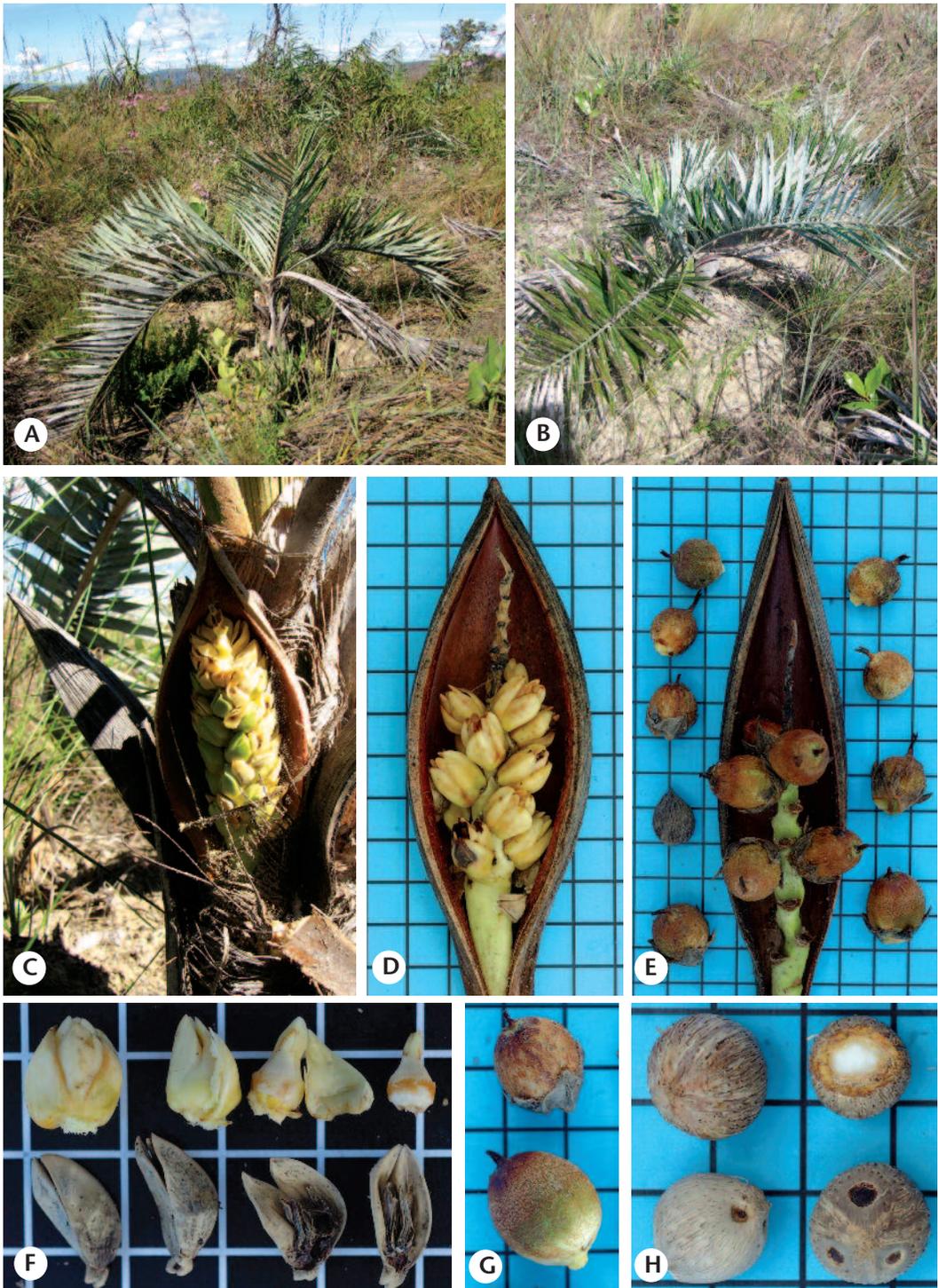
**PHENOLOGY:** It was flowering in July, but no fruits were present.

**OTHER SPECIMENS EXAMINED:** Brazil, Goiás, Município de Alto Paraíso de Goiás, *R. Tsuji & E. Franco 2622* (HPL).

**NOTES:** The attractive bluish color of the palm is due to the thick waxy bluish coating on the lower side of its leaves. It frequently has a low number of leaves, but this may be due to having to recover from the frequent fires that sweep across its habitat. Its leaflet anatomy is most similar to *S. rupicola*, but it has thinner leaflets, a much thinner epidermis and more numerous small vascular fibers along the abaxial surface of its leaflets. It differs further from *S. rupicola* by being smaller in stature with leaves that are blue on the lower surface and green on the upper surface, rather than silvery-blue on both surfaces.

***Syagrus cerqueirana*** Noblick & Lorenzi, **sp. nov.**, Palma solitaria vel caespitosa, acaulis, foliolis angustis, inflorescentia unilateralis; *S. petraeae* similis sed inflorescentia ramosa (non spicata) et et anatomia foliolorum dissimili differt. Typus: BRAZIL, Mato Grosso do Sul, Ponta Porã, collected on the road to Antonio João near the fiscal post Aquibadã, located 21 km from Ponta Porã. 22° 21' 54.7"S; 55° 43' 59.5"W, altitude: 680 m. 8 Sept. 2008. *H. Lorenzi & M. Pinho 6514* (holotypus HPL; isotypi R, SP, CGMS, NY, K). Fig. 7.

Palm solitary or caespitose, less than 1 m tall, with short or subterranean stem. **Leaves** medium-green, 5–9 per stem; sheath 15–30 cm long, pseudopetiole 13–23 cm long, true petiole 7–24 cm long, both with smooth margins; rachis is 43–75 cm long; leaflets 28–62 on each side of the rachis, linear with long acuminate and asymmetric to bifid apex, arranged in clusters of 2–3 along the rachis, basal leaflets measuring 19.0–28.5 × 0.4–0.7 cm, middle leaflets, 20–33 × 0.5–1.2 cm, and apical leaflets 7.5–22.0 × 0.1–0.3 cm. **Inflorescences** erect and branching; peduncle 4–9 cm long; prophyll 8–14 × 2.2–2.5 cm; peduncular bract 18–27 cm long, the expanded portion 13–18 × 2.3–3.0 cm; inflorescence axis 13–24 cm long, rachis 2–9 cm long with 4–12



6. *Syagrus caerulea*: A. Habit; B. Leaf with a greenish upper and bluish lower surface; C. Inflorescence on the plant; D. Spicate inflorescence, showing the pistillate flowers and thickish bract; E. Inflorescence; F. Pistillate flowers and pistil above and older staminate flowers below; G. Fruits; H. Endocarps. All grids are in centimeters.

primary branches 6–15 cm long; **staminate flowers** 7–8 × 3–5 mm, sepals 2.5 × 1.0–1.5 mm, glabrous, keeled and very briefly connate

at the base, petals 4 × 1.0–1.3 mm with acute tips, nerves indistinct to slightly raised, stamens 3 mm long, anther 1.5–2.0 mm long,

filaments 1.5 mm long, basal **pistillate flowers** elongate conical, glabrous, 12.0–12.5 × 7.5 mm (apical flowers 10.0 × 6.5 mm), sepals imbricate 10–12 × 5 mm, petals glabrous, imbricate at the base but (upper 4–5 mm) slightly valvate at the tips, 11 × 4–5 mm, pistil glabrous, 9 × 4 mm in diameter, stigmas 3 in number, and 4 mm long, glabrous, staminodial ring ca. 1 mm high and 6-dentate. **Fruits** ovoid, brownish-yellow, 2.3–3.5 × 1.2–2.2 cm, containing a fibrous-fleshy mesocarp, endocarp 1.8–2.2 × 0.8–1.1 cm and 0.8–1.5 mm thick, seed and endosperm with no central cavity.

COMMON NAME : *acumã-mirim*.

ETYMOLOGY: This palm is named in honor our mutual friend and palm enthusiast, Luiz Sergio Coelho de Cerqueira of Pará, who aided both of us while doing palm research in the Amazon region and due to his untimely death will be sorely missed.

DISTRIBUTION AND ECOLOGY: Paraguay and in the Brazilian states of Mato Grosso do Sul and maybe São Paulo, in *cerrado*, generally in sandy to rocky clay soils. At this writing, it is one of two acaulescent *Syagrus* in Paraguay, the other being *S. lilliputiana*. All other closely related acaulescent palms are in the genus *Butia*.

PHENOLOGY: Flowering specimens seen in June.

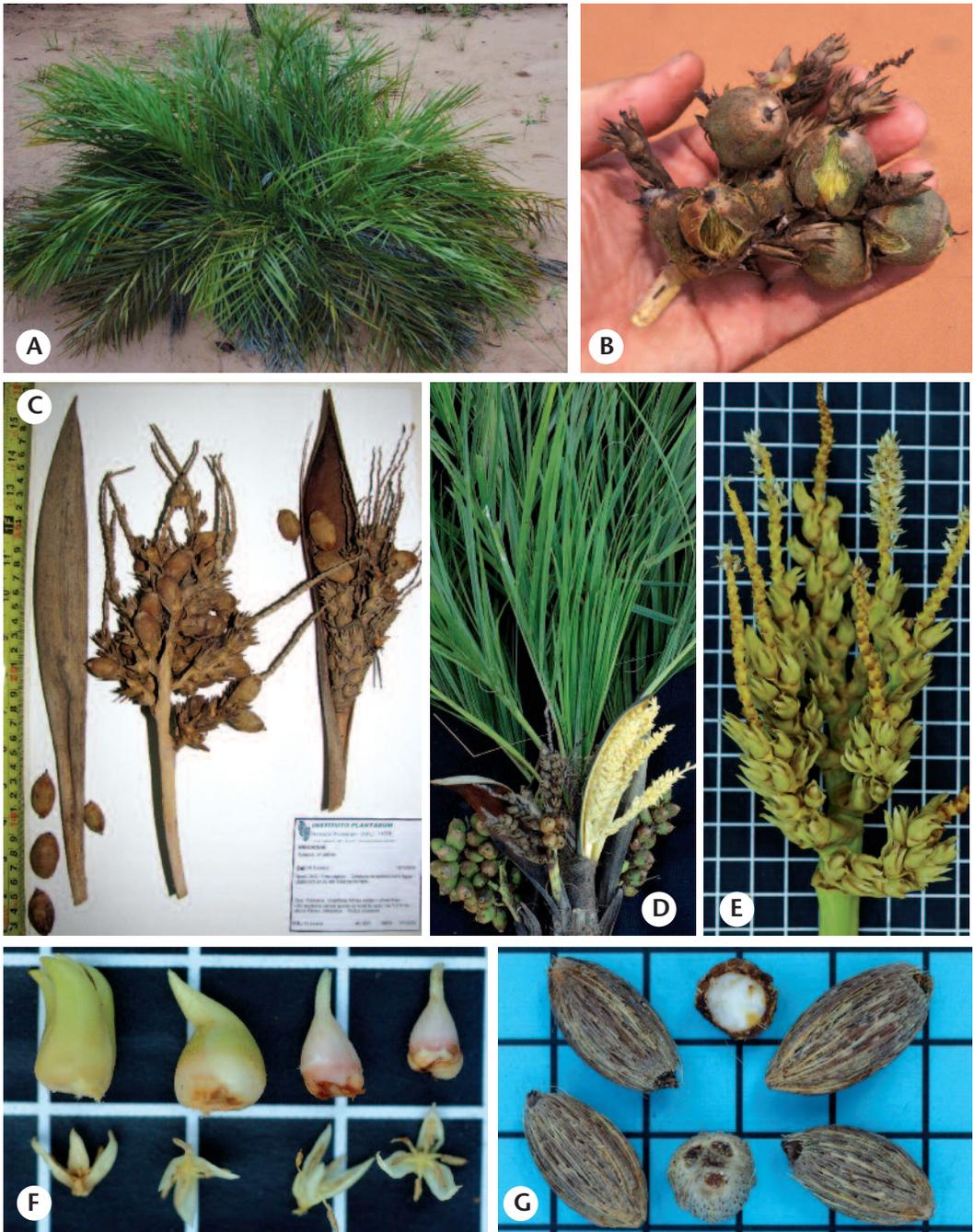
OTHER SPECIMENS EXAMINED: BRAZIL, Mato Grosso do Sul, Ponta Porã, R. Tsuji & E.R. Salviani 1029 (HPL); H. Lorenzi 6512 (HPL); Três Lagoas, H. Lorenzi et al 6577 (HPL); H. Lorenzi et al 6578 (HPL); PARAGUAY, Amambay, Cerro Cora National Park, 22°39'35.1"S 56°1'37.7"W, Noblick et al. 5126 (FTG, PY).

