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A revision of the genus *Syagrus* (Arecaceae)

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Abstract

Presented here is a taxonomic revision of the Neotropical palm genus *Syagrus* (Arecaceae, Arecoideae, Cocoseae, Attaleinae), which is mostly from South America and primarily from Brazil. The history of the genus is reviewed. The revision includes a key, a complete list of synonymy, species descriptions, a list of specimens, distribution maps, color plates, and a conservation assessment of each species. Included herein are 65 species, 2 subspecies, and 14 natural hybrids. Of these palms, one is new (*Syagrus pimentae*); three are new combinations (*S. cataphracta, S. elata*, *S.* × *dickensonii*); and two have changed their status (*S. graminifolia* subsp. *graminifolia* and S. *graminifolia* subsp. *glazioviana*). Of the fourteen naturally occurring hybrids, eleven have hybrid names and three do not. This revision is an important contribution to the taxonomy and identification of *Syagrus* species from South America and the Caribbean, and is the culmination of many years of lab and fieldwork.

Key words: morphology, Palmae

Introduction

The genus *Syagrus* belongs to the family Arecaceae and is placed in subtribe Attaleinae of tribe Cocoseae (subfamily Arecoideae). There are currently 65 species, 2 subspecies and 14 natural hybrids. The genus is distributed throughout the Neotropics, with the largest concentration in eastern and central Brazil. The most southern species is *S. romanzoffiana* (Uruguay and Argentina); the most northern is *S. amara* (Montserrat, Lesser Antilles); and the most western ones are *S. sancona* (Bolivia, Colombia, Ecuador, and Peru), *S. smithii* (Colombia, Ecuador, and Peru) and *S. yungasensis* (Bolivia).

Syagrus species occupy a variety of habitats. Some inhabit tropical humid forests, like the Amazon (*S. inajai*) or the Atlantic forest (*S. botryophora*). A few (*S. coronata, S. vagans*) can survive extremely dry conditions, like the caatinga of Brazil's Northeast, which suffers long periods of low or no rainfall. They can grow from sea level (*S. schizophylla*) to elevations up to 1800 m (*S. insignis*). However, the transitional zones, the seasonally dry forests, savannas (cerrados), and campo rupestres are home for most of this genus. *Syagrus* can have very tall, columnar stems to short subterranean stems. The species with short, subterranean stems are especially common in the cerrados, where keeping the growing tip underground increases the chances of survival from frequent fires and seasonal dry spells.

Several characters distinguish *Syagrus* from the other nine genera found in the Attaleinae (*Beccariophoenix, Jubaeopsis, Voanioala, Butia, Jubaea, Parajubaea, Allagoptera, Attalea, and Cocos*). *Syagrus* has a peduncular bract borne just above the prophyll unlike *Beccariophoenix* which possesses a peduncular bract borne at the tip of its peduncle. *Syagrus* has shallowly or deeply grooved peduncular bracts, not smooth or finely striate peduncular bracts like *Butia, Jubaea*, and *Jubaeopsis.* If there is doubt about the smoothness of the bract, *Syagrus* is one-seeded (with rare exception), whereas *Butia* fruits are 1 and commonly 2 or 3 seeded. *Butia* has staminate flower

petal margins with crystal-like raphides, but the raphides are absent in *Syagrus* (Martel *et al.* 2013). *Butia* cross-sectional anatomy is mirrored (upper surface is like the lower), and *Syagrus* anatomy is dorsal-ventral (upper surface unlike the lower). *Syagrus* always has 6 stamens, whereas *Jubaea, Jubaeopsis, Parajubaea,* and *Voanioala* all have more than 6 stamens (8–30) and *Attalea* and *Allagoptera* can have 6 or more stamens. *Syagrus* has only bisexual inflorescences, but *Attalea* usually have inflorescences differentiated into male and female in the same plant. *Syagrus* have a membranaceous epicarp, whereas *Attalea* and *Cocos* fruits have a very tough fibrous epicarp. *Syagrus* female flowers and fruits are significantly dwarfed by the huge *Cocos* female flowers and enormous fruits. *Syagrus* triads (a female flower flanked by two males) are separately, not densely arranged on a spike or usually branched inflorescence, but *Allagoptera* triads are densely or compactly arranged on the lower portion of a spike inflorescence.

Syagrus has not been revised since 1987 (Glassman), nearly thirty years ago. Since then many more palm collections have been made, new roads built, and more new areas have been explored. There are more students actively working on the palm family. With new scientific breakthroughs and new techniques for analyzing the genera, species and complexes within, we have greatly increased our understanding of the genus. The number of species of *Syagrus* has more than doubled since the last revision. Also since the last revision, several genera have been subsumed into *Syagrus*, an unpopular move that Glassman had always favored, but was prevented from publishing (Glassman, pers. comm.). Some genera that are no longer accepted are *Arecastrum, Arikuryroba, Barbosa, Chrysallidosperma, Lytocaryum, Microcoelum,* and *Rhyticocos*. Although new species continue to be discovered (i.e. *S. pimentae*), it is time to bring all of our current knowledge together in one place and to summarize what we know. This revision corrects, builds and greatly expands on the previous 1987 work of Dr. Sidney F. Glassman.

Prior taxonomic work

The history of *Syagrus* is complex. Linnaeus (1753) first coined the genus *Cocos* L. to include just the coconut (*Cocos nucifera* L.), but was surprised when his students were sending him miniature coconuts (*Syagrus*) from the New World. Martius (1824) described *Syagrus* to accommodate species with two peduncular bracts: a smaller, narrower, exterior bract (prophyll) and a larger, fusiform, sulcate, interior peduncular bract, instead of one simple peduncular bract (an erroneous descriptive character for *Cocos*); and species with a female flower with a flat, not convolute, petals; and a subsessile, not sessile, stigma. Martius (1824) did not list any species in his original article (Glassman 1965). The first species he described in the genus was *S. cocoides* Mart. in 1826. Numerous other species followed, described by Martius (1823–1850, 1847), Barbosa Rodrigues (1875, 1879, 1888), Beccari (1916), and Burret (1932, 1933, 1937, 1940).

Drude (1881) incorporated *Syagrus* and other related genera into sections within *Cocos* in his treatment of the genus for Brazil. Both Barbosa Rodrigues (1899, 1900, 1901, 1903a, 1907) and Bondar (1939a, 1939e, 1941, 1942a) followed Drude's treatment by transferring existing species of *Syagrus* to *Cocos* and describing new taxa under the latter.

Other segregate genera followed for *Cocos.* Devansaye (1873) first coined the name *Glaziova* in 1873 when he described *Glaziova insignis.* Drude (1881) intended to use *Glaziova* for some other species in the genus *Cocos* (*i.e. C. weddelliana*), but since the genus *Glaziova* Bureau ex Baillon (1868; Bignoniaceae) already existed it was deemed illegitimate. It was replaced by *Lytocaryum* (Toledo 1944), *Microcoelum* (Burret & Potztal 1956), and eventually by *Syagrus* (Glassman 1965, Noblick & Meerow 2015). *Barbosa* and *Rhyticocos* were erected by Beccari (1887) to separate out two species with ruminate endosperm: *Syagrus pseudococos* from the Atlantic forest and *S. amara* from the Caribbean. *Arikuryroba* was segregated out by Barbosa Rodrigues (1891) to distinguish S*yagrus schizophylla* due to ruminate endosperm and spiny petioles. Finally, Beccari (1916) transferred the rest of the remaining taxa in the genus *Cocos* to *Syagrus, Arecastrum*, *Butia*, and *Aricury* (a name meant to replace *Arikuryroba*).

Hawkes (1952a) also disagreed with Drude, Barbosa Rodrigues, and Bondar in their use of the genus *Cocos*. He followed Beccari by making new combinations of Bondar's *Cocos* species under *Syagrus* and reestablishing the segregate genera *Arecastrum*, *Arikuryroba*, and *Barbosa*. Toledo (1944) also followed Beccari by transferring one of Bondar's *Cocos* species to *Arikuryroba* (*Syagrus ruschiana*). Toledo (1944), and Burret and Potztal (1956)

created *Lytocaryum* and *Microcoelum*, respectively, as additional segregate genera of *Syagrus*. Glassman (1970b, 1972b) weighed Bondar's arguments concerning the segregate genera, evidence from his own studies, and transferred *Arecastrum, Arikuryroba, Barbosa, Lytocaryum*, and *Microcoelum* to *Syagrus*. He distinguished 37 species (Glassman 1972b), not including those he had transferred from *Butia* to *Syagrus* (Glassman 1970a) and later transferred back to *Butia* (Glassman 1979).

Moore (1963a) described *Chrysallidosperma* as a new segregate genus of *Syagrus*. Glassman (1970b) transferred Moore's new genus to *Syagrus*. In his initial summary treatment of the palm family, Moore (1973) did not recognize Glassman's generic concepts. A few years later, Glassman (1979) reinstated the genus *Butia*, amended the generic description, and added a few additional members by describing new species and by transferring some *Syagrus* species to it. Over the next few years, Glassman (pers. comm.) recapitulated in order to get his work published and he accepted the distinct genera in his revision of *Syagrus* and its relatives (Glassman 1987). Meanwhile, Uhl and Dransfield (1987), continuing Moore's study of palm genera, accepted much of Glassman's 1970 treatment, and synonymized several of the segregate genera (*Arikuryroba, Arecastrum, Barbosa, Chrysallidosperma*, and *Rhyticocos*) with *Syagrus*. They also synonymized *Microcoelum* with *Lytocaryum*. Uhl and Dransfield (1987) recognized 32 species of *Syagrus,* and Dransfield *et al.* (2008) recognized 31 species.

Noblick transferred two species of *Syagrus* to the genus *Butia* (Noblick 2004a, Noblick 2006). He then described several new species of *Syagrus* (Noblick 2004b, 2004c, 2009, Noblick & Lorenzi 2010b). Fourteen of these were described with Lorenzi (Noblick & Lorenzi 2010b) in preparation for a Brazilian palm flora (Lorenzi *et al.* 2010) in which they resurrected four additional *Syagrus* species from synonymy based on their field work, herbarium specimens, living collections, and anatomical observations. Soares, Pimenta, and Guimarães (2013) discovered and described two more *Syagrus* species. Shortly thereafter, Noblick *et al.* (2014) described four new taxa of *Syagrus* from Brazil. Finally after several molecular and morphological analyses (Meerow *et al.* 2009, 2014), Noblick and Meerow (2015) transferred all of the four known species of *Lytocaryum* to *Syagrus* bringing the number of taxa to 64. One new species is described herein, bringing the total to 65.