NOTES: In Paraguay, Larry collected this plant and identified it as *S. petraea*, because it was identified as such in all of the local herbaria; however, it did not look like the plants of *S. petraea* that he had collected elsewhere in Brazil, so he suspected that it may not be identified correctly. Suspicions were confirmed when he had the opportunity to compare the leaflet anatomy of this plant to Bolivian material collected from the type locality and discovered that it was different. *Syagrus cerqueirana* has small vascular bundles on both the upper and lower surface of the leaf and very few nonvascular fibers on either surface, while *S. petraea* from Bolivia has small vascular fibers only along the lower surface and an abundance of nonvascular fibers along the upper surface. *Syagrus cerqueirana* has leaflet

anatomy similar to *S. allagopteroides* which grows above 600 m in Bahia, Goiás and Minas Gerais, but it is a larger plant with a leaf rachis measuring 43–75 vs. 23–52 cm and middle leaflets measuring 20–33 vs. 12–20 cm. Also *S. allagopteroides* tends to be solitary, but *S. cerqueirana* tends to be caespitose.

***Syagrus gouveiana* Noblick & Lorenzi sp. nov.**, *S. evansianae* affinis sed foliis pallidioribus viridibus et concoloribus, floribus plerumque ut in quadratis dispositis, partibus floris tetrameris differt. *Typus*: BRAZIL, Minas Gerais, Municipio de Gouveia, collected on the Gouveia/Curvelo road 20 km from Gouveia [km 479 on BR-259], S18°35'12.6", W43°53'44.8", 1269 m [ca. 1200–1270 m] altitude. 14 Nov 2008, H. Lorenzi 6537 (holotypus HPL; isotypi R, SP, BHCB, NY, K). Fig. 8.

Palm solitary, less than 1 m in height, with a very short or subterranean stem. **Leaves** arching, with 3–4 in the crown, less than 1 m long and the general coloration medium to light green; sheath 12–26 cm with fibrous margins, pseudopetiole 16–31 cm long; petiole smooth 2–8 cm long; rachis 42–75 cm long; leaflets 30–60 along each side, linear, rigid-coriaceous with apex acute or rounded and asymmetric, concolorous, distributed irregularly in clusters of 2–3 and inserted at different angles along the rachis, basal leaflets measuring 9–26 × 0.2–0.6 cm, middle leaflets 18–25 × 1.2–2.0 cm, apical leaflets 6–14 × 0.3–0.7 cm. **Inflorescences** erect and spicate to branched; peduncle 17–28 cm long; prophyll 9–17 × 1.5–3.5 cm long; peduncular bract 28–47 cm long, expanded part 14–24 × 4–6 cm; inflorescence axis 8–15 cm long, rachis 0–5 cm, with 1–6 primary branches 5–11 cm long; flowers usually arranged in triads, but frequently arranged in groups of four with two central pistillate flowers each of which is flanked on one side by one staminate flower, both staminate and pistillate flowers frequently have 4 sepals and petals instead of the normal 3, **staminate flowers** 12–14 × 5–7 mm, sepals 2–3 × less than 1 mm, glabrous, keeled and connate at the base, petals 10 × 3–4 mm with acute tips, nerves indistinct to slightly raised, stamens 4.5–5.0 mm long, anther 4 mm long, filaments 1.5 mm long; basal **pistillate flowers** elongate conical, glabrous, 13–15 × 5–6 mm (apical flowers ca. 10 × 4 mm), sepals imbricate 14–15 × 5–6 mm, petals glabrous, imbricate at the base but slightly valvate (upper 3–5 mm) at the tips, 11–13 × 4–5 mm, pistil glabrescent, 8–9 × 4–5



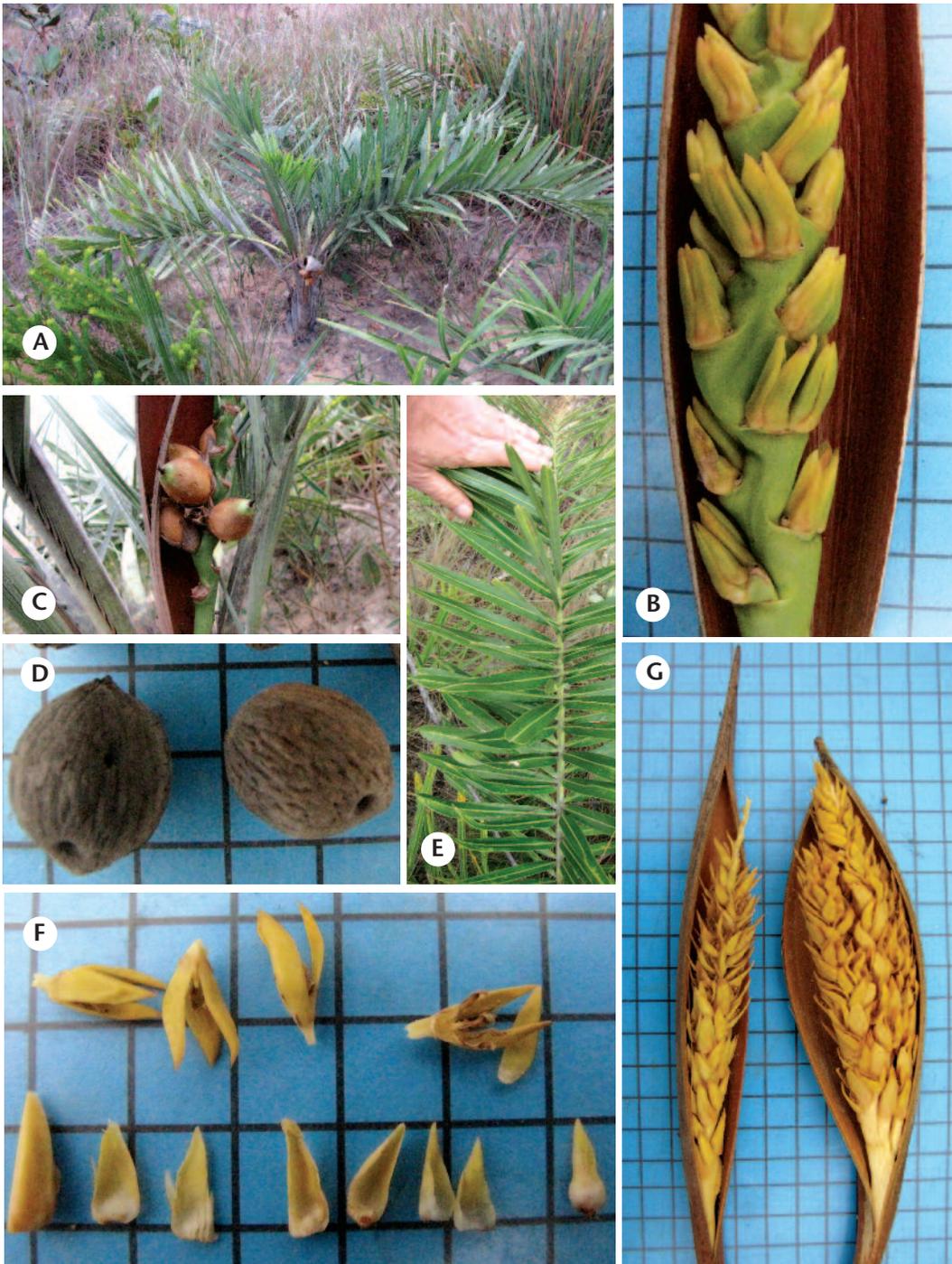
7. *Syagrus cerqueirana*: A. Habit; B. Infructescence, Noblick *et al.* 5126; C. Herbarium sheet showing unilateral infructescence, H. Lorenzi 6577; D. Close up of inflorescence and infructescence on the plant; E. Inflorescence with pistillate flowers; F. Pistillate flowers and pistils above and staminate flowers below; G. Endocarps. All grids are in centimeters.

mm diam., stigmas 3, 3–4 mm long, staminodial ring ca. 2 mm high and 6-dentate. **Fruits** globose, yellowish brown, 1.7–2.1 cm diam., with a fibrous-fleshy (pulpy) mesocarp. Endocarp 1.9–2.2 × 1.5–1.7 cm.

COMMON NAME : *coquinho-da-pedra*.

**ETYMOLOGY:** Named for the closest town to the place of its discovery, Gouveia, Minas Gerais.

**DISTRIBUTION AND ECOLOGY:** Occurs in the state of Minas Gerais in the Cadeia do Espinhaço region, in high altitude *campo rupestre* or *cerrado*, generally in well-drained rocky terrain.