Materials and methods

Species concept, Field, and Lab work

A morphological species concept (Davis & Heywood 1963, McDade 1995, Dransfield 1999) is used in this revision. The author looked for "groups that were consistently and persistently distinct and distinguishable by ordinary means" (Cronquist 1978).

This revision is based on over 30 years of field work and the examination of many specimens in several herbaria. It builds on and corrects the former work done by the author's adviser, Sidney F. Glassman. The author has visited populations of *Syagrus* in the Lesser Antilles, French Guiana, Venezuela, Brazil, Argentina, Paraguay, Uruguay, Peru, and Bolivia. The author first encountered the genus in Salvador, Bahia, Brazil (1978–1980) while working at the Federal University (ALCB) as a Peace Corp volunteer. Work continued (1981–1986) in Feira de Santana, Bahia (HUEFS), while building up their herbarium collections. They were further studied (1986–1991) while working on his doctorate thesis, "The Indigenous Palms of the state of Bahia, Brazil" (Noblick 1991) at the Field Museum in Chicago (F) and the University of Illinois at Chicago. He expanded his work on cocosoid palms as a post-doc (1991–1994) at Fairchild Tropical Botanic Garden (FTG) and later as the Palm Biologist for Montgomery Botanical Center (1994-present). He has seen all but six of the 65 taxa in the wild. Three species of *Syagrus*, he knows from cultivation (*S. cardenasii, S. elata, S. weddelliana*) and three are known only from dried material (*S. pimentae, S. santosii, S. yungasensis*). His own collections of *Syagrus* can be found in the following herbaria: **United States**: F, FTG, MO, NY, US; **Brazil**: ALCB, BAH, BHCB, CEN, EAC, ESA, HPL, HRB, HUEF, IAN, IPA, MBM, MBML, RB, SP, TEPB, UB, UFG, UFMA etc.; **Paraguay**: FCO, PY; **United Kingdom**: K. Additional collections are deposited in Brazilian herbaria that do not yet have an official acronym nor recognized by Index Herbariorum (HTSA, Herbarium of Fazenda Itaibaiana). The internet has allowed him to access virtually many more specimens from herbaria, such as: MO, NY, US, K, P, G, etc. Other websites such as Reflora (http://reflora.jbrj.gov.br/reflora/herbarioVirtual/) have given him access to type collections for Brazil. The Specieslink online network in Brazil has given him access to many more collections (http://inct.splink.org.br/) along with the Brahms online websites (http://herbaria.plants.ox.ac.uk/bol/brahms/Websites). Other Brazilian herbaria visited in

Brazil and their acronyms include: ASE, CESF, CGMS, CTES, HBR, HEPH, HUFU, IBGE, JPB, MAC, R, SPF, UEC, SI, UFMT, UFP, and VIC.

Most of the measurements were taken from freshly collected material just prior to pressing, from dried specimens, and rarely from spirit-preserved material. Flowers were often rehydrated before by soaking for 24 hours or lightly boiling them in a 5% solution of detergent for cleaning laboratory glassware, such as Contrad 70 by Decron Labs, or by microwaving them for ca. 10–20 seconds in 50% glycerin. Contrad 70 was also used to rehydrate dried leaflet material for anatomical studies along with fresh material collected from the living collections located at Montgomery Botanical Center and the Jardim Plantarum (HPL). The simple methods and inexpensive materials used in the study of the leaflet cross-sections for identification have been discussed in Noblick (2013a), which includes a key to the acaulescent species that were known at that time.

Common names came from the author's fieldwork and the literature (Glassman 1987, Lorenzi *et al.* 2010, Moraes R. 2004, Moreno & Moreno 2006, 2013, Read 1979).

The conservation status for each species and subspecies of *Syagrus* was assessed based on the *IUCN red list categories and criteria version 3.1 Second edition* (IUCN 2012). The author did not attempt to assess the conservation status of hybrids. Names and authors generally follow Govaerts *et al.* (2016) for the most part, but do not necessarily follow their synonymy.

Square brackets are used by the author to clarify or inject additional information that was not readily available on the original plant label (i.e. name change of a town, latitude and longitude, explanations and translations, additional collectors, etc.).

Distribution and Ecology

Syagrus is a large genus almost totally restricted to South America, with Central and Eastern Brazil being the center of its distribution. Its populations stretch north to south from the Caribbean to Argentina and Uruguay, and east to west from the Atlantic Ocean to the Andes (Fig. 1). All South American countries have native *Syagrus* species except Chile. It is represented by 67 taxa, 65 species and two subspecies. Of this number, 57 occur in Brazil. Eight species are currently not found in Brazil. Four, *S. petraea*, *S. elata*, *S. orinocensis,* and *S. stratincola,* grow close enough to the Brazilian border that they may occur there, but at the time of publication there are no confirmed collections. *Syagrus petraea is* now believed to be a Bolivian endemic, but may be discovered in similar mountainous habitat in Brazil near the pantanal. *Syagrus elata* is also a Bolivian endemic, but it is close to similar habitat in Rondônia and Mato Grosso, Brazil. Although *Syagrus orinocensis* has been reported from Brazil (Lorenzi *et al.* 2010), no confirmed collections could be found. *Syagrus orinocensis* grows in Venezuela and Colombia close to similar habitat in Amazonas, Brazil. *Syagrus stratincola* grows on isolated, exposed rock formations (inselbergs) in the middle of otherwise unbroken jungle in the Guyanas. Since similar unexplored inselbergs also occur in Amapa, Brazil, *S. stratincola* may be found there as well. Four *Syagrus* species definitely do not occur in Brazil (*S. amara, S. cardenasii, S. stenopetala, S. yungasensis). Syagrus amara* is found on only five islands in the Caribbean (Montserrat, Guadeloupe, Dominica, Martinique, and St. Lucia). *Syagrus cardenasii* grows west of Santa Cruz, Bolivia in the foothills of the Andes, more than 600 km from Brazil; and *S. yungasensis* grows near La Paz at high elevations (900 m) in the Andes. *Syagrus stenopetala* is from the northern coastal mountain ranges of Venezuela and over 900 km from Brazil.

The majority of *Syagrus* grow in seasonally dry forest or transitional forests from wetter to dryer ecotones. Many with short, subterranean stems are found in the seasonally dry cerrado areas which that are periodically burned. This has always been a naturally occurring phenomenon, but the increased frequency of man-made fires have led to the degradation of these areas.

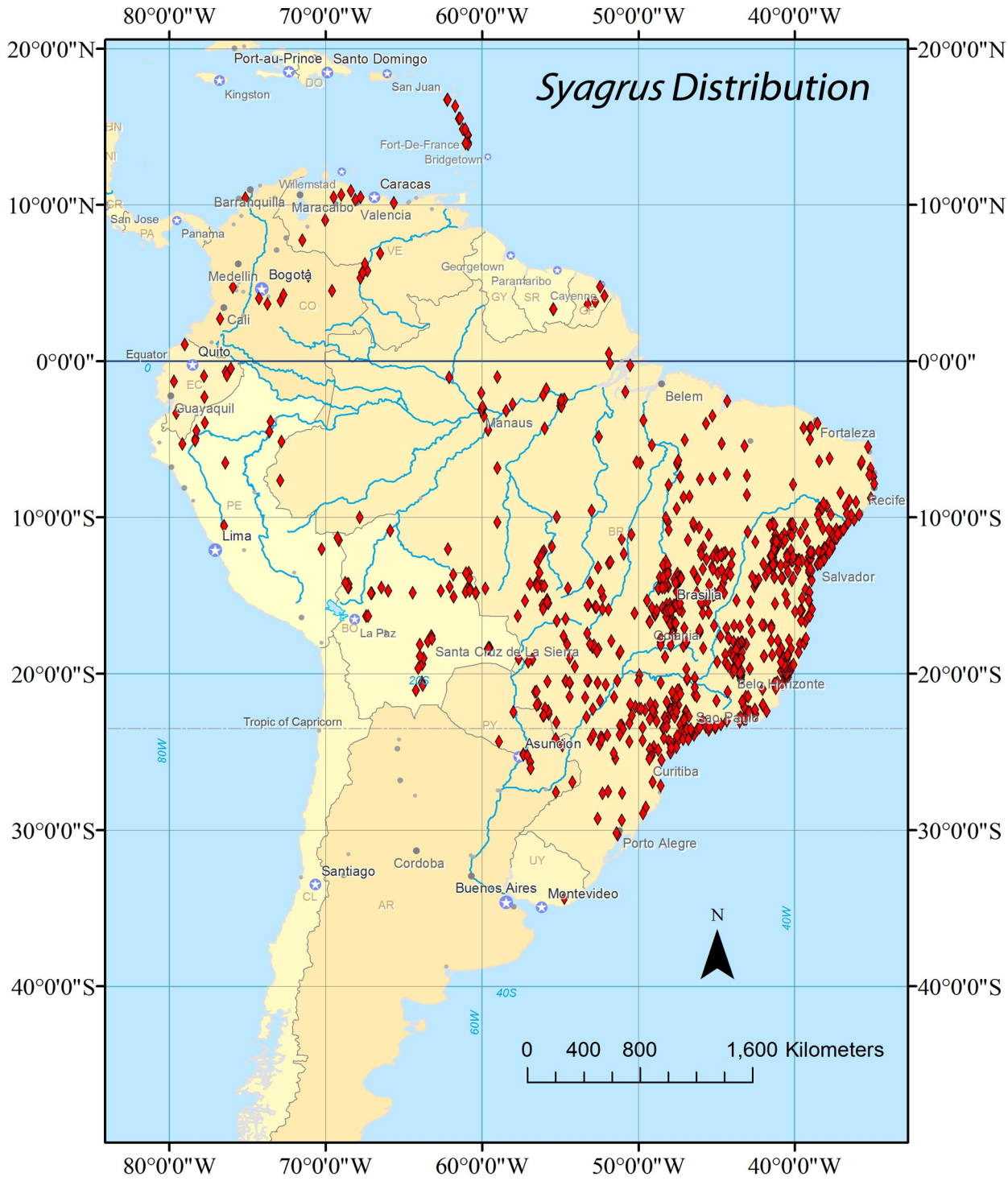

FIGURE 1. Distribution map of *Syagrus*.