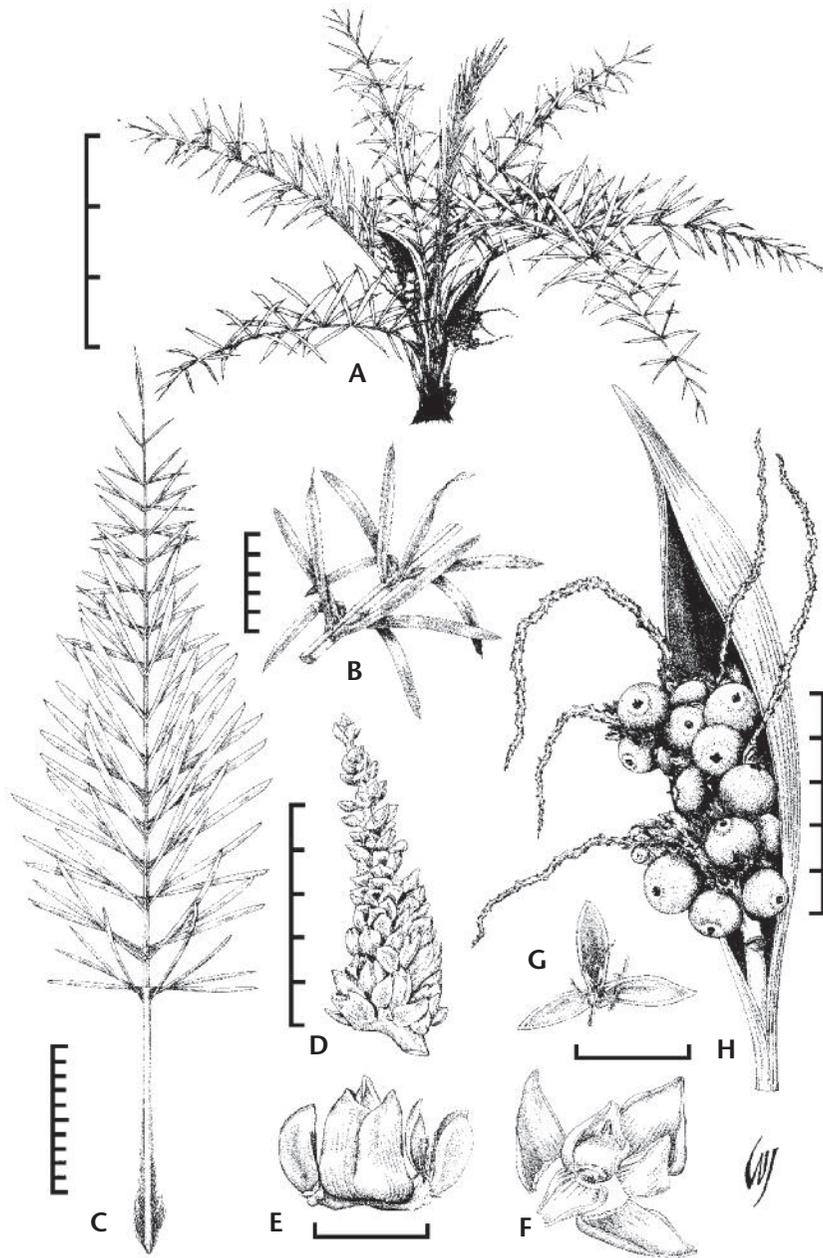


8. *Syagrus gouveiana*: A. Habit; B. Inflorescence with two sets of pistillate flowers part of a quadrad; C. Infructescence on the plant; D. Endocarps; E. Close-up of leaf showing concolorous leaflets; F. Staminate flowers above and dissected 4 parted pistillate flower below including the pistil with its fourth petal still attached; G. Spicate and branched inflorescence. All grids are in centimeters.

**PHENOLOGY:** Flowering with some immature fruit in June.

**NOTES:** A small acaulescent palm with coriaceous, concolorous leaves, usually spicate and sometimes branched inflorescences, often

with flowers in groups of 4 instead of the normal triad or with 4 sepals and 4 petals instead of the normal 3, these are characters that set this species apart from anything else in the region.



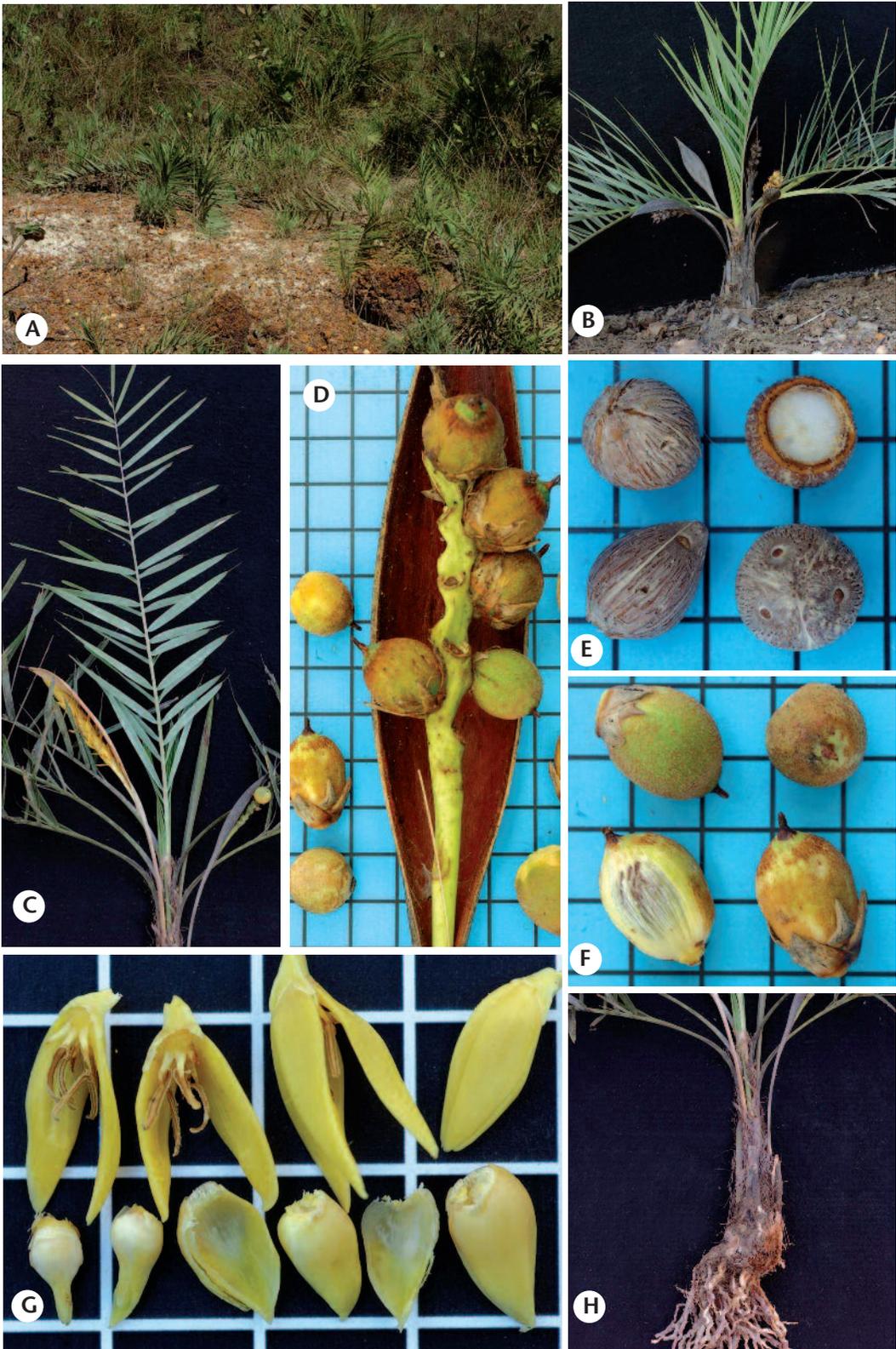
9. *Syagrus itacambirana*: A. Habit; B. Leaflets; C. Leaf; D. A primary branch with flowers; E. Triad with central pistillate flower flanked by two staminate flowers; F. Pistillate flower; G. Staminate flower; H. Inflorescence. A–F drawn from images taken by L.R. Noblick and H. Lorenzi, E–L drawn from R. Tsuji *et al.* 2691. All scales are in centimeters except A which is in decimeters.

***Syagrus itacambirana*** Noblick & Lorenzi, *sp. nov.*, Palma acaulis, foliis 5–9 saturate viridibus, concoloribus, foliolis 25–38, rhachide 24–46 cm longa et fructibus globosis.

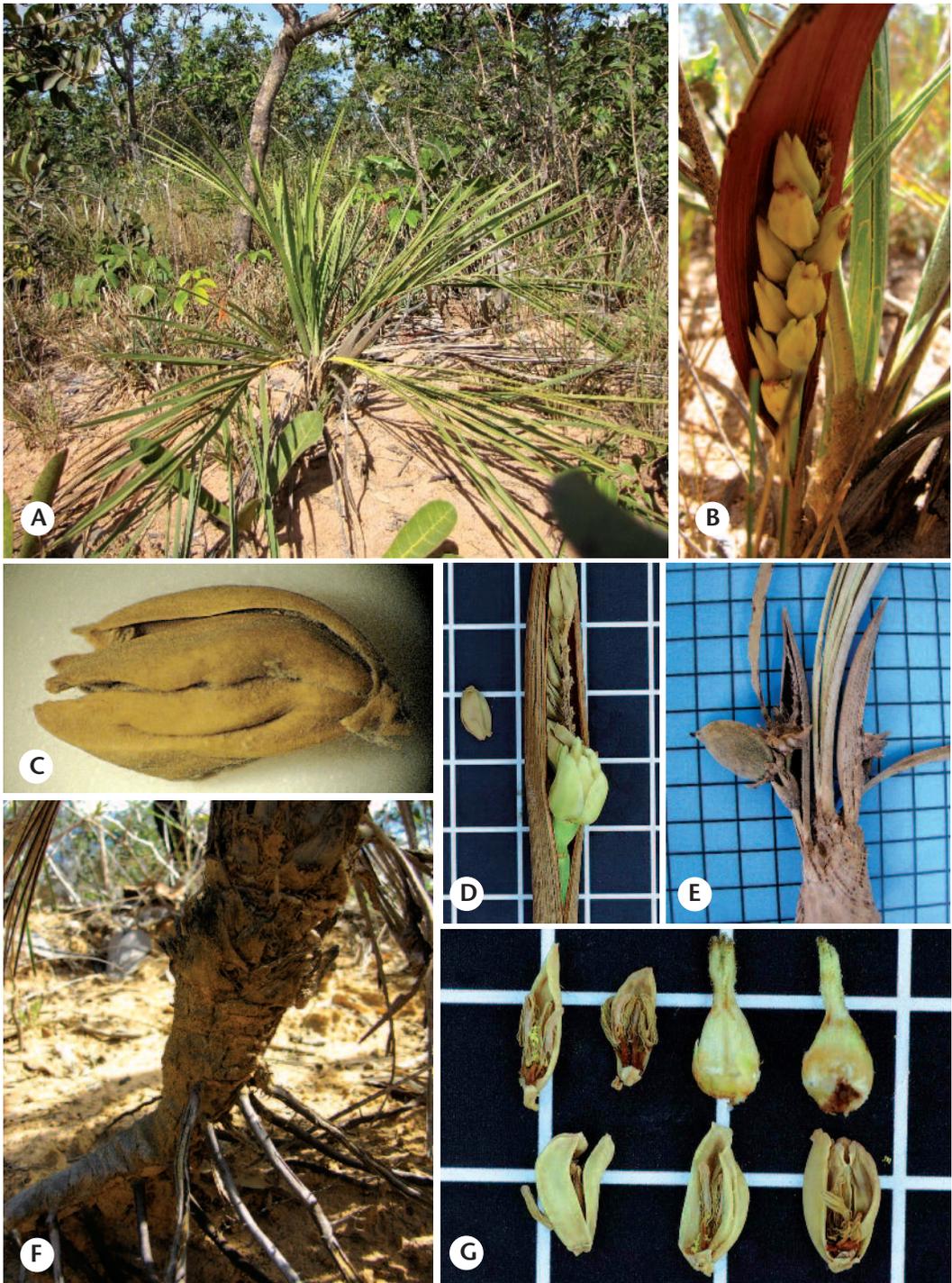
Typus: BRAZIL, Minas Geras, Municipio of Juramento, collected on the Juramento/Itacambira road between Juramento and Itacambira on the right [southside], in the interior of an *Eucalyptus* planting, 27 km east

of Juramento, 16°57'20.9"S, 043°28'11.4"W, altitude 1220 m, 20 JUN 2008, R. Tsuji, H. Lorenzi, L. Noblick *et al.* 2706 (holotypus HPL; isotypi R, SP, BHCN, NY, K). Fig. 9.