Morphology

Stem and Root

Stems are usually solitary or less commonly clustering (*Syagrus flexuosa, S. ruschiana, S. stenopetala, S. stratincola*), at times forking at or below the ground (*S. cearensis*), rarely stolon-like (*S. campylospatha*), and in a few cases they are reclined or prostrate (*S. loefgrenii, S. microphylla, S. vagans, S. werdermannii*). Stems are often slender or thick, sometimes swollen basally (*S. amara*). Under stressful conditions, some species, which are

normally solitary, will sprout new stems (*S. orinocensis*). Stems are unarmed or less frequently armed due to the presence of persistent leaf sheaths and their stiff fibrous margins (*S. coronata*) or spines (*S. schizophylla, S. santosii*). The stem is first obscured by leaf sheath remains (later becoming bare), sometimes striate, and marked with leaf scars, which may be inconspicuous, raised, or impressed, closely ringed (*S. glaucescens, S. coronata*) or broadly ringed (*S. botryophora, S. vermicularis*), oblique or circular. Plants with aerial stems grow 2–36 m tall and 6–35 cm in diameter. Some *Syagrus romanzoffiana* can approach a royal palm (*Roystonea regia*) in stem diameter. Many cerrado species have short subterranean stems that keep the growing tip below ground, perhaps an adaptation for surviving ground fires. The stem is sometimes covered with persistent leaf bases when younger, these eventually abscising (*S. botryophora, S. coronata, S. glaucescens, S. flexuosa, S. schizophylla*). They never form prop roots, although they often form a conspicuous root mass at the base of the trunk.

Leaves

Leaves are alternate and spirally arranged on the stem or at times in 5 nearly vertical or slightly spiraled rows or ranks (*S. duartei, S. glaucescens,* and *S. coronata*). The sheathing leaf is split to the base and does not form a crownshaft. The adult leaves are nearly always pinnate, 3–30 in the crown. The leaves of *Syagrus smithii* are exceptional in that they often retain the juvenile, undivided, condition even at maturity (Rodrigo Bernal, pers. comm.). The leaf has a sheath and petiole that transition into one another such that it is often difficult to say where one ends and the other begins, but when they can be discerned, the sheath is ca. 2.5–180 cm long. The petiole is only 0–30 cm long, but the apparent petiole or pseudopetiole (a portion of the sheath plus petiole), which is often recorded as the "petiole," is 2–170 cm long. The petiole and pseudopetiole are channeled adaxially and rounded abaxially with surfaces that are variously glabrous, waxy, scaly, pubescent, tomentose, or covered with dark hairs (*S. weddelliana, S. insignis*). The sheaths generally have fibrous margins. The pseudopetioles usually have short, narrow, soft or stiff fibers along most of their length; but occasionally have rigid woody fibers (*S. coronata)* that function like rudimentary spines or are actually spine-like teeth or prickles (*S. schizophylla, S. santosii)*. The leaf rachis is 2.5–440 cm long and tapers distally. The leaflets or pinnae are single-folded and almost always linear, with reduplicate (Λ-shaped in cross-section) plication. They are frequently glaucous, rigid or flexible, and sometimes with patches of ramenta along the lower midvein (*S. campestris*). The leaflet blade is dark to light green or bluish-green, soft membranous or stiff and coriaceous. Adaxially leaflet blades can be glabrous, with sparse scales or hairs, and sometimes waxy. Abaxially they can be glabrous, with a waxy bloom (*S. loefgrenii, S. deflexa, S. coronata, S. cataphracta*), or covered with gray to silvery hairs or indument (*S. insignis, S. itapebiensis, S. weddelliana*) to short brownish indument (*S. hoehnei*). Transverse veinlets are mostly obscure or inconspicuous, but sometimes raised, and visible adaxially (*S. pompeoi*), especially in dried material (*S. comosa, S. inajai*). The leaflet tip is asymmetric, obtuse, acute or acuminate, or long tapering. There are 3–250 leaflets along each side of the rachis distributed regularly and arranged in the same plane (*S. botryophora, S. ruschiana*); or more frequently arranged in clusters of 2–5 (sometimes more near the base), and inserted in more than one plane. The middle portion of the leaf has pinnae 10–120 cm long by 0.5–6.0 cm wide.

Glassman (1972a) first suggested using leaflet anatomy as a tool in the identification of *Syagrus* species, and Noblick (2013a) expanded on this. Useful anatomical characters include: the absence or presence of large marginal veins with exaggerated vascular bundles; the absence or presents of major marginal fiber bundles; and the arrangement and abundance of the major veins, minor veins, fiber bundles or fiber strands. Only rarely do two species have anatomy that is so similar that using only leaflet anatomy would make identification difficult. However in most cases, the species are so different, they would not be confused (i.e. *S. lilliputiana*, *S. cerqueirana*).

The eophyll (first leaf) is simple, entire, and lanceolate. The next several leaves to emerge are also simple and entire; with the exception of *S. weddelliana*, in which the second leaf to emerge is always pinnate.

Inflorescences

Inflorescences are interfoliar, erect or pendulous, spicate (unbranched) or branched to one order (with the exception of the hybrid *S.* × *lacerdamourae*, which is occasionally branched to two orders) with few or numerous floral branches (rachillae). The very base of the inflorescence is surrounded and subtended by two bracts: a prophyll up to 60 cm long, which is often mostly hidden or concealed by the leaf sheath and is rarely collected or properly measured; and the peduncular bract (the largest and most visible bract). The prophyll is 2-keeled, and usually

becomes fibrous and ultimately disintegrates into a mass of fibers or stays chartaceous or even woody. The peduncular bract is inserted just above the prophyll and is almost always woody and persistent, sulcate (deeply grooved) or striate, glabrous, glaucous waxy, lepidote, whitish, grayish or brownish pubescent, sometimes becoming glabrous with age on the external surface. The peduncular bract is usually longer than the inflorescence, rarely is it shorter (*S. itapebiensis*). The peduncular bract is spindle-shaped or fusiform, rarely just tubular (*S. itapebiensis*, which usually is not expanded), 12–223 cm long, and the expanded or inflated portion of the bract is 4.5–170 cm long by 1.7–38 cm wide. It usually splits along the underside of the bract. The peduncle is 10–107 cm long and is glabrous, lepidote, tomentose or hairy. It is often somewhat flattened or elliptical in cross-section. The inflorescence axis (distance from the lowest branch to the tip or, if unbranched, lowest flower to the tip) is 3.3–167 cm long. The rachis (distance from the base of the most proximal branch to the base of the most distal branch) is 0–110 cm. There are 1–330 rachillae that are 0.5–118 cm long, usually arranged in a spiral on the rachis or less frequently unilaterally arranged along the rachis (*S. flexuosa, S. campestris, S. cataphracta, S. cerqueirana*). Peduncle, rachis, and rachillae are usually glabrous; but sometimes covered with pubescence (*S. werdermannii).* Rachillae are usually straight or curvy, but rarely twisted together like noodles (*S. vermicularis)* or gnarled and twisted (*S. pleioclada).* Several species (mostly ones with short subterranean stems) have been found to have spicate inflorescences and have long been thought to belong to one very variable single species, *S. petraea,* but that is now known to be incorrect (see notes under *S. petraea*).

Flowers

The flowers are arranged spirally on the rachillae, are unisexual with both male (staminate) and female (pistillate) flowers found in the same inflorescence, and arranged proximally on the rachillae in triads (one central pistillate flower flanked by two lateral staminate flowers) or distally on the rachillae in diads or single staminate flowers. Rarely are they arranged in tetrads of 2 central pistillate flowers each flanked by a lateral staminate flower, i.e. *S. gouveiana*. Staminate flowers are born to the tip with the exception of *S. vermicularis,* which is devoid of flowers at the tip of its rachillae and for some distance before the tip. Each triad is subtended by a small, conspicuous to inconspicuous crescent-shaped bract.

Staminate flowers are dark yellow to creamy white, with 3 (rarely 4, i.e. *S. gouveiana*) very short sepals that are keeled and briefly connate at the base (rarely not keeled, i.e. *S. comosa*). Sometimes the sepals are elongated into a short pedicel. Staminate flowers also have 3 petals (rarely 4, i.e. *S. angustifolia, and S. gouveiana*). The staminate petals are larger, separate, and valvate. Staminate flowers have 6 stamens with anthers 2–9 mm long, dorsifixed or medifixed filaments; and a pistillode (aborted pistil or ovary) that is trifid and usually present but sometimes absent.

Pistillate flowers are acute to rounded, conical to pyramidal in shape, and 3.5–35 × 3.5–19 mm. They nearly always have 3 broadly overlapping (imbricate) sepals and 3 petals (rarely 4 in *S. gouveiana*). The petals are slightly smaller, nearly equal or longer than the sepals. Sepals are not keeled, or slightly or strongly keeled, especially in pyramidal shaped flowers. The petals are coriaceous to fleshy, broadly overlapping (imbricate) at the base, but the upper parts of the petals are often abruptly narrowed or tapered into minute to moderately large valvate tips. The pistillate flowers have a distinct pistil with 3 stigmas (rarely more) that is surrounded by a staminodal ring (aborted stamens) that is more or less 6 toothed, undulate or truncate, and occasionally nearly absent.

Fruits and seeds

The fruits are drupes. They can be ovoid, ellipsoid, and sometimes globose (*S. stratincola, S. pseudococos)*; generally rostrate at the apex; with varying colors of green, greenish-yellow, yellow, yellowish-orange, orange, reddish-orange (*S. itapebiensis*), and brown. They are from 1.2 cm (*S. lilliputiana*) to 9.0 cm long (*S. macrocarpa)* and 0.7–4.5 cm in diameter. The epicarp is usually smooth, sometimes grooved or striate (*S. stratincola),* glabrous, lepidote or scaly or short pubescent. The mesocarp is succulent and fibrous (pulpy with an abundance of longitudinal fibers), and at times dry and fibrous. The epicarp and mesocarp sometimes split longitudinally (*S. weddelliana, S. insignis*) or at the tips (*S. ruschiana, S. lorenzoniorum, S. picrophylla*). This character seems to be more common among the rock-loving species. The endocarp is hard, woody or bony, less commonly fragile (*S. weddelliana, S. insignis, S. hoehnei, S. itapebiensis*), 1–8 mm thick, light to dark brown, containing 3 pores (rarely 4 or 5, i.e. *S. vermicularis, S. evansiana*) that are located at the basal end of the endocarp usually with one locule and one seed, but rarely 2 locules and 1 or 2 seed (*S. graminifolia and S. loefgrenii*). The exterior of the endocarp is

smooth (*S. itapebiensis, S. botryophora*) to rough (*S. oleracea, S. flexuosa*), often with a beak that is commonly acute, and less commonly trilobed (*S. vermicularis*) or broadly conical like a "Chinese hat" (*S. pseudococos*). The exterior of the endocarp sometimes has 3 conspicuous or obscure longitudinal markings in the form of pores or dotted bands or raised ridges (*S. macrocarpa*). The interior of the endocarp cavity is often trivittate (3 longitudinal stripes representing the carpels). The shape of the endocarp cavity in transverse section is usually round or circular; but sometimes it is triangular, which constitutes a good character for separation of the Amazonian species, which are triangular (*S. inajai, S. smithii*) or slightly triangular (*S. orinocensis, S. vermicularis*). Rarely, the interior of the endocarp is irregular and the endocarpal wall may intrude into the seeds, causing the seeds to have an irregular shape (*S. romanzoffiana*).

Most seeds are broadly or narrowly ellipsoid. The endosperm of the seed is generally homogeneous or less commonly ruminate (*S. amara, S. hoehnei, S. pseudococos, S. schizophylla, S. smithii*). Sometimes the endosperm forms an interior cavity (*S. cearensis, S. kellyana, S. lorenzoniorum*), much like a coconut (*Cocos nucifera*). Germination is usually remote-tubular and less commonly adjacent-ligular (i.e. *S. insignis*). See also Dransfield *et al.* (2008).

Pollen Morphology

Syagrus has a monosulcate pollen grain, that is, one with a single sulcus or furrow across the middle of the outer face of the pollen grain. It is ellipsoid, frequently elongate, and/or pyriform, asymmetrical or slightly so. Its aperture is a distal sulcus. Its ectexine tectate surface is finely perforate, perforate and micro-channeled, perforate-rugulate, regulate-verrucate, or reticulate, aperture margin similar. The infratectum is columellate. The longest axis is 36–56 µm. The post-meotic tetrads are tetrahedral (Dransfield 2008). As stated by Glassman (1987), the most comprehensive treatments of palm pollen (including several taxa of *Syagrus*) were carried out by Thanikaimoni (1970), and Sowunmi (1972) in which they studied 800 species in 193 genera and 350 species in 120 genera, respectively. Glassman himself surveyed 56 species of cocosoid palms and their hybrids using a scanning electron microscope and a transmission electron microscope (Glassman 1987). There may be some value in further examining the tectate exine ultrastructure of *Syagrus*, where some interspecific variation has been discovered (Harley 1999b). The more recent and extensive studies by M.M. Harley (1996, 1999a, 1999b) and additional information by M.M. Harley in Dransfield *et al.* (2008) shows that the search is still alive to demonstrate the potential value of pollen for identification at the species level in systematics, and to show its importance in interpreting palm evolution through the fossil record. Unfortunately, the result of all of these studies shows that most of the species and genera defined as the *Cocos* alliance (Attaleinae) cannot be distinguished from one another by pollen morphology.

Phylogeny

Morphology and Phylogenetic Analysis

In a postdoctoral study, the author recorded quantitative and qualitative morphological characters for 72 species of cocosoid palms including 37 species of *Syagrus* from 733 herbarium specimens. Many of the characters based on measurements (quantitative characters) were ultimately used in species descriptions, but most were dropped from the phylogenetic analysis, because they were found to be overlapping and problematic. Mostly qualitative morphological and anatomical characters were then used in a phylogenetic analysis for a total of 130 characters in 69 ingroup species and 3 outgroup species (Noblick *et al.* 2013c). To reconstruct phylogenetic relationships among the Cocoseae, Attaleinae, *Syagrus* and related genera, PAUP* version 4.0b10 (Swofford 1998) was used for maximum parsimony (MP) analysis with the characters unweighted. Details concerning the analysis are available in Noblick *et al.* (2013c). To summarize the results, two major clades were resolved (Syagroid and Butioid), all genera were found to be monophyletic except for *Syagrus* and *Butia*. *Butia* was found to be paraphyletic with *Jubaea* embedded and *Syagrus* was found to be paraphyletic with *Allagoptera, Cocos, Voanioala*, and *Attalea* embedded. As in many large-scale morphological analyses containing many species and many characters, good resolution with strong support was found wanting.

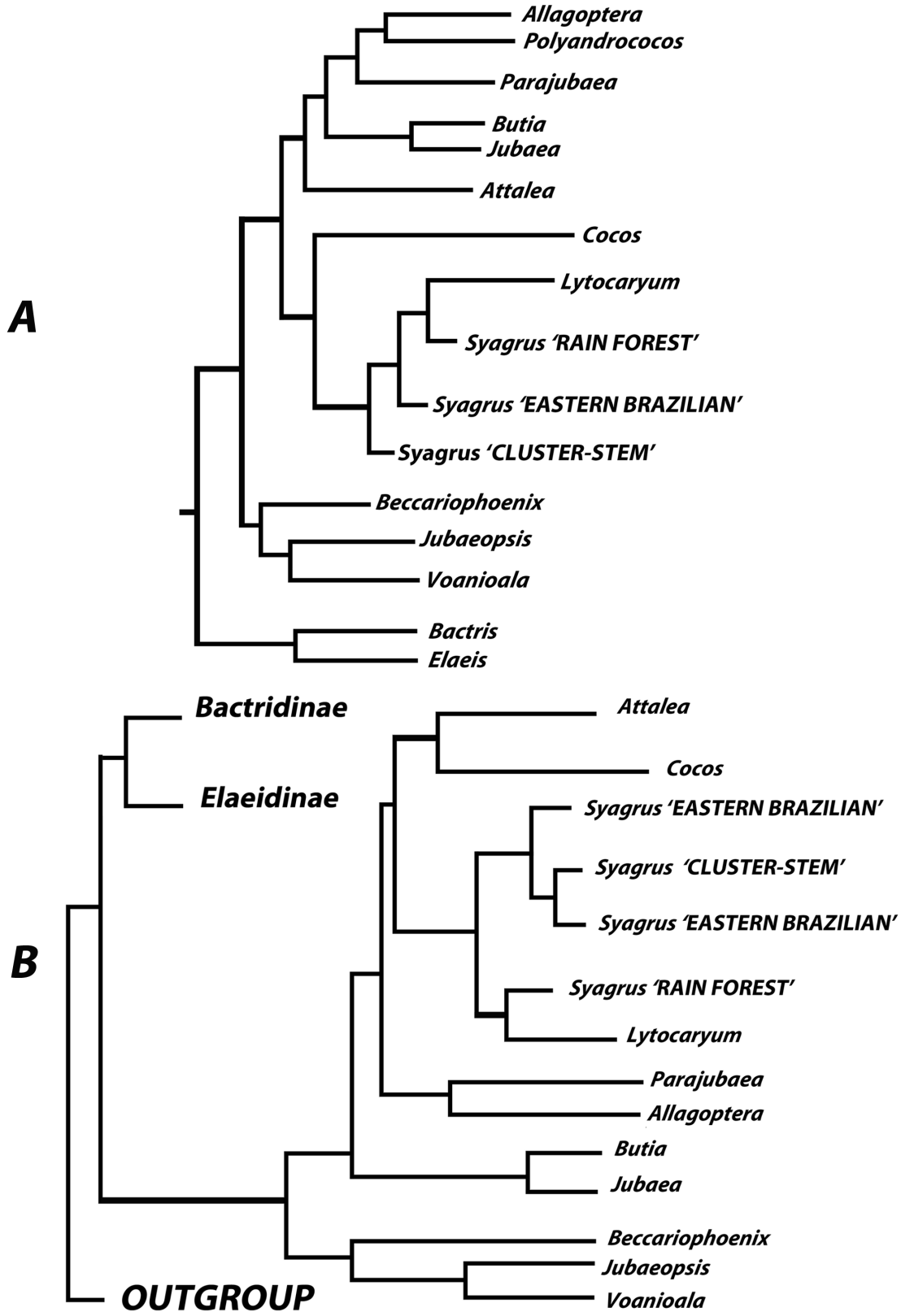

FIGURE 2. Phylogenetic cladograms based on molecular analysis. A. Simplified cladogram based on a majority rule consensus of 12,500 trees from partitioned Baysian analysis of seven combined WRKY loci sequences across 72 samples (Meerow *et al.* 2009). B. Simplified cladogram based on a maximum clade consensus chronogram of 15,000 trees from non-partitioned Baysian analysis of six WRKY loci sequences (Meerow *et al.* 2014).

Molecular Phylogenetic Analysis

Meerow *et al.* (2009, 2014) analyzed just the Attaleinae and then the entire Cocoseae using orthologs of the WRKY transcription factor gene family. A more fully resolved phylogeny of *Syagrus* with stronger support resulted than with only morphological/anatomical data, although only 14 species of *Syagrus* were sampled.

Meerow *et al.* (2009) analyzed a supermatrix of seven WRKY loci across 72 samples of the subtribe Attaleinae, with one species each of *Bactris* and *Elaeis* as outgroups (Fig. 2A). Attaleinae formed two subclades, one New World and one Old World. The Old World subclade consisted of *Beccariophoenix, Jubaeopsis* and *Voanioala*. The New World subclade separated into two large monophyletic groups. One consisted of a paraphyletic *Syagrus* due to the nested inclusion of *Lytocaryum*, and was the sister genus to *Cocos nucifera* with strong support. In the second subclade, monophyletic *Attalea* was sister to the rest of the American Attaleinae. *Butia* was monophyletic, and *Jubaea* was robustly resolved as sister to *Butia*. A novel sister relationship of *Allagoptera* (including *Polyandrococos*) and *Parajubaea* was resolved with high support that was also confirmed by leaf anatomical evidence. Subclades within *Syagrus* and *Attalea* were congruent with morphological and/or biogeographic data.

In Meerow *et al.* (2014), WRKY 2 was dropped from the study due to evidence that it was a paralog of the WRKY12 locus. *Roystonea* was utilized as outgroup, and two *Reinhardtia* sequences were included as well. In the strict parsimony consensus tree of the concatenated matrix, the first branch of the New World subclade terminated with sister genera *Butia* and *Jubaea*, followed by a *Parajubaea/Allagoptera* clade, and ultimately a larger group within which *Attalea* was sister to a grade beginning with *Cocos nucifera*, then *Lytocaryum,* and finally *Syagrus*. In this tree, all of the genera were monophyletic. However, in the maximum clade consensus chronogram of 15,000 trees produced by Bayesian analysis (Fig. 2B), *Cocos* was resolved as sister to *Attalea* rather than sister to *Lytocaryum* and *Syagrus*. Moreover, *Lytocaryum* was again embedded in *Syagrus* rendering the latter paraphyletic. Meerow *et al.* (2014) further tested the relationship of *Cocos* and *Attalea* as a constraint on the supermatrix with parsimony analysis, and found that only four additional base substitutions were required to support this new resolution over a sister relationship of *Cocos* to *Syagrus*.