Palm less than 50 cm tall, stem caespitose or solitary, very short or subterranean. Leaves 5–9 in the crown; sheath ca. 10–15 cm long; pseudopetiole 9–19 cm long with fibrous and smooth margins; true petiole 7–15 × 0.7–1.0



10. *Syagrus longipedunculata*: A. Palms in habitat; B. Habit with infructescences; C. Discolorous leaf with inflorescence and infructescence; D. Infructescence; E. Endocarps; F. Close-up of fruits; G. Staminate flowers above and dissected pistillate flower below; H. Underground stem. All grids are in centimeters.



11. *Syagrus minor*. A. Habit; B. Inflorescence with pistillate flowers; C. 4 parted staminate flower; D. Inflorescence; E. Infructescence; F. Underground stem; G. Two staminate flowers and two pistils above and staminate flowers below. All grids are in centimeters.

cm by 0.3–0.4 cm thick, rachis 24–46 cm long; leaflets, 25–38 along each side of the rachis, distributed irregularly in clusters of 2–5 and inserted in different planes, lanceolate, dark-green, glabrous on both sides, with acute and

asymmetrical apex; basal leaflets measuring 10–14 × 0.5–0.7 cm, middle leaflets 10–19 × ca. 0.5–1.8 cm, apical leaflets 3–6 × 0.1–0.3 cm. **Inflorescences** with peduncle glabrous, 6–14 cm long, somewhat flattened in cross-section,

0.5–1.0 × 0.3–0.7 cm diam.; prophyll ca. 8 × 1.5 cm; peduncular bract 20–30 cm long, the expanded part 12–22 × 2.7–6 cm; inflorescence axis 7–18 cm long, rachis 2–10 cm long with (1–) 3–8 primary branches measuring 3.5–11 cm long; **staminate flowers** 8–9.5 × 4–4.5 mm, sepals 1–1.5 × 1–1.5 mm, glabrous, keeled and connate at the base, petals 7.5 × 3.5 mm with acute tips, nerves indistinct to slightly raised, stamens 2.4–3.5 mm long, anther 1.7–2.5 mm long, filaments ca. 1.4–1.5 mm long, basal **pistillate flowers** elongate pyramidal, glabrous, 9–10 mm × 6–7 mm, sepals imbricate 8–9 mm × 4–5 mm, petals glabrous, imbricate at the base but slightly valvate at the tips, 9.5 mm × 5 mm, pistil glabrous, 7 mm × 3.5–4.0 mm, stigmas 3, 2.5–3.0 mm long, staminodial ring ca. 3 mm high, 6-dentate. **Fruits** globose, green when mature, 1.8–2.5 × 2.1–2.7 cm, with a fleshy-fibrous (pulpy) yellowish mesocarp ca. 3 mm thick, endocarp ca. 2.5 mm thick, ca. 1.5–1.7 × 1.1–1.4 cm with suture lines visible at the base but obscured at the apex. Seed nearly globose ca. 7 mm diam. with no internal cavity.

COMMON NAME : *palmeira-de-vassora*.

ETYMOLOGY: This palm is named for the município close to where it was collected, Itacambira, Minas Gerais.

DISTRIBUTION AND ECOLOGY: This palm is endemic to the state of Minas Gerais, in the Cadeia do Espinhaço, generally in rocky, sandy soils of high altitude *cerrado* or *campo rupestre*. One of the few known surviving populations was discovered in a *Eucalyptus* plantation along the road between Juramento and Itacambira. Another population was discovered in a *cerrado* region just south of Montes Claros, but with spicate inflorescences.

PHENOLOGY: Immature fruits can be found in June. In cultivation mature fruits were present in September.

NOTES: This is a small, acaulescent palm with branched inflorescences, globose fruit and tightly clustered, dark green, coriaceous, concolorous leaflets that are occasionally slightly twisted.

***Syagrus longipedunculata*** Noblick & Lorenzi, **sp. nov.**, palma caule subterraneo, foliis plerumque patentibus rachide usque ad 65 cm longa, foliolis medianis brevibus usque ad 19 cm longis, inflorescentia spicata plerumque longipedunculata usque ad 31 cm longa.

Typus: BRAZIL, Goiás, Niquelândia, collected on the road to Alto Paraíso, ca. 20 km from the

town of Niquelândia, coordinates: 14°28'1.7"S, 48°18'8.1"W; 530 m altitude, common, 12 Dec 2009, H. Lorenzi, K. Soares & R. Campos 6790 (holotypus HPL; isotypi R, SP, BHCB, NY, K). Fig. 10.

Palm erect, 40–60 cm tall, stem solitary, very short to 20–30 cm in height with a rhizome 6–14 × 5–6 cm. **Leaves** 3–6 in the crown; sheath ca. 12–14 cm long; pseudopetiole 8–14 cm long with fibrous and smooth margins; true petiole 7–11 × 0.6–0.9 cm by 0.5–0.7 cm thick, rachis 46–65 (–73) cm long; leaflets, 28–42 along each side of the rachis, distributed irregularly in clusters of 2–4 and inserted in different planes, lanceolate, grayish blue, glabrous on both sides, with acute and asymmetrical apex; basal leaflets measuring 9–16 × 0.7–1.1 cm, middle leaflets 10–19 × 0.7–1.2 cm, apical leaflets 8–15 × 0.5–0.9 cm. **Inflorescence** a spike with glabrous peduncle, 17–31 cm long, somewhat flattened in cross-section, 0.3–0.4 cm diam.; prophyll ca. 6–10 cm × 1.2–2.0; peduncular bract 25–41 cm long, expanded part 8–19 × 2.2–3.3 cm; inflorescence axis 8.0–15.5 cm long, rachis not measureable with 1 primary branch measuring 8–19 cm long; **staminate flowers** 14–18 × 4.5–7.0 mm, sepals 3.0–4.7 × 1.0–1.2 mm, glabrous, keeled and connate at the base, petals 12.4–16.0 × 2.9–3.5 mm with acute tips, nerves indistinct to slightly raised, stamens 5.3–6.0 mm long, anther 3.5–4.1 mm long, filaments ca. 1.2–1.8 mm long; basal **pistillate flowers** elongate conical, glabrous, ca. 11–12 × 5–6 mm, sepals imbricate 7–10 mm × 4.9–5.5 mm, petals glabrous, imbricate at the base but (upper 2–3 mm) slightly valvate at the tips, 7.5–8.2 mm × 3.5–4.7 mm, pistil glabrous, 6.5–7.1 mm × 3.5 mm, stigmas 3, 2.4–2.5 mm long, staminodial ring ca. 0.7–1.2 mm high, 6-dentate. **Fruits** globose or somewhat ellipsoid, green when mature with a little bit of indument on the epicarp, 2.0–2.3 × 1.3–1.7 cm, green, with a fleshy-fibrous (pulpy) mesocarp ca. 2–3 mm thick, endocarp ca. 1.5–1.7 × 1.0–1.3 cm, with suture lines visible at the base but obscured at the apex, ca. 0.8–1.0 mm thick. Seed nearly globose ca. 0.9–1.0 cm diam. with no internal cavity.

COMMON NAME : *ariri-mirim*.

ETYMOLOGY: The specific epithet "*longipedunculata*" means long peduncle and refers to the longer than normal peduncle seen in this acaulescent palm.

DISTRIBUTION AND ECOLOGY: This palm is endemic to the state of Goiás, in rocky,

gravelly, sandy clay soils of high altitude sparsely vegetated *cerrado* or *campo rupestre*. PHENOLOGY: Flowering and older fruits seen in December.

NOTES: This is a medium-sized acaulescent palm, normally with spicate inflorescences, globose fruit and a long pedunculate inflorescence and infructescence.

***Syagrus minor*** Noblick & Lorenzi, **sp. nov.**, palma minutissima, acaulis, foliis parvis, rachide 14–31 cm longa, 5–15 foliolis utroque, inflorescentiis spicatis 4.5–9.5 cm longis.

Typus: BRAZIL, Minas Gerais, Grande Sertão Veredas, collected on the road of the Parque [Nacional] do Grande Sertão Veredas, 15°25'26"S, 45°52'12.9"W, altitude 890 m. 4 Mar 2009. *H. Lorenzi, R. Pimenta & R. Campos 6639* (holotypus HPL; isotypi R, SP, BHC, NY, K). Fig. 11.

Palm less than 40 cm tall, stem solitary, very short or subterranean, 3.0–3.5 cm diam. **Leaves** arched, 3–5 in the crown, sheath 3.0–9.5 cm long, pseudopetiole with fibrous and smooth margins 8–18 cm long, petiole 3.5–9.0 cm long; rachis 14–31 cm long; leaflets 5–15 along each side of the rachis, distributed regularly or at times irregularly towards the base in clusters of 2 or rarely 3 and inserted along the rachis in nearly the same plane, lanceolate, dark-green, glabrous on both sides, with acute and rounded asymmetrical apex, basal leaflets 7–20 × 0.2–0.5 cm, middle leaflets 14.5–30.0 × 0.6–0.8 cm, and apical leaflets 10–19 × 0.3–0.5 cm. **Inflorescences** spicate, peduncle 5–16 cm long; prophyll 2.7–9.0 × 0.7–1.2 cm; peduncular bract 10–28 cm long, the expanded part 5.6–13.0 × 0.8–2.5 cm; inflorescence axis 4.5–9.5 cm long, rachis absent and one terminal primary branch 4.5–9.5 cm long; **staminate flowers** 7–8 × 3.5–4.0 mm, sepals 1.5 × 1.0 mm, glabrous, keeled and connate at the base, petals 6–7 × 2.0–2.5 mm with acute tips, nerves slightly raised, stamens 4–5 mm long, anther 3–4 mm long, filaments 1.5–2.0 mm long; basal **pistillate flowers** elongate pyramidal, glabrous, 14–18 × 8–11 mm (apical flowers 13–14 mm and 8–11 mm), sepals imbricate 9–11 × 7.5–9.0 mm, petals glabrous, imbricate at the base but slightly valvate at the tips, 9–13 × 5 mm, pistil glabrous, 9–10 × 3.5–4.0 mm diam., stigmas 3, ca. 4 mm long, glabrous, staminodial ring ca. 1 mm high, 6-dentate. **Fruits** ellipsoid to ovoid 2.5 × 1.5 cm, with a sweet, fibrous-fleshy mesocarp and hard endocarp ca. 1.7–2.5 × 1.1–1.3 cm containing

a single seed. Seed ca. 0.8 cm diam. with no interior cavity.