Morphological data may more favorably suggest a closer relationship of *Cocos* to *Syagrus* based on the following factors: 1) the exterior morphology of a *Syagrus* endocarp with its three pores more closely resembles a coconut endocarp than do endocarps of *Attalea* species with their 3–10 sunken or impressed pores; 2) the interior morphology of a *Syagrus* endocarp with a single chamber or locule more closely resembles a coconut than *Attalea,* which frequently has two or more chambers or locules; 3) several *Syagrus* species form an internal cavity within their endosperm like a coconut, but the author has never seen *Attalea* endosperm with internal cavities; 4) *Syagrus* produces one bisexual, androgynous inflorescence like *Cocos*, but all *Attalea* usually produce separate male and female inflorescences on the same tree and only occasionally will produce what appear to be a bisexual inflorescence with many male flowers and a few scattered functional or possibly non-functional female flowers near its base; and 5) many caulescent *Syagrus* species have a canopy with pendulous, spreading leaves, rather than strongly ascending leaves like most caulescent *Attalea* species. However, the mesocarp of *Attalea* is fibrous, like the *Cocos*, rather than fleshy as in *Syagrus*.

The two studies also gave us some insight into the interspecific relationships of *Syagrus*. In Meerow *et al.* (2009), three major subclades resolved in the genus were found to be supported anatomically (Noblick, 2013a) and partially supported by the morphological analysis (Noblick 2013c). The first clade, the "cluster-stem" clade, was found to be sister to all other *Syagrus* species. The "cluster-stem" clade (76/84% bootstrap support (BP) united three multistemmed (clustering) species (*S. flexuosa*, *S. cerqueirana, S. campylospatha*) from east-central to south-central Brazil and Paraguay and one solitary-stemmed species (*S. macrocarpa*) from east-central Brazil. The solitary-stemmed species, *S. macrocarpa*, had nearly identical leaflet anatomy to *S. flexuosa*, confirming its close relationship (Noblick 2013a) to the clade. The second "Eastern Brazilian" clade (59/77% BP) resolved as sister to the third "rain forest" clade. This "Eastern Brazilian" clade included palms from eastern Brazil (*S. cearensis*, *S. kellyana*, *S. coronata*, *S. schizophylla*); east-central Brazil (*S. glaucescens*, *S. oleracea*); and east and southeastern Brazil, Paraguay, Uruguay, and Argentina (*S. romanzoffiana*). The "rain forest" clade (86/98% BP), included species from Amazonas (*S. vermicularis*, *S. orinocensis, S. cocoides*), the foothills of the Andes (*S. sancona*), northern South America (*S. stenopetala*), the Caribbean (*S. amara*), and the Atlantic rain forest of Brazil (*Lytocaryum, S. ruschiana,* and *S. botryophora*). That these Atlantic forest species would resolve in a clade with mostly Amazonian species supported the theory that the Amazon and Atlantic forest were connected at one time.

Both analyses (Meerow *et al.* 2009, 2014) resolved all three *Syagrus* clades, but the relationships between the three clades changed. The differences are as follows: 1) instead of the "cluster-stem clade" being sister to all other *Syagrus* species, the "rainforest" clade now became sister to all other *Syagrus* species; and 2) the "cluster-stem" clade became nested within the former Eastern Brazilian clade, or, in other words, *S. romanzoffiana* and *S. schizophylla*, once part of the "East Brazilian" clade and formerly the genus *Arecastrum* and *Arikuryroba,* separated into their own small clade, which is sister to both the "cluster-stem" clade and a smaller "East Brazilian" clade.

Finally, because of the ambiguous position of *Lytocaryum* and a lack of clear morphological discontinuities between the genera*,* Noblick and Meerow (2015) subsumed the four known species of *Lytocaryum* into *Syagrus*, thus rendering the genus unquestionably monophyletic.

Taxonomic Treatment

Syagrus Martius (1824: 18). Type: ***S. cocoides*** Martius (1826: 130)

Langsdorffia Raddi (1820: 345). (illegitimate; not *Langsdorffia* Mart., Balanophoraceae) Type: *L. pseudococos* Raddi (= *Syagrus pseudococos* (Raddi) Glassman).
Platenia Karsten (1856: 250). Type: *P. chiragua* H.Karst. (= *Syagrus sancona* (Kunth) H.Karst.) (see Bernal & Galeano 1989).
Glaziova Mart. ex Drude (1881: 295) (illegitimate; not *Glaziova* Bureau, Bignoniaceae). Lectotype (designated by Moore [1963b: 267]): *G. martiana* Glaz. ex Drude (illegitimate name) (= *Syagrus weddelliana* (H.Wendl.) Becc.).
Cocos subgenus *Arecastrum* Drude (1881: 402).
Barbosa Beccari (1887: 349, 352). Type: *B. pseudococos* (Raddi) Becc. (= *Syagrus pseudococos* (Raddi) Glassman).
Rhyticocos Beccari (1887: 350, 353). Type: *R. amara* (Jacq.) Becc. (= *Syagrus amara* (Jacq.) Mart.).
Arikuryroba Barbosa Rodrigues (1891: 5). Type: *A. capanemae* Barb.Rodr. (= *Syagrus schizophylla* (Mart.) Glassman).
Arikury Beccari (1916: 445). Superfluous substitute name for *Arikuryroba*.
Arecastrum (Drude) Beccari (1916: 446). Type: *A. romanzoffianum* (Cham.) Becc. (= *Syagrus romanzoffiana* (Cham.) Glassman).
Lytocaryum Toledo (1944: 6). Type: *Lytocaryum hoehnei* (Burret) Toledo (= *Syagrus hoehnei* Burret).
Microcoelum Burret & Potztal (1956: 387). Lectotype (designated by Moore [1963b: 267]): *Microcoelum martianum* (Glaz. ex Drude) Burret & Potztal (illegitimate name) (= *Syagrus weddelliana* (H.Wendl.) Becc.).
Chrysallidosperma Moore (1963a: 109). Type: *C. smithii* H.E.Moore (= *Syagrus smithii* (H.E.Moore) Glassman).

Small to tall, slender or thick, solitary, clustering, at times forking at or below the ground, unarmed or armed, pleonanthic, monoecious palms. **Stem** very short, subterranean to erect, tall, columnar, rarely stolon-like, slender or thick, sometimes swollen basally, distally obscured at first by leaf sheath remains, later becoming bare, sometimes striate, and marked with inconspicuous or raised or impressed, closely or broadly ringed, oblique or circular conspicuous leaf scars. **Leaves** pinnate, spirally arranged, in obscure or regular phyllotaxy, scars circular, arranged in 5 ranks, marcescent or neatly abscising; leaf *sheath* split to its base with no visible crown shaft, disintegrating into an interwoven mass of fibers, sometimes light or dark brown to nearly black hairy, distal part of the sheath and petiole often blending into the other forming a pseudopetiole (sheath plus petiole), *pseudopetiole* short to long, adaxially channeled or flattened, and abaxially rounded or angled, usually fibrous along the margins, bearing short caducous fibers, or stiff, rigid, flat woody fibers or rarely the base of the fibers in the form of sharp, spine-like teeth, surfaces variously glabrous, waxy, scaly, covered with a thin indument, pubescent, tomentose, sometimes with some coarse dark hairs; *petiole* (distal portion of the pseudopetiole) with smooth margins, shorter, glabrous, scaly, tomentose or hairy, channeled adaxially, rounded abaxially, *rachis* straight or curved, short to long, variously scaly, tomentose, sometimes bearing conspicuous, coarse dark hairs adaxially or glabrous; *leaflets* single-fold, plication reduplicate, few to very numerous, regularly or irregularly arranged, held in one or several planes, linear, wide to narrow, closely or widely spaced, stiff or curved, the tips acute, acuminate or obtuse, asymmetrical or symmetrical; blade dark to light green or bluish-green, soft membranous or stiff and coriaceous, adaxially glabrous, with sparse scales or hairs, sometimes waxy, abaxially glabrous, with a waxy bloom, or covered with gray, silvery to brownish indument, frequently with inconspicuous to conspicuous ramenta along the main midveins, very rarely also with dense gray indument, transverse veinlets mostly obscure or inconspicuous but sometimes raised and visible adaxially, especially in dried material. **Inflorescence** solitary, interfoliar, erect or pendulous, spicate or usually branched to one order (rarely two), protandrous, usually much shorter than the leaves; *peduncle* more or

less elliptic in cross-section to rounded, short to long, glabrous or variously hairy, sparsely to densely tomentose or scaly; *prophyll* usually mostly concealed within the leaf sheaths, tubular, flattened, 2-keeled, opening distally, often spitting at the tip or distally, becoming fibrous, and disintegrating with age, glabrous to light or dark brown tomentose; *peduncular bract* persistent, much longer than the prophyll, usually inserted just above the prophyll, tubular, enclosing the inflorescence until shortly before anthesis, very rarely shorter than the expanded inflorescence, often more or less spindle-shaped or fusiform before splitting longitudinally along the lower face for most of its length, then expanding and becoming a large hood, beaked, usually more or less woody, rarely thinly coriaceous, glabrous, smooth, glaucous, pubescent or tomentose, longitudinally grooved; *rachis* absent or present, if present, usually shorter than the peduncle or nearly equal, glabrous, hairy, sparsely or densely tomentose often like the peduncle, bearing spirally arranged rachillae or sometimes unilaterally arranged rachillae, each subtended by a minute, nearly inconspicuous or short, triangular, usually coriaceous bract; rachillae one, few to numerous, short or elongate, close or widely spreading, slender, sometimes gnarled and short, straight or often twisted in bud, frequently zigzag, glabrous or sparsely tomentose, bearing spirally arranged triads (rarely tetrads) proximally, paired or solitary staminate flowers distally, the distal-most rachillae occasionally bearing only staminate flowers or rarely the distal portions of the rachillae completely lacking flowers; flower groups usually sessile, subtended by usually inconspicuous bracts; floral bracteoles minute. *Staminate flower* usually more or less asymmetrical or symmetrical; sessile or sometimes borne on brief, slender pedicels; sepals 3 (rarely 4), membranous, thinly coriaceous or fleshy, keeled or more or less triangular, briefly connate at the base; petals 3 (rarely 4) distinct, valvate, more or less thinly coriaceous or fleshy, much longer than the sepals, variously ovate-triangular, lanceolate, oblong, or with acute tips, glabrous, tomentose, scaly or dotted; stamens 6, filaments distinct, sometimes inflexed, sometimes thickened at the base, or very briefly connate or very briefly epipetalous, relatively short, more or less fleshy, anthers elongate, sometimes basally sagittate, apically pointed, dorsifixed near the base or medifixed and more or less versatile; pistillode trifid, conspicuous up to ½ the size of the filaments, or minute, 3(–5)-parted or absent. *Pollen* ellipsoid, frequently elongate, and/or pyriform, usually with either slight or obvious asymmetry; aperture a distal sulcus; ectexine tectate, finely or coarsely perforate, perforate and micro-channeled, perforate-rugulate, rugulate-verrucate or reticulate, aperture margin similar or may be slightly finer; infratectum columellate; longest axis 34–56 μm; post-meotic tetrads tetrahedral. *Pistillate flower* slightly smaller to very much larger than the staminate flowers, pyramidal or conical; sepals 3, distinct, broadly imbricate, triangular, conical to ovate, acute or obtuse, fleshy to coriaceous, sometimes tomentose or scaly; petals 3, distinct, slightly shorter, nearly equaling to slightly longer than the sepals, triangular or ovate, broadly imbricate at the base, with minute to moderately large and conspicuous valvate tips; staminodal ring membranous, thin fleshy or thinly coriaceous, low, more or less 6-toothed or truncate, occasionally absent; gynoecium columnar to conical or ovoid or more or less pyramidal, trilocular, triovulate, glabrous or tomentose, brown-hairy to scaly, the stigmas 3(–5), very long or short, appressed in bud or reflexed, fleshy, ovules laterally attached to the central wall of the locules or the central axis. **Fruit** small to relatively large, 1 (or rarely 2-) seeded, spherical, globose, ovoid, ellipsoidal or rarely obpyriform, variously green, brown, yellow, orange or reddish or reddish tinged, sometimes beaked, the perianth segments and staminodal ring persistent, and sometimes enlarging as a cupule at the fruit base; epicarp smooth or longitudinally striate, glabrous or hairy or lepidote, mesocarp fleshy or dry, with abundant longitudinal fibers, occasionally it and the epicarp split along 3 or more longitudinal sutures to expose the endocarp; *endocarp* thin to thick, bony to woody, smooth or rough with 3 (rarely –5) basal or subbasal pores, sometimes beaked, beak sometimes 3-lobed or broadly conical, sometimes with 3 longitudinal ridges or with 3 regular vertical bands of minute pores, internally often with 3 shiny longitudinal bands or stripes, representing the 3 carpels (trivittate), endocarp circular, rarely triangular or irregular in cross-section, with 3 conspicuous, vertical lines, very rarely with a curved lateral protrusion into the seed; *seed* usually one per fruit, conforming to the shape of the endocarp cavity, subbasally attached or laterally attached with a broad lateral hilum, endosperm usually homogeneous or less commonly ruminate, sometimes with a central cavity; embryo basal or subbasal opposite one of the endocarp pores. *Germination* remote-tubular, rarely adjacent-ligular; *eophyll* simple, entire. *Cytology*: 2n = 32. (Modified from Dransfield *et al.* 2008.)