COMMON NAME : *palmeirinha-mirim*.

ETYMOLOGY : The specific epithet "*minor*" refers to the small stature of this species.

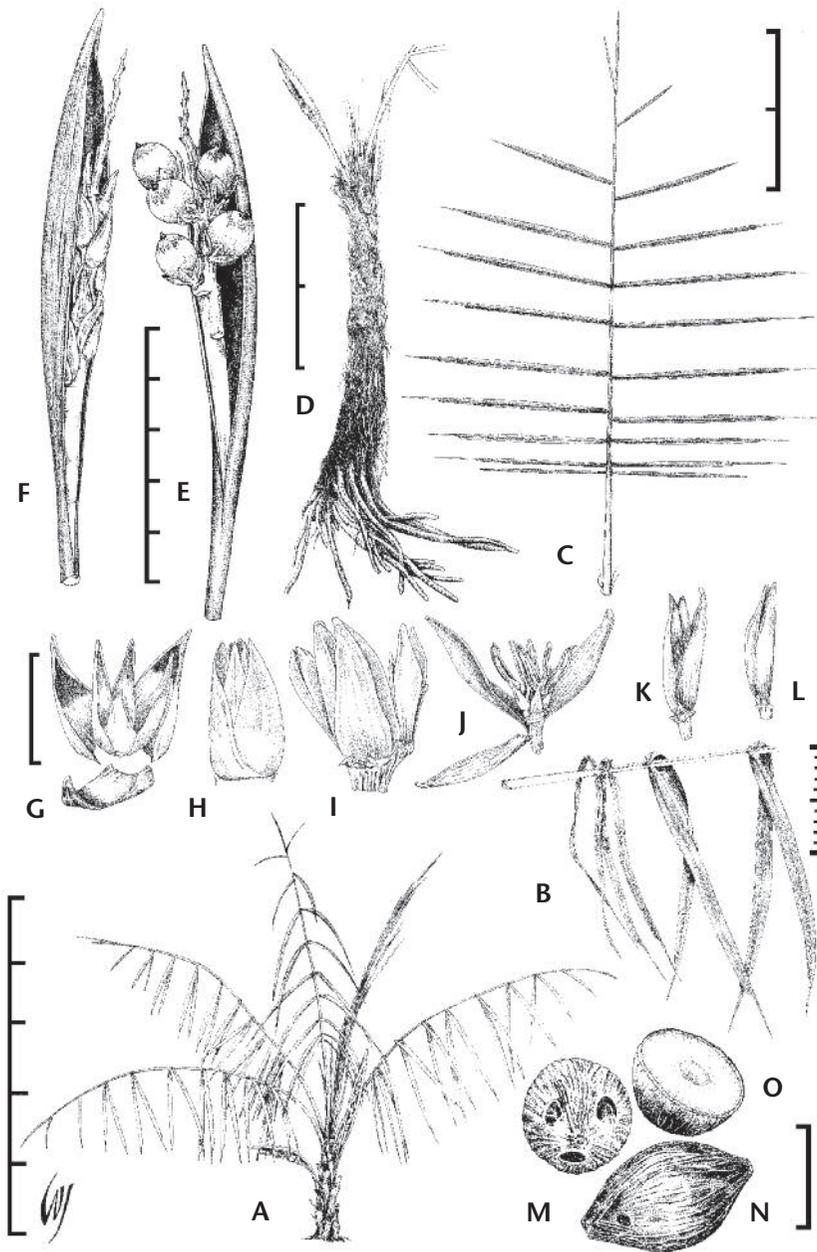
DISTRIBUTION AND ECOLOGY: Northwestern Minas Gerais in the Grande Sertão Veredas National Park in open *cerrado* vegetation. It is known only from the park. Since the park borders on Bahia, it is possible that this species occurs in the extreme southwestern part of Bahia as well.

PHENOLOGY: A few flowering specimens were seen in June.

NOTES: This is possibly one of the smallest *Syagrus* species yet discovered. Although there are two species that have small versions that are also contenders for the smallest *Syagrus* (*S. lilliputiana* and *S. procumbens*), this is certainly an impressively small palm.

***Syagrus pleiocladoides*** Noblick & Lorenzi, **sp. nov.**, *S. pleiocladae* similis sed inflorescentia spicata, regulariter dispositis foliolis praeter ad basem et anatomia foliolorum dissimili differt. Typus: BRAZIL, Mato Grosso, General Carneiro, on the road to Cuiabá – BR 070 at Km 126.5, coordinates: 15°35'05.9"S, 053°10'25.5"W, altitude 493 m, 21 Jan 2009, *H. Lorenzi, R. Pimenta & R. Campos 6583* (holotypus HPL; isotypi R, SP, UB, UFMT, NY, FTG, K, AAU, CTES). Fig. 12.

Palm with an overall height of 50–70 cm, stem generally solitary, short (ca. 20 cm) or subterranean. **Leaves** nearly 1 m long and 4–9 in the crown; sheath 2.5–5.0 cm long; pseudopetiole with fibrous margins, 14–26 cm long, true petiole nearly absent to 15 × 0.4–1.0 cm by 0.2–0.5 cm thick; rachis 43–81 cm long; leaflets 11–25 along each side of the rachis, linear, pendulous, bright green, with long acuminate and asymmetrical apex, distributed mostly regularly except at the base where irregular in clusters of 2 and inserted in one plane, leaflets strongly deflexed or pendulous forming what appears to be an upside down "V" under the rachis; basal leaflets 7–22 × 0.1–0.5 cm, middle leaflets 21–35 × 1.0–1.5 cm, apical leaflets 7–13 × 0.1–0.6 cm. **Inflorescence** erect, spicate or rarely branched, with peduncle ca. 10–20 cm long; prophyll 8–13 × 0.8–1.8 cm; peduncular bract (6–) 14–37 cm long, expanded part 6.5–12.0 × 0.8–4.2 cm and 1–2 mm thickness; spike or inflorescence axis 3–14 cm long, rachis usually not measureable, usually with 1 primary branch



12. *Syagrus pleiocladoides*: A. Habit; B. Leaflets; C. Leaf; D. Underground stem; E. Inflorescence; F. Inflorescence; G-H. Pistillate flowers; I. Triad with one pistillate flower flanked by two staminate flowers; J-L. Staminate flowers; M-O. Endocarp basal end showing pores, side view, and x-section showing the interior cavity. A-D drawn from images taken by L.R. Noblick and H. Lorenzi, E-O drawn from H. Lorenzi 6583. All scales are in centimeters except A, C, and D which are in decimeters.

3–14 cm long, pistillate portion ca. 2.5–4.0 cm long with 3–5 pistillate flowers or fruits, staminate portion ca. 3.5–4.0 cm long; **staminate flowers** 8.5–12.0 × 4 mm, sepals fleshy 1 mm long or less and connate at the base, petals 7–11 × 3–4 mm (7–8 mm long at apex) with acute tips, nerves indistinct, stamens 5–6 mm long, anther 4.5–5.0 mm

long, filaments 1.5–2.0 mm long; **pistillate flowers** pyramidal, glabrous, 12–13 × 6 mm at the base of the inflorescence and 6 × 2.5–3.0 mm at the apex, sepals imbricate 10–12 × 4–5 mm, petals unnerved, imbricate at the base but (upper 1.5–2.0 mm) valvate at the tip, 7.5–9.0 × 3.5–4.0 mm, pistil glabrous, 6 × 2.5–3.0 mm diam., stigmas 3, 3 mm long,

glabrous, staminodial ring about 1 mm high and 6-dentate. **Fruits** ovoid with a short apical beak, 2.0–2.3 × 1.3–1.5 cm, with a fibrous-fleshy mesocarp, endocarp 1.9–2.2 × 1.2–1.3 cm; seed 1.1 cm diam. with a small central cavity.

COMMON NAME : *coqueirinho-mirim*.

ETYMOLOGY: The specific epithet "*pleiocladoides*" alludes to its close resemblance to *S. pleioclada*, with similar strongly pendant leaflets, which grows in eastern Minas Gerais in the Serra do Cipo and Cadeira do Espinhaço region.

DISTRIBUTION AND ECOLOGY: Mato Grosso and Goiás in open *cerrado* vegetation in rocky areas with sandy and median textured, well drained soil, between 350–500 m elevation.

PHENOLOGY: Fruiting in November.

OTHER SPECIMENS EXAMINED:: BRAZIL, Mato Grosso, Barra do Garças, 15°51'15"S 52°16'10"W, *H. Lorenzi* 4752 (HPL); General Carneiro, 15°43'02.1"S 52°39'44.7"W. *R. Tsuji et al.* 974 (HPL). 15°35'33"S 53°13'22.6"W, *H. Lorenzi, K. Soares & R. Campos* 6787 (HPL).

NOTES: Harri Lorenzi discovered *S. pleiocladoides* in Mato Grosso and successfully introduced it into his garden collections. This acaulescent palm with its deflexed leaflets resembles *S. pleioclada*, but differs from it in having a straight, spicate inflorescence instead of one with several gnarly branches. It also has regularly spaced leaflets (basal ones excepted) instead of clustered leaflets and a distinctively different leaflet anatomy. The *S. pleiocladoides* has thinner leaflets with distantly spaced large vascular bundles (veins) that are attached only to the upper surface of the leaflet along with numerous smaller nonvascular fibers that are found along both the upper and lower surface of the leaflet. *Syagrus pleioclada* has a thicker leaflet that has larger, more closely spaced vascular bundles that touch both the upper and lower surface of the leaflet along with a few large nonvascular fibers. The two species are separated by hundreds of kilometers with *S. pleiocladoides* growing in Mato Grosso and possibly western Goiás and *S. pleioclada* in eastern Minas Gerais.

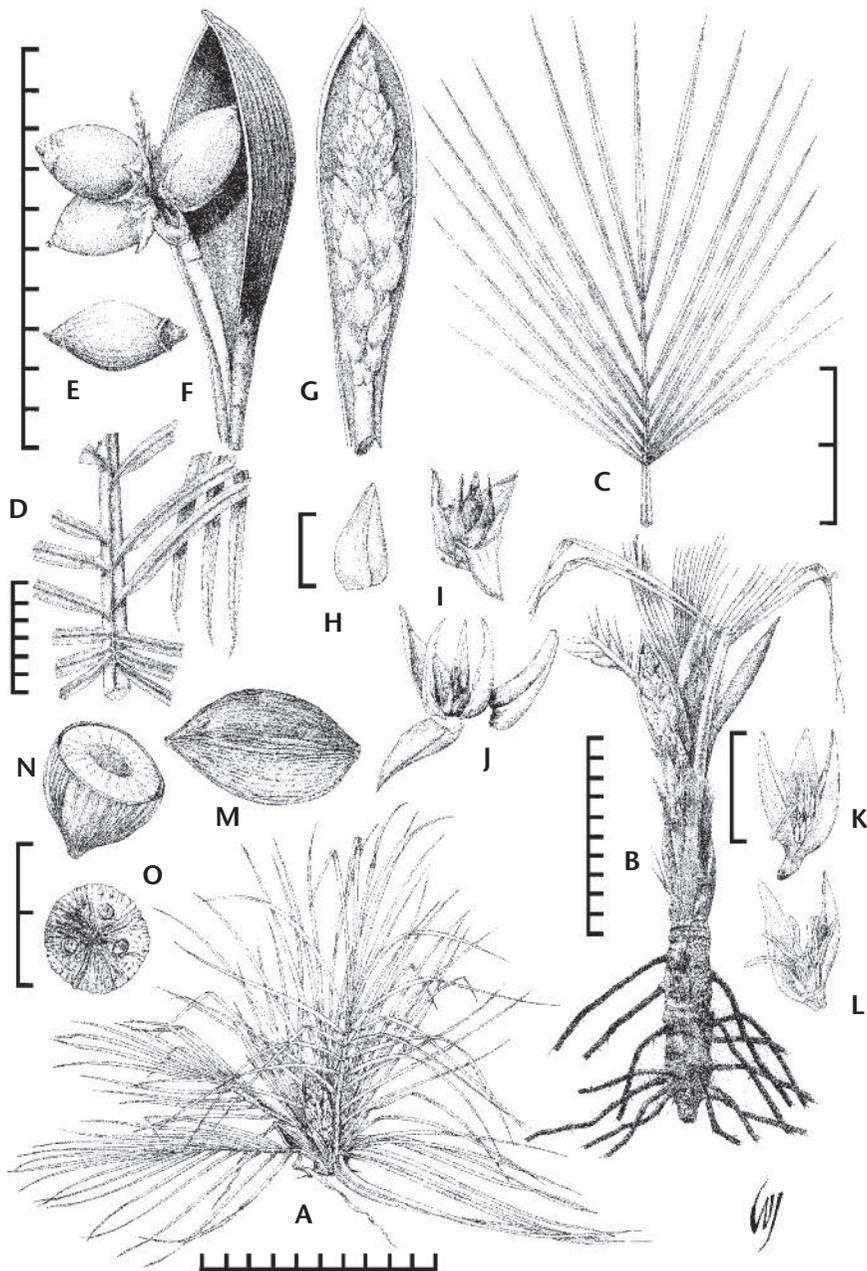
***Syagrus procumbens*** Noblick & Lorenzi, *sp. nov.*, palma tronco solitario subterraneo, inflorescentia spicata, foliis veterioribus valde procumbentibus, foliolis angustis plerumque regulariter dispositis ad basem aggregatis, apicibus foliorum asymmetricalibus acuminatis. Typus: BRAZIL, Mato Grosso do

Sul, Municipio de Agua Clara, collected near km 107, at an entrance to a side road that gives access to a *cerrado*, 33 km from Agua Clara, 20°33.579'S, 52°35.130'W. 16 Jun 2008. *R. Tsuji, H. Lorenzi, L. Noblick and R. Ventura* 2677 (holotypus HPL; isotypi R, SP, CGMS, UB, CTES, NY, FTG, K, AAU). Fig. 13.

Acaulescent palm with solitary short subterranean stem, the whole plant usually less than 50 cm in height. **Leaves** less than 1 m long and 2–4 in the crown and the older ones lying procumbent on the ground, only the newest leaf erect; sheath 9–16 cm long; pseudopetiole with fibrous margins, 2–9 cm long, true petiole 0–6 × 0.5 cm by 0.4 cm thick, rachis 2.5–13.0 cm long; leaflets medium to dark green, (3–) 5–8 (–11) along each side of the rachis, linear, with long acute to acuminate and asymmetrical apex, distributed mostly regularly along the rachis and arranged in one plane with the two sides forming a slight V over the rachis; basal leaflets 18–50 × 0.1–0.8 cm, middle leaflets 31–78 × 0.4–1.5 cm, apical leaflets 13–59 × 0.1–1.5 cm. **Inflorescence** erect, spicate or rarely branched, peduncle 7.0–9.5 cm long; prophyll 4.0–8.5 × 1.0–1.5 cm; peduncular bract 6.5–20.0 cm long, expanded part 4.5–10.0 × 3.0–4.8 cm including a beak, nearly absent to 2 mm long; spike inflorescence 3.3–10.0 cm long, 1 primary branche 3.3–10.0 cm long, pistillate portion ca. 4 cm long or less with 3–6 pistillate flowers or fruits, staminate portion ca. 2–6 cm long; **staminate flowers** 4–13 × 4–6 mm, sepals 1–2 × 1.5–2.0 mm, usually keeled and connate at the base, petals 6–8 × 2.5–5.0 mm with acute tips, nerves indistinct, stamens 3.5–5.0 mm long, anther 3–4 mm long, filaments 0.5–1.0 mm long; **pistillate flowers** elongate pyramidal, glabrous, 8–19 × 4–9 mm, sepals imbricate 8–13 × 4–9 mm, petals nerved, imbricate at the base but (upper 6–7 mm) valvate at the tips, 9–13 × 5–8 mm, pistil nearly glabrous, 4 × 2.0–2.5 mm diam., stigmas 3, 2–3 mm long, glabrous, staminodial ring about 1.5–2.0 mm high, short dentate to nearly truncate. **Fruits** ellipsoid, yellowish tinged when mature, 2.5–3.3 × 1.8–2.2 cm with fibrous-fleshy (pulpy) mesocarp ca. 3 mm thick, epicarp fine reddish brown lepidote; endocarp 1.5–2.6 × 1.3–1.6 cm, ca. 0.5–2.0 mm thick. Seed ca. 1.1 cm diam. with an internal cavity.

COMMON NAME : *ariri-rasteiro*.

ETYMOLOGY: The Latin word "*procumbens*" means procumbent and refers to the manner



13. *Syagrus procumbens*: A. Habit; B. Underground stem; C. Leaf; D. Leaflets; E. Fruit; F. Infructescence; G. Inflorescence; H-J. Pistillate flowers; K-L. Staminate flowers; M-O. Endocarp sideview, x-section showing the interior cavity, side view, and basal end view showing the pores. A-D drawn from images taken by L.R. Noblick and H. Lorenzi, E-O drawn from R. Tsuji *et al.* 2277. All scales are in centimeters except A, and C which are in decimeters.

in which the lower leaves tend to lay nearly flat against the ground.

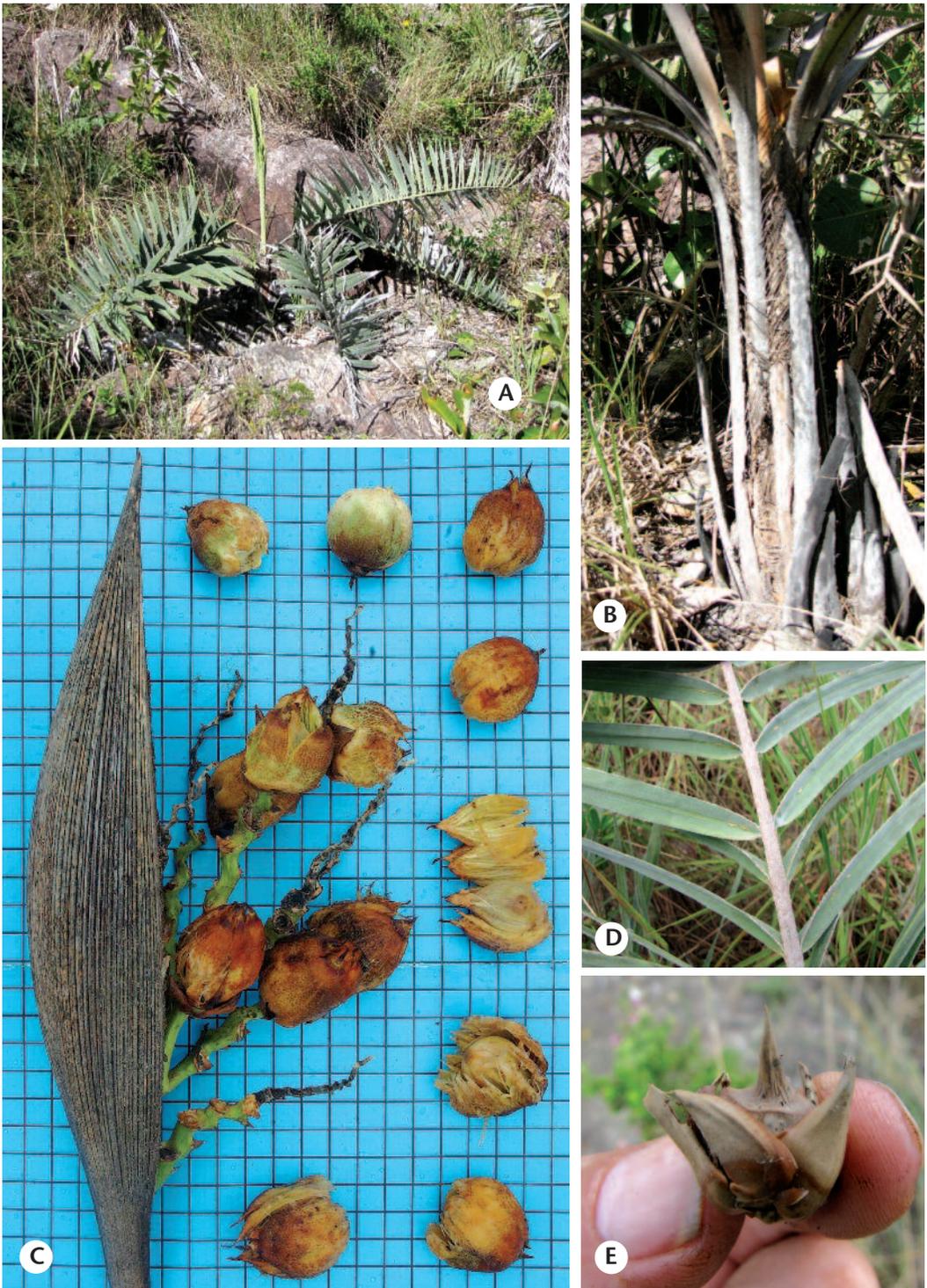
**DISTRIBUTION AND ECOLOGY:** Goiás and Mato Grosso do Sul in *cerrado*, generally in sandy soils.