Definitions and clarifications of measurements used in the keys and the species accounts:

Inflorescence axis—is measured along the main inflorescence axis from the lowest flower-bearing branch (rachilla) or lowest flowers to the tip of the inflorescence.

Pseudopetiole measurement—a measurement that includes the petiole and part of the sheath that is separated from the plant in a petiole fashion. This is a variable and imprecise measurement that can vary depending on the age of the plant and the position of the leaf within the crown, and generally it should be taken on the older leaves.

Petiole measurement—a measurement taken from the apex of the leaf sheath to the base of the leaf blade. However, it is often difficult to determine where the petiole ends and the sheath begins. The petiole always has smooth margins and lacks sheath remnants or darkened marginal scars of former sheath remnants.

Peduncular Bract—the entire peduncular bract is rarely collected, because much of it is buried deep between the leaf sheath and stem. One would have to do major damage to the palm to get it out. Therefore, the "expanded" or "inflated" portion of the peduncular bract is more likely to appear on herbarium sheets. Herein it will be referred to as the expanded portion. It is measured from the tip (often referred to as the beak) to where it just begins to widen or the split open at the base. In this revision, the width or diameter (when curved) is a straight line measurement across the expanded portion of the bract from one side to the other and is often included in the length × width measurement. The width may vary depending on the age, freshness, and dryness of the bract, which affects the bract's curvature. The perimeter is a measurement of the curved portion of the bract and starts at one edge, goes around the curved part of the bract, and ends at the opposite edge. If the bract is flat, then the width and perimeter measurements will be nearly the same, if not, the perimeter will be longer. If width or perimeter measurements are not indicated, then one should assume that it is a perimeter measurement. The thickness measurement is taken at the edge of the bract and is its thickness.

Rachis—is part of the inflorescence axis above the peduncle. However as Tomlinson (1990) noted, the main axis terminates in a flower-covered rachilla. Therefore, if the inflorescence is spicate, there is no rachis to measure, it is absent because the spike is a terminal rachilla and not a terminal portion of the rachis. Rachis measurements recorded herein are measured between the lowest most branch or rachilla and the uppermost branch or rachilla.

Spicate—having an unbranched inflorescence. This is an apical or terminal rachilla (branch) with no rachis present.

Apex and Base—flowers at the apex refers to those flowers that are distally arranged on the inflorescence and flowers at the base refers to those flowers that are proximally arranged on the inflorescence.

Key to *Syagrus*

1. Plants erect with an above ground stem ..... 2.
- Plants without an above ground stem or only a very short or prostrate stem ..... 38.
2. Stems clustering ..... 3.
- Stems solitary ..... 11.

CLUSTERING PALMS WITH ERECT ABOVE-GROUND STEMS

3. Leaflets regularly or evenly arranged along the rachis ..... *Syagrus ruschiana*
- Leaflets arranged in clusters of 2–5 along the rachis, especially near the base ..... 4.
4. Leaflets all deflexed (bent downwards) ..... *Syagrus deflexa*
- Leaflets in slightly different planes, but not all deflexed ..... 5.
5. Stems usually two, twins, occasionally 4 or clustered; mature fruit broadly flattened at tip and covered with brownish lepidote scales; seed often with a central cavity ..... *Syagrus cearensis*
- Stems usually clustering, more than two; mature fruit rounded or tapering at the tip and glabrous or only sparsely lepidote; seed solid, without a central cavity ..... 6.
6. Inflorescence unilaterally branched (rachillae all on one side) ..... 7.
- Inflorescence spirally branched (rachillae on all sides) ..... 9.
7. Leaflets flexible more or less membranaceous, pendant at the tips ..... *Syagrus flexuosa*
- Leaflets stiff, thick, and more or less leathery, straight or only slightly pendant at the tips ..... 8.
8. Leaflet blades green or pale green abaxially, Minas Gerais ..... *Syagrus campestris*
- Leaflets blades white waxy abaxially, endemic to Bahia ..... *Syagrus cataphracta*
9. Stems 12–18 cm in diameter and 15 m tall (endemic to Venezuela) ..... *Syagrus stenopetala*
- Stems 5–8 cm in diameter to 4 m tall ..... 10.
10. Middle leaflets ca. 3 cm wide, fruit nearly globose, deeply grooved (Guyana, Suriname, French Guiana, Amapa, Brazil?) ..... *Syagrus stratincola*
- Middle leaflets 1.5–2 cm wide, fruit ovoid, smooth, and less than 2.5 cm in diameter (endemic to western Bolivia) ..... *Syagrus cardenasii*

11. Pseudopetiole margins with well-defined teeth along its margins ..... 12.
- Pseudopetiole margins nearly smooth, with flexible or rigid fibers, but no teeth ..... 13.
12. Leaflets 18–50, rachillae 8–32, fruits not splitting at tips, endosperm ruminate at least at the margins with an intruded seed coat ..... *Syagrus schizophylla*
- Leaflets 70–90, rachillae 43–62, fruits split at tips, endosperm homogeneous ..... *Syagrus santosii*
13. Leaflets deflexed (bent downwards) ..... *Syagrus deflexa*
- Leaflets in different planes or nearly in one plane, but not all deflexed ..... 14.
14. Leaflets evenly distributed along each side in one plane ..... 15.
- Leaflets in clusters of 2–5 along each side usually in various planes ..... 18.
15. Leaflets glabrous abaxially, both sides of the leaf forming a V-shape, and leaf rachis recurved ..... *Syagrus botryophora*
- Leaflets covered with silvery or fine light brownish pubescence abaxially, arranged regularly in one plane, with both sides of leaf lying in the same plane, and more or less straight ..... 16.
16. Leaflets covered with usually a brownish pubescence adaxially, leaf rachis 140–155 cm, leaflets 1.5–2.0 cm wide, fruit with ruminate endosperm ..... *Syagrus hoehnei*
- Leaflets covered with a silvery pubescence abaxially, leaf rachis to 99 cm, leaflets 0.4–1.5 cm wide, fruit with homogeneous endosperm ..... 17.
17. Stem to 10 m, leaf sheath and leaf rachis covered with fine black fibers, eophyll simple lanceolate, continuing to produce simple lanceolate leaves for the first 30 cm ..... *Syagrus insignis*
- Stem to 1–3.5 m, leaf sheath and leaf rachis covered with fine dark brownish to chestnut colored fibers, eophyll very small and simple lanceolate, but second leaf and thereafter are pinnate ..... *Syagrus weddelliana*
18. Rachillae devoid of flowers at the tips; the naked tips folded back and forth like dried ramen noodles ..... *Syagrus vermicularis*
- Rachillae flowering to the tip; straight or only slightly twisted ..... 19.
19. Leaf bases in vertical or spiraled rows on the stem ..... 20.
- Leaf bases not in rows; leaves spirally arranged ..... 22.
20. Pseudopetiole margins with very wide, stiff, flat woody fibers ..... *Syagrus coronata*
- Pseudopetiole margins with thinner, narrower, more flexible fibers ..... 21.
21. Stem usually erect, pistillate flowers 10–17 mm long, fruit ellipsoid, 2–3 cm long, endocarp ellipsoid to ovoid, 2–2.8 cm long, 2–4 mm thick on its sides ..... *Syagrus glaucescens*
- Stem usually prostrate (occasionally erect), pistillate flowers 17–25 mm long, fruit globose, 3–4 cm long, endocarp nearly globose, 2.8–3.5 cm in diameter, 5–8 mm thick on its sides ..... *Syagrus duartei*
22. Pistillate flowers large, 16–35 mm long ..... 23.
- Pistillate flowers small, 5–15 mm long ..... 28.
23. Inflorescence spicate or bifid (1 or 2 rachillae), fruit with longitudinal grooves ..... *Syagrus elata*
- Inflorescence with more than 15 rachillae, fruit smooth without grooves ..... 24.
24. Leaflets mostly straight and rigid, fruits 3.5–5.0 cm long ..... 25.
- Leaflets mostly curled or pendulous, fruits 5.5–9.0 cm long ..... 27.
25. Pistillate flower petals terminating in a long tapering valvate tip, fruit mostly glabrous, scale or short hairy indument present only at the tip ..... *Syagrus oleracea*
- Pistillate flowers abruptly terminating in a short valvate tip, fruits mostly covered by a fine lepidote scale or indument ..... 26.
26. Stems in twos, fours or clustered, but occasionally solitary, fruit nearly globose, broadly flatted at tip ... *Syagrus cearensis*
- Stems always solitary, fruit ovoid, rounded to tapered at tip ..... *Syagrus kellyana*
27. Pistillate flowers rounded, globose, fruits globose, 5.5–6.8 cm long, endocarp globose with smooth surface, endocarp tip with broad conical "Chinese-like cap"; endosperm ruminate ..... *Syagrus pseudococos*
- Pistillate flowers pyramidal or elongate conical, fruit ellipsoid 6.5–9.0 cm long, endocarp ellipsoid with rough surface, endocarp tip with 3 ridges that begin at the tip and often continue down the sides; endosperm homogeneous ..... *Syagrus macrocarpa*
28. Pistillate flowers 7 mm long or less, endocarpal wall irregular and penetrating the seed or endosperm, irregular in cross-section ..... *Syagrus romanzoffiana*
- Pistillate flowers usually 5–15 mm long, endocarpal wall smooth, triangular or circular in cross-section, but not irregular. ..... 29.
29. Endocarp cavity more or less triangular in cross-section ..... 30.
- Endocarp cavity more or less circular in cross-section ..... 31.
30. Pistillate flowers 11–13 mm long, anthers 5–6 mm long, fruits 5–8 cm in length, seeds with ruminate endosperm especially near its outer surface ..... *Syagrus smithii*
- Pistillate flowers 5–8 mm long, anthers 2.5–4 mm long, fruits 3.0–5.5 cm in length, seeds with homogeneous endosperm. ..... *Syagrus inajai*
31. Rachillae 1–20 ..... 32.