**PHENOLOGY:** Fruiting in December.

**OTHER SPECIMENS EXAMINED:** BRAZIL, Goiás,

Município de Mineiros, Parque Nacional das Emas, 18°05'S 53°05'W, L. Noblick and H. Ferreira 4868 (FTG, UFG).

**NOTES:** This is an acaulescent palm with its lower leaves lying flat or procumbent on the ground; long narrow leaflets with a relatively short rachis help to identify this palm along with its leaflet anatomy.



14. *Syagrus rupicola*: A. Habit; B. Above ground portion of the stem; C. Inflorescence showing the tendency of the fruit to split at their apices; D. Underside of leaflets showing the ramenta and tomentum along the rachis; E. Large old pistillate flower. Grid is in centimeters.

***Syagrus rupicola*** Noblick & Lorenzi, *sp. nov.*, Palma rupicola, caule breve subterraneo 10–20 cm longo, foliis coriaceis usque ad 1.2m longis viride-argenteis vel caerulescentibus, floribus

femineis grandibus usque ad 2 cm longis. *Typus*: BRAZIL, Goiás, Teresina de Goiás, on the GO-118 highway towards Alto Paraiso de Goiás – km 215 (ca. 35 km from the town of

Alto Paraíso), 13°52'28.8"S, 47°20'08.4"W, at an altitude of 1140 m, in the region of the Chapada dos Veadeiros. 7 Mar 2009, H. Lorenzi, R. Pimenta & R. Campos 6647 (holotypus HPL; isotypi R, SP, UB, NY, K). Fig. 14.

A robust solitary palm, slightly over 1 m in height, with a very short or subterranean stem, 10–20 cm long. **Leaves** arched, 3–6 in the crown, ca. 1 m long; sheath 17–35 cm with fibrous margins, pseudopetiole 36–55 cm long; true petiole 16–30 cm long; rachis 0.7–1.2 m long, the underside of the sheath and rachis covered by a thick white tomentum; leaflets 45–66 along each side, linear, rigid-coriaceous with apex acuminate and asymmetric, silver or bluish-green and slightly lighter on the lower surface, distributed irregularly in clusters of 2–5 and inserted at different angles along the rachis, ramenta scales or tomentum often present near the base along the abaxial vein and especially at the insertion of the leaflets on the rachis, basal leaflets 6–22 × 0.1–0.4 cm, middle leaflets 24–34 × 2–3 cm, and apical leaflets 4.0–8.5 × 0.2–0.6 cm. Inflorescences erect and spicate to branched; peduncle 30–40 cm long; prophyll 16–21 × 4.5–6.0 cm; peduncular bract covered on the exterior with a grayish indument, 56–64 cm long, expanded part 20–29 × 4–7 cm; inflorescence axis ca. 24 cm long, rachis ca. 8 cm, with 1–6 primary branches ca. 9–15 cm long; **staminate flowers**, not yet seen; basal **pistillate flowers** pyramidal, glabrous, 18–20 × 13–16 mm, sepals imbricate 17–18 × 10–11 mm, petals glabrous, imbricate at the base but strongly valvate (upper half 8–9 mm) at the tips, 18–19 mm × 14–15 mm, pistil glabrous to finely lepidote, stigmas 3, glabrous, staminodial ring ca. 2.5 mm high, 6-dentate. **Fruits** nearly globose, pale yellowish to reddish brown, 3.5–3.9 × 2.5–3.4 cm, with a fibrous-fleshy (pulpy) mesocarp and visibly splitting at the apices when mature; epicarp covered with a fine reddish-brown lepidote indument.

COMMON NAME : *palmeria-da-pedra*.

ETYMOLOGY: The specific epithet means rock dweller and alludes to the preferred rocky habitat of this species.

DISTRIBUTION AND ECOLOGY: Occurs in the northern part of the state of Goiás in the

Chapada dos Veadeiros region, in high altitude (above 1000 m) *campo rupestre* or *cerrado*, generally in very rocky, well-drained soils.

PHENOLOGY: Fruiting in December.

NOTES: A medium-sized acaulescent palm; the rigid-coriaceous silvery-bluish leaves, fruit that splits at the apex with the mesocarp easily separating from the endocarp, and large pistillate flowers are some of this palm's distinguishing characters.

#### Acknowledgments

Sincere thanks to Fairchild Tropical Botanic Garden, where Larry is a research associate, and especially to their volunteer, Wes Jurgens, who furnished the drawings for the diagnostic plates. We would also like to thank Eduardo Gonçalves from Inhotim for helping us with the Latin diagnoses and to both Monica Moraes and Luiz Moreno for sending Larry material of the Bolivian *S. petraea* for study. Final thanks to Jill Menzel and Ricardo Campos for their support in helping Larry study many of these palms in the field. Part of the impetus for publishing some of these species was provided by the National Science Foundation Grant #0212779.

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# Is *Trachycarpus latisectus* Vanishing from its Natural Habitat?

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1. Rocky habitat with three living palms and one dead palm.

The relatively recently described rare and endemic palm from Darjeeling Himalaya of India, *Trachycarpus latisectus* (Fig. 1), was surveyed to evaluate its status in its only known wild and semi-cultivated localities. The Windamere palm is becoming rarer and rarer in its natural habitat and exposed to the great threat of extinction. It is feared that if the threats continue this beautiful palm may perish very soon from the wild. A few protective measures are also suggested here for its conservation.



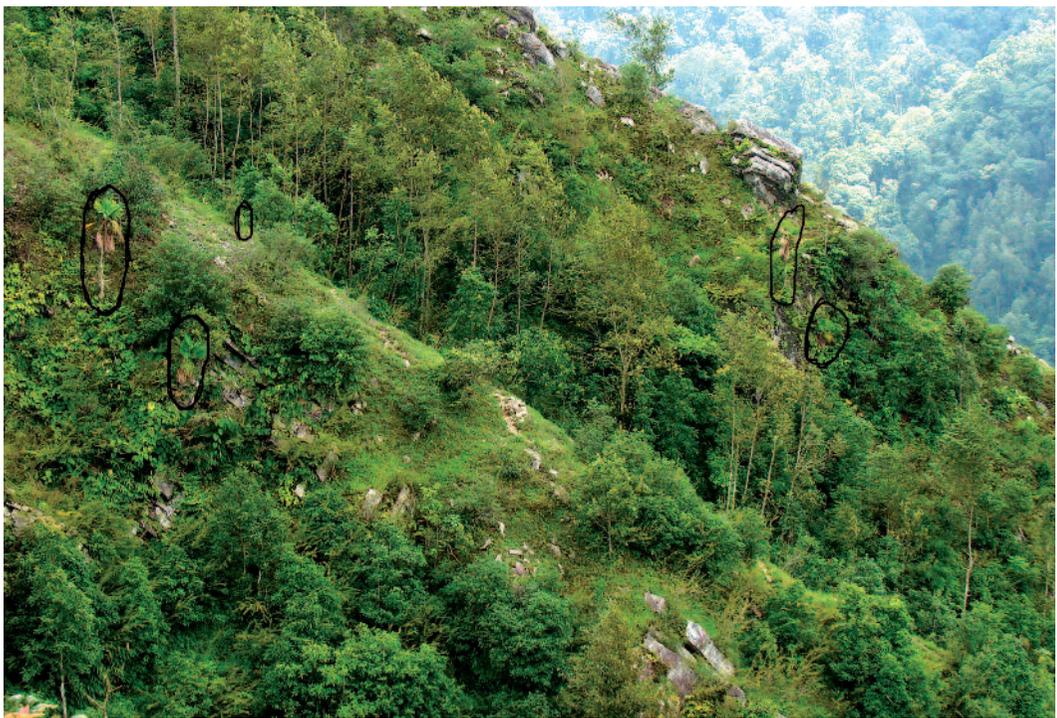
2. Satellite imagery of the site of *Trachycarpus latisectus*. Two open areas with scattered vegetation are separated by two narrow parallel gorges with dense vegetation. (Courtesy Google Wikimapia)

The Himalaya and South East Asia bear a very rich and diverse flora due to their unique geographical position, complex topography and variable climatic conditions. This region is considered as the South East Asian center of species diversity of Angiosperms (Takhtajan 1969, Rao & Murti 1990) and Pteridophytes (Ching 1979). It contains large numbers of indigenous genera and species of various plant groups, and the whole area is included under different recognized biodiversity hotspots of the world (Myers et al. 2000, Mittermeier et al. 2004). However, in general, biodiversity is being destroyed rapidly from most of these biodiversity hot spots, and many endemic species are becoming rare and threatened due to overuse of land and natural resources in these regions.

One of the threatened and vulnerable groups of plants in the Himalayan region is that of the genus *Trachycarpus* H. Wendl. In the wild the eight species of the genus are restricted to the temperate forests of Himalaya and South East Asia (Gibbons & Spanner 1998a). Including the extensively cultivated and naturalized Chusan Palm *Trachycarpus fortunei* (Hook.) H. Wendl., in India the genus is represented by about five species. Among these five species *T. takil* Becc. and *T. latisectus* Spanner et al. are endemic to Kumaon Himalaya and Darjeeling Himalaya of India respectively. There are several reports on endemism, rarity and conservation of *T. takil* (Basu 1988, Singh et al. 1995, Rana et al. 1995,

Hussain & Garg 2004, Gibbons et al. 2008, Kholia, 2009); however, the recent recognition of another endemic and threatened species of Darjeeling and Kalimpong hills of west Bengal, India, *T. latisectus* (Spanner et al. 1997, Gibbons & Spanner 1998b, Gibbons 2003), with fewer than a hundred individuals surviving in the wild, is still ignored by taxonomists and conservation biologists in India. Keeping this in view, the author surveyed all known populations (both wild and cultivated) of this palm during 2008 (April, August and December) to establish the exact status of surviving plants and causes of threat to their survival. The results of the survey are summarized here along with some conservation strategies.

The only known wild population of this palm is below Mirik Church about 25 km east of Kalimpong on an east-facing slope above the Relli River (1300–1450 m) between 27°05′05.65″ to 27°05′13.77″N and 88°34′59.87″ to 88°35′09.02″E (Fig. 2). Most of the wild plants are growing in inaccessible localities in two deep gorges and two steep rocky slopes above Sirise and Lubing *busty* (settlements) below upper Santook village (Figs. 3 & 4). Both open slopes are separated from each other by two narrow deep gorges. The gorges have good signs of vegetation due to small seasonal rivulets, which remain dry in other months. The common trees growing in these gorges are *Betula alnoides*, *Myrsine semiserrata*, *M. capitellata*, *Schima wallichii* and



3 (top). Palms growing on exposed rocky slope, eleven palm trees are in frame and encircled and remaining are out of frame. 4 (bottom). An over view of plants growing in gorges, only five palm trees encircled are in frame few other smaller individuals are hidden under bushes, remaining are out of frame.