- Rachillae usually more than 20 ..... 33.
32. Stem smooth, more or less self-cleaning, peduncular bract thin 1–3 mm thick, fruit ovoid to pear-shaped, 3.5–6 cm long .. .. *Syagrus cocoides*
- Stem rough or with persistent leaf bases, peduncular bract thicker 2.5–7 mm thick, fruit ellipsoid, 2–3 cm long .... *Syagrus comosa*
33. Leaves strongly ascending, fruit 2.5–3 cm long; mostly covered with a fine lepidote ..... *Syagrus lorenzoniorum*
- Leaves horizontal to spreading and pendulous, fruit 3 cm long or more; more or less glabrous ..... 34.
34. Fruits 4.1–7 cm long, endosperm ruminate with seed coat penetrating the margins of the endosperm (Eastern Caribbean) . ..... *Syagrus amara*
- Fruits 3–4.5 cm long, endosperm homogeneous (South American) ..... 35.
35. Stem rough, leaf scars closely spaced with little or no internodes, fruits only 1 or 2 per rachilla..... *Syagrus yungasensis*
- Stem relatively smooth with distinct internodes, fruits many more than 2 per rachilla..... 36.
36. Rachis of inflorescence usually more than 50 cm long, rachillae 78–180 or more, Andean foothills ..... *Syagrus sancona*
- Rachis of inflorescence less than 50 cm long, less than 70 rachillae..... 37.
37. Leaflets more or less rigid and straight, pistillate flowers ca. 15 mm long; fruit often splitting at its tip, Atlantic Forest .... *Syagrus picrophylla*
- Leaflets more or less pendulous, pistillate flowers 5–9 mm long; fruits not splitting at their tips, Amazonian..... ..... *Syagrus orinocensis*

SHORT and SUBTERRANEAN or PROSTRATE STEMMED PALMS

38. Leaflet blades covered with silvery pubescence abaxially, fruits red to reddish-orange, small 1.0–1.3 × 0.6 –0.7 cm .... *Syagrus itapebiensis*
- Leaflets blades glabrous to waxy abaxially, fruits green, brown, yellow, orange, and larger than above ..... 39.
39. Leaflet tips with hardened spines..... *Syagrus campylospatha*
- Leaflet tips acute, acuminate, asymmetric, emarginate, but not with spines ..... 40.
40. Leaflets all deflexed (bent downwards) ..... 41.
- Leaflets in one plane or in various planes but not all deflexed ..... 43.
41. Leaflets in clusters of two along the rachis; rachillae gnarled and nodose, 0.5–0.7 cm long..... *Syagrus pleioclada*
- Leaflets evenly arranged along the rachis; rachillae straight, 3 cm long or more ..... 42.
42. Rachilla 1, peduncle 10–20 cm long, inflorescence axis 3–14 cm long ..... *Syagrus pleiocladoides*
- Rachillae 5–31, peduncle usually longer than 40 cm; inflorescence axis longer than 18 cm .... *Syagrus harleyi* (lower elevation form with strongly pendulous leaflets)
43. Leaves gray-blue, silvery-blue or silvery-green..... 44.
- Leaves various shades of light to dark green or dark blue-green..... 47.
44. Leaflets usually 0.3–0.8 cm wide..... *Syagrus graminifolia* subsp. *graminifolia*
- Leaflets usually 0.9–3 cm wide..... 45.
45. The two sides of the leaf forming a V, proximal leaflets irregularly arranged along the rachis in clusters of 2 and sometimes 1 or 3, middle leaflets usually longer than 40 cm ..... *Syagrus pimentae*
- Two sides more open and not forming a strong V, proximal leaflets irregularly arranged along the rachis in clusters of 3–5, middle leaflets usually 10–34 cm long..... 46.
46. Leaf rachis 29–62 cm long, middle leaflets 10–22 cm long, pistillate flowers 5–7 mm long (Bahia) ... *Syagrus microphylla*
- Leaf rachis 70–120 cm long, middle leaflets 24–34 cm long, pistillate flowers 16–20 mm long (Goiás) ... *Syagrus rupicola*
47. Conspicuous whitish waxy bloom on abaxial side of the younger leaflets..... 48.
- Green or pale green adaxially but lacking waxy bloom or bloom not that conspicuous on underside of younger leaflets..... ..... 54.
48. Middle leaflet tip usually emarginate and symmetrical ..... *Syagrus evansiana*
- Middle leaflet tip asymmetrical, obtuse, oblique, often one half acuminate and the other half obtuse..... 49.
49. Inflorescence usually branched; rachillae 4–9 ..... 50.
- Inflorescence spicate or rarely branched; rachillae 1 or rarely 2 ..... 51.
50. Middle leaflets 29–66 cm long (Southwestern Goiás)..... *Syagrus menzeliana*
- Middle leaflets 11–25 cm long (São Paulo to Mato Grosso do Sul)..... *Syagrus loefgrenii*
51. Leaflets with prominently raised adaxial transverse veins, white lepidote waxy scales abaxially on younger leaves..... ..... *Syagrus pompeoi*
- Leaflets with inconspicuous adaxial transverse veins, solid whitish waxy bloom adaxially on young leaflets ..... 52.
52. Leaflets stiff, coriaceous, leaflets congested along the rachis, 40–112, bluish to silvery waxy on the abaxial surface (Goiás, Brazil)..... *Syagrus caerulescens*
- Leaflets more membranaceous, clustered or separated but not congested, 19–47, glaucous waxy only on abaxial surface... ..... 53.
53. Middle leaflets 12–20 cm long, pistil whish pubescent on lower 1/3, ca. 7.5 mm long (central Brazil)..... ..... *Syagrus allagopteroides*

- Middle leaflets 18–43 cm long, pistil furfuraceous on lower 1/2, ca. 5 mm long (Bolivia) ..... *Syagrus petraea*
54. Middle leaflets longer than the leaf rachis (rachis can be absent in young *Syagrus lilliputiana* or *Syagrus procumbens* resulting in a semicircular leaflet fan) ..... 55.
- Middle leaflets nearly equal to or usually shorter than the leaf rachis (rachis always present, young leaves always pinnate) ..... 60.
55. Leaf rachis nearly absent, leaf emerging as a semicircular leaflet fan ..... 56.
- Leaflet rachis present, leaf emerging as a pinnate leaf ..... 57.
56. Inflorescence unbranched, 1 rachilla, pistillate flowers 8–19 mm long ..... *Syagrus procumbens*
- Inflorescence branched, 2–9 rachillae, pistillate flowers 6–8 mm long ..... *Syagrus lilliputiana*
57. Adult leaf rachis 2.5–13 cm long ..... *Syagrus procumbens*
- Adult leaf rachis 14–75 cm long ..... 58.
58. Inflorescence branched to 2–9 rachillae ..... *Syagrus lilliputiana*
- Inflorescence spicate ..... 59.
59. Middle leaflets twisted longitudinally, 14–30 cm long (Goiás) ..... *Syagrus emasensis*
- Middle leaflets straight, flat, 36–75 cm long (Mato Grosso) ..... *Syagrus guimaraesensis*
60. Trunk often (not always) visible with a prostrate trunk, leaves erect to strongly ascending in habit, leaflets usually coriaceous ..... 61.
- Trunk usually short, subterranean, not prostrate nor usually visible, leaves spreading or more prostrate in habit, leaflets usually membranaceous (prostrate leaves with more coriaceous leaflets) ..... 63.
61. Inflorescence covered with a fine dense white tomentum ..... *Syagrus werdermannii*
- Inflorescence glabrous ..... 62.
62. Leaflets 44–64 on each side, up to 8 rachillae, pistillate flowers 17–25 mm long ..... *Syagrus duartei*
- Leaflets 17–38 on each side, up to 46 rachillae, pistillate flowers 5–7 mm long ..... *Syagrus vagans*
63. Leaflets evenly arranged along the rachis with only slight clustering or loose clustering at the base ..... 64.
- Leaflets clustering along most of the length of the rachis ..... 69.
64. Inflorescence always spicate ..... 65.
- Inflorescence usually branched ..... 66.
65. Leaf rachis 14–46 cm long, leaflets 5–17, pistillate flowers 13–18 mm long, pistil 9–10 mm long ..... *Syagrus minor*
- Leaf rachis 46–89 cm long, leaflets 20–45, pistillate flowers 11–12 mm long, pistil ca. 6.5–7.0 mm long ..... *Syagrus longipedunculata*
66. Leaflets usually 1.2–2.7 cm wide, peduncle usually longer than 45 cm (45–112 cm), pistillate flowers 4–6 mm long ..... *Syagrus harleyi*
- Leaflets usually 0.4–1.3 cm wide, peduncle usually less than 45 cm (9.5–49 cm), pistillate flowers 7–15 mm long ..... 67.
67. Leaf rachis to 129 cm long, leaflets usually 30 or more ..... *Syagrus glazioviana*
- Leaf rachis to 70 cm long, leaflets usually 25 or less ..... 68.
68. Leaflets 18–24 × 0.8–1.0 cm ..... *Syagrus angustifolia*
- Leaflets 30–55 × 0.4–0.7 cm ..... *Syagrus graminifolia* subsp. *glazioviana*
69. Leaf petiole 0.4–0.5 cm wide, leaflets less than 15, inflorescence spicate ..... *Syagrus graminifolia* subsp. *cabraliensis*
- Leaf petiole wider than 0.5 cm (0.5–1.0 cm), leaflets more than 15, inflorescence usually branched ..... 70.
70. Plants usually smaller than 40–50 cm tall, leaflet usually less than 20 cm long ..... 71.
- Plants usually larger than 60 cm tall, leaflets usually more than 20 cm long ..... 72.
71. Newer leaflets whitish and glaucous abaxially, leaflet flat and straight, pistillate flowers 11–13 mm long ..... *S. allagopteroides*
- Newer leaflets green and glabrous abaxially, leaflet slightly twisted longitudinally, pistillate flowers 9–10 mm long ..... *S. itacambirana*
72. Basal rachillae to 5 cm long, inflorescence sometimes spicate or branched to 6 rachillae, basal flowers sometimes in tetrads ..... *Syagrus gouveiana*
- Basal rachillae 6–25 cm long, inflorescence branched 4–14 rachillae, basal flowers always in triads ..... 73.
73. Leaflets 13–31, expanded peduncular bract 18–53 cm long, peduncle 22–49 cm long ..... *Syagrus mendanhensis*
- Leaflets 28–62, expanded peduncular bract 13–18 cm long, peduncle 4–9 cm long ..... *Syagrus cerqueirana*