*Castanopsis indica* along with several other trees, shrubs and herbs such as *Alnus nepalensis*, *Eurya japonica*, *Wendlandia* spp., *Gynocardia odorata*, *Helicia erratica*, *Rhus* spp., *Cissus* spp.,

*Rubia cordifolia*, *Osbeckia* sp., *Oxyspora paniculata*, *Lyonia ovalifolia*, *Callicarpa arborea*, *Saurauia napaulensis*, *Phyllanthus* sp., *Engelhardtia spicata*, *Boehmeria platyphylla*,

*Hedychium* spp., *Thysanolaena maxima*, *Begonia* spp., orchids, bamboos, grasses and ferns. However, most of the tree species growing in these gorges are very young. The open grassy and rocky slopes are dominated by common grasses such as *Desmostachya bipinnata*, *Digitaria ciliaris*, *Capillipedium assimile* and *Imperata cylindrica* along with a few scattered common hardy xeric trees species, bushes, seasonal herbs and ferns growing in nearby dense forest and deep gorges. The thin vegetation cover of these slopes seems to be the remnant of primary forests.

At the time of discovery, the population contained about 50 surviving plants and was considered to be under immediate threat of extinction. It was suggested that “Unless immediate action is taken, the chances for its survival in the wild seem bleak” (Gibbons & Spanner 1998b). In spite of this warning, no proper steps were taken for *in situ* conservation of this palm. In this survey, I counted only 28 surviving plants in the wild. Among these, six are in very poor condition and may perish soon due to factors currently under investigation. I also noticed the presence of a few dead plants (Figs. 1 & 5) and a few dead

trunks and stumps of palms that had been felled (Fig. 6).

Thus during a period of only 13 years, the wild population has declined 45–50%. Besides noting the very small size of the population and its rather rapid rate of decline, I also noted that during the year of the survey (2008), only twelve plants flowered in the wild, and none of them set fruit. This may be due to drought in the degraded habitat and a lack of female plants. Furthermore, no young seedlings and saplings were found growing in this only surviving, declining population. The youngest plants have trunks <1 m and are probably about 10 years old. The primary cause of threat to this locality seems to be habitat destruction.

Most of the mature plants growing on cultivated land (Windamere Hotel, in the old cemetery and on the premises of Shiv temple in Darjeeling, and in Himalayan Hotel, Mr. Udai Pradhan’s residence, near Ganesh Villa in Nagdhara and in front of many more houses in Kalimpong ) are well cared for and in good general condition (Fig. 7). However, three plants growing in semi-cultivated land at Algarah, a sub-town of Kalimpong, about 15 km to the east, are neglected and one of them

5. Young plants are dying due to unknown factors.





6. The trunks of dead palms still stand.

may die very soon due to negligence of local people who have tightened wires for many years for drying clothes in the sun resulting in a deep cut nearly up to half the depth of the trunk; the wire has been removed from the scar. Two other individuals (probably male plants, as they were never seen with fruits) growing at Pedong about 18 km northeast of Kalimpong on private cultivated land are neglected but still in a healthy state. Besides these localities, four plants are also found growing in the village of Dalepchen on the east side of Algarah in semi-cultivated or waste land, and six plants are growing in cultivated land between Mirik and Santook.

It also came to my notice from local people that several more plants are growing in different localities of Kalimpong and vicinity, but they need confirmation because *T. fortunei* is also cultivated in this area along with other fan palms such as *Livistona jenkinsiana*. It is difficult to say whether these plants growing on semi-cultivated land in different villages and towns are planted, naturally germinated by the dispersal of seeds by birds or left at the time of clearing of forest for settlement.

However, because of the nearest wild population in the Mirik/Santook area, I presume the last explanation and suspect that the dense forests of these areas were well populated with *T. latisectus* more than 150 years ago.

During the study period almost all the mature plants growing in cultivated and semi-cultivated land flowered, but only seven out of about 30 were seen in fruit in the month of August. While some of the plants with inflorescences would have been males, fruit set may have failed on others due to unknown factors. The youngest plant in fruit was found growing in front of a small house near Mirik Church and School, and the infructescence of this plant held very few fruits. The remainder of the fruiting plants in cultivated and semi-cultivated land were seen heavily laden with fruits. Among them, one was at Algarah, another near Santook community center, two were in Dalepchen area and two were in Kalimpong (one at Himalaya Hotel and another at Ganesh villa). On visiting in December for seed collection, I noticed that seeds were taken either by birds or by local



7. Plants growing at Windamere Hotel, Darjeeling

children, who chew them for their coconut-like taste. Some were perhaps collected by local nurseries and seed collectors.

Thus the palms growing in cultivated and semi-cultivated land are healthy and tall in comparison to wild plants because they can access a sufficient amount of nutrients and water in such localities. On the other hand most of the wild plants are on an exposed, xeric, inaccessible, rocky slopes, where nutrients, humidity and soil cover are very poor. However, there may be some more secondary unknown climatic, biotic and genetic factors (inbreeding depression, homozygosity, etc.) which are inhibiting its reproductive cycle as noted by the author in another endemic palm *T. takil* (Kholia 2008).

There are no reports on its cultivation in other parts in India except Kalimpong and Darjeeling. After learning of its endemic status Mr. Ganesh Mani Pradhan and his son Mr. Mahendra Mani Pradhan of Kalimpong started growing this palm in his nursery along with their other collections of palms, rattans, gingers, bamboos, orchids and wild bananas. But hundreds of thousands of seeds have been collected in the last 12 years from cultivated plants of Kalimpong and Darjeeling and distributed all over the world. It has become a popular ornamental and is currently being cultivated all over Europe, the US, Australia, Brazil and elsewhere (M. Gibbons & T. Spanner, pers. comm.).

The threat index, calculated according to Perring and Farewell (1977), is 14 out of a maximum 17. Thus it is clear that this endemic palm is under great threat of extinction in the wild, and according to IUCN criteria (2001), it should be placed in the critically endangered category. If no proper steps are taken soon, it may completely vanish from the wild. But the good thing is that the place of origin and the wild population of this palm are known to the scientific community and may thus be saved and restored.

The first step for the conservation of this palm is to halt the declining trend of the population and enhance its size and density in the wild. I suggest the following *in-situ* as well as *ex-situ* approaches for the recovery of the wild population in its natural habitat and cultivation of plants in different gardens.

- Incorporate a 2–4 km<sup>2</sup> area into the Protected Area Network. The existing natural population of palm should be protected and monitored until the population reaches a

healthier state again and natural regeneration starts. This may be possible by habitat restoration planting the wild angiosperm tree species of that area. It is hoped that by habitat restoration fruit set may start in existing females if they are there in the wild or a few younger plants when they reach flowering size may be female. If the decline of the wild population continues then alternative means of reproduction such as micropropagation might have to be used to save the wild genome. If seeds from locally cultivated palms are used to augment natural populations, care must be taken to avoid using hybrid seeds. If restoration of natural habitats and micropropagation fail, then saplings could be planted from the seeds of semi-cultivated sources. The planted saplings should be monitored until the populations become self-sustaining in reproduction and natural regeneration takes place.

- Undertake a thorough search in the natural forests of this area for any hitherto unknown populations in the wild.
- The fruiting plants growing at cultivated and semi-cultivated land should also be monitored and seeds from cultivated sources should be encouraged for ornamental purposes in the area as well as abroad. These cultivated plants can produce a heavy output of seeds each year. Planting of seedlings in botanical gardens of Sikkim and Darjeeling Himalaya such as Lloyd Botanic Garden Darjeeling, BSI experimental Garden Gangtok, Jawaharlal Nehru Botanic Garden Rumtek, Gangtok should also be promoted instead of planting *T. fortunei*. Care should also be taken that this should not be planted in the areas where *T. martianus* grows naturally, because of the danger of hybridization. The income from the export of seeds should be utilized in the protection of the species.

#### Acknowledgments

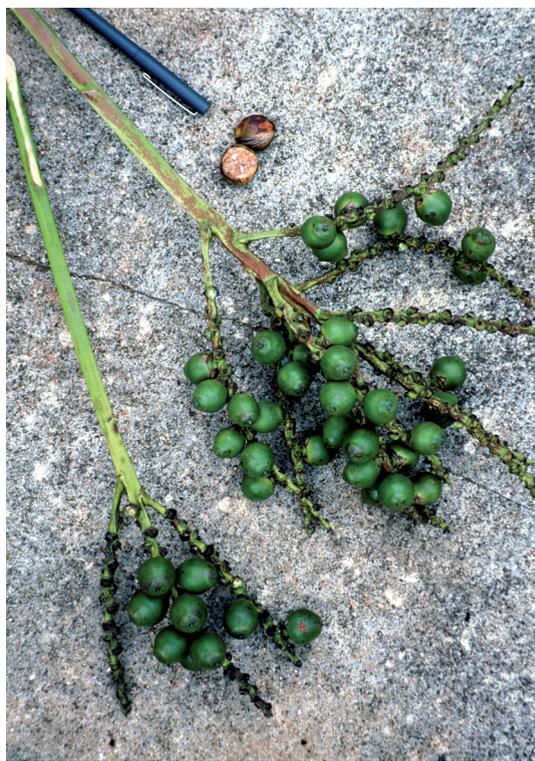
The author is indebted to Martin Gibbons of England and Tobias Spanner of Germany for their help in providing sufficient literature, constant support and encouragement, and for correcting and editing the previous drafts and their fruitful suggestions as well as information regarding the cultivated plants. The author is also grateful to Dr. M. Sanjappa, Director, Dr. D.K. Singh, Additional Director and Dr. A.A. Anshari, Joint Director, Botanical Survey of India (B.S.I.) for constant guidance and support. Thanks are also due to Prof. John

Dransfield of Royal Botanic Gardens, Kew and D. G. S. Rawat of Wildlife Institute of India for improving the manuscript. Mr. Sundar Rai of BSI Gangtok is also acknowledged for his help in one field survey.

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## Photo Feature



These photos of the seldom-seen *Reinhardtia paiewonskiana* Read, Zanoni & M.M. Mejía were provided by IPS member Leonel Mera, of the Dominican Republic. Described in 1987, this species is the only member of the genus *Reinhardtia* to occur in the Caribbean. Unlike the more familiar species of *Reinhardtia*, this species is a large, canopy palm with regularly pinnate leaves. Its leaflets lack the “windows” seen in the small species, such as *R. gracilis*. It grows in just a handful of localities in the southern Dominican Republic in the Sierra de Bahoruco at 800–1200 m elevation. The flowers have many stamens. The fruits, green and immature in this photograph, resemble little coconuts and account for the local name of this species, “coquito.”