Species Accounts

Sixty-five taxa are distinguished in this revision besides the 12 taxa used to designate natural and garden hybrids. One species is new (*Syagrus pimentae*) and three are new combinations (*S. elata, S. cataphracta,* and *S.* × *dickensonii*). Two have changed their status moving from variety to subspecies (*S. graminifolia* subsp. *glazioviana* and *S. graminifolia* subsp. *graminifolia*). The author has tried not to repeat items in the descriptions that are true for the entire genus. If only one or two species are the exception for the genus, then that exception is recounted in the above generic description and also repeated in that one species account. Specimens examined are organized by

their country, state, major closest city, then by primary collector, and the primary collector's collecting number. The author has used decimal degrees throughout most of the paper for localities.

1. *Syagrus allagopteroides* Noblick & Lorenzi (2010b: 23). Type:—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, 840 m, –12.83, –45.89, 13 December 2009, *H. Lorenzi, K. Soares & R. Campos 6792* (holotype HPL!, isotypes CEPEC!, FTG!, K!, NY!, RB!, SP!)

Figure 3 plate. Figure 4 map.

Small, solitary palm, whole plant less than 50 cm tall. **Stem** generally solitary, short or subterranean appearing acaulescent, ca. 4 cm in diameter. **Leaves** 2–8; *sheathing leaf base* 6–14 cm long; *pseudopetiole* with nearly smooth to fibrous margins, 6–22 cm long; *petiole* 5–16 × 0.5–1.0 cm; *rachis* 23–52 cm long; *leaflets* 21–47 along each side of the rachis, linear, stiff, flat, straight, usually whitish, glaucous on the abaxial side of newer leaflets, sometimes gradually becoming green on both sides, apex long acuminate, asymmetrical, often rounded on one half, distributed irregularly in clusters of 2–4, inserted in various planes, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 11 × 0.2 cm, middle leaflets 12–20 × 0.8–2.6 cm, apical leaflets ca. 10 × 0.3 cm. **Inflorescence** erect, spicate or spirally branched; *prophyll* 5.0–14.5 × 1–3 cm; *peduncular bract* 10–32 cm long, expanded part 7–20 × 1.2–4.5 cm, including a short beak, 2–3 mm thickness, woody, sulcate; *peduncle* 8–22(–46) × 0.4–0.6 cm; *inflorescence axis* 6–17 cm long; *rachis* 0–5 cm long; *rachillae* 1–6, 3–19 cm long; *staminate flowers* 9 × 4 mm, sepals 1.5 × 1 mm, glabrous, petals 7–8 × 3 mm with acute tips, nerves indistinct to slightly raised, stamens 3 mm long, anthers 1.5–2.0 mm long, filaments 1.0–1.5 mm long; *pistillate flowers* 11 × 6 mm at the apex, 12–13 × 8 mm at the base, elongate conical, glabrous, sepals 10–12 × 5–6 mm, petals 10–11 × 4–6 mm, glabrous, pistil 7.5 × 4.0 mm, with white pubescence on the lower third; stigmas 2.5 mm long, staminodal ring ca. 2 mm high, 6-dentate. **Fruit** ovoid, ca. 2.2–3.3 × 1.8–2.2 cm, yellow to brown, with epicarp less than 1 mm thick, mesocarp, succulent and fibrous, thickness not measured; *endocarp* 2.4–3.1 × 1.4 cm, thickness 1.5–2.2 mm; *seed* ca.1 cm in diameter with no internal cavity, endosperm homogeneous. Germination remote-tubular.

Common name:—buri-falso.

Etymology:—The specific epithet, *allagopteroides,* refers to the similarity of this palms leaves to those of *Allagoptera* Nees.

Distribution and habitat:—Found mostly in the Brazilian state of Bahia throughout the extreme western portion of the state in the prime soybean planting region (i.e. Barreiras), but reaching into Tocantins (Mateiros), Goiás, and Minas Gerais, in cerrado, generally in sandy soils in full sun. It is found in the state of Bahia (Serra Geral de Goiás), northeastern Goiás (Possé), and northwestern Minas Gerais (Formoso), 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* Mart. and *Attalea barreirensis* Glassman.

Conservation:—This palm is highly threatened outside of the few reserves left in western Bahia and Goiás. Its survival is threatened by the soybean plantations in western Bahia. Because of its vulnerability to aggressive agricultural practices, this species is classified as Endangered, EN A4ac.

Phenology:—Flowering in June. This palm fruits sparsely in the spring (September to November).

Uses:—The tasty and nutritious fruits, which are easily accessible, are eaten by small rodents. It possesses potential for cultivation in gardens by virtue of its attractive foliage and compact form.

Notes:—Leaflets are arranged much like those on an *Allagoptera* leaf with its tightly clustered leaflets. Leaflet anatomy is distinctive with very large marginal fiber strands that can be felt with the fingers along the margins of the leaf. It is a small-leaved, acaulescent palm with a spicate inflorescence. The author first collected this palm several times throughout western Bahia in the 1980s, but dismissed it as another growth form of *S. petraea*. However, after having the opportunity to examine Bolivian material of *S. petraea*, the author found that the leaflet anatomy of *S. allagopteroides* is significantly different, 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*).

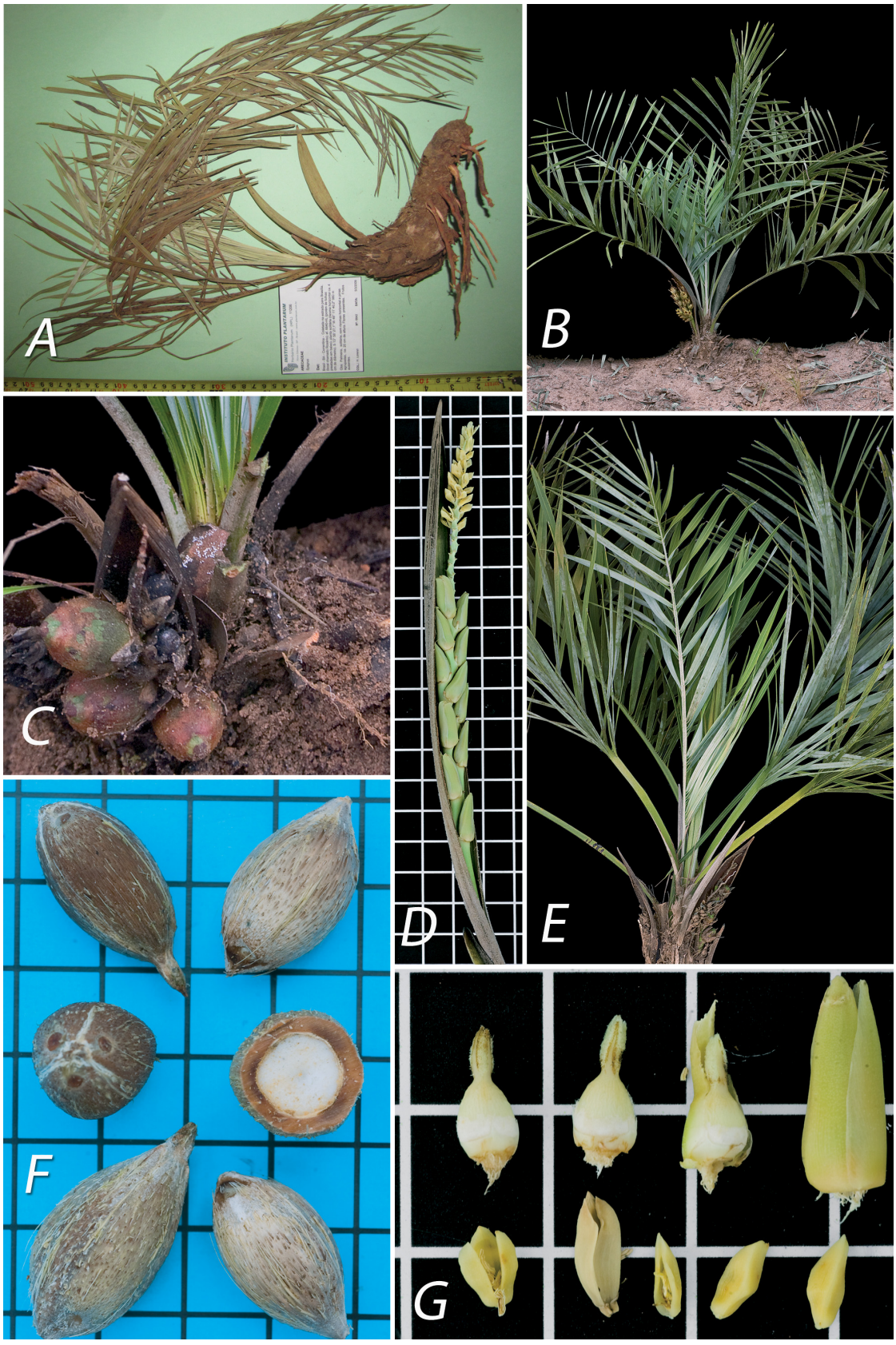

FIGURE 3. *Syagrus allagopteroides*. A. Specimen with leaf showing the *Allagoptera* like leaf (*Lorenzi 6642*). B. Habit with an inflorescence. C. Infructescence. D. Spicate inflorescence. E. Leaves with glaucous waxy underside. F. Endocarps. G. Pistil and pistillate flowers above and staminate flowers below. All grids are in centimeters.

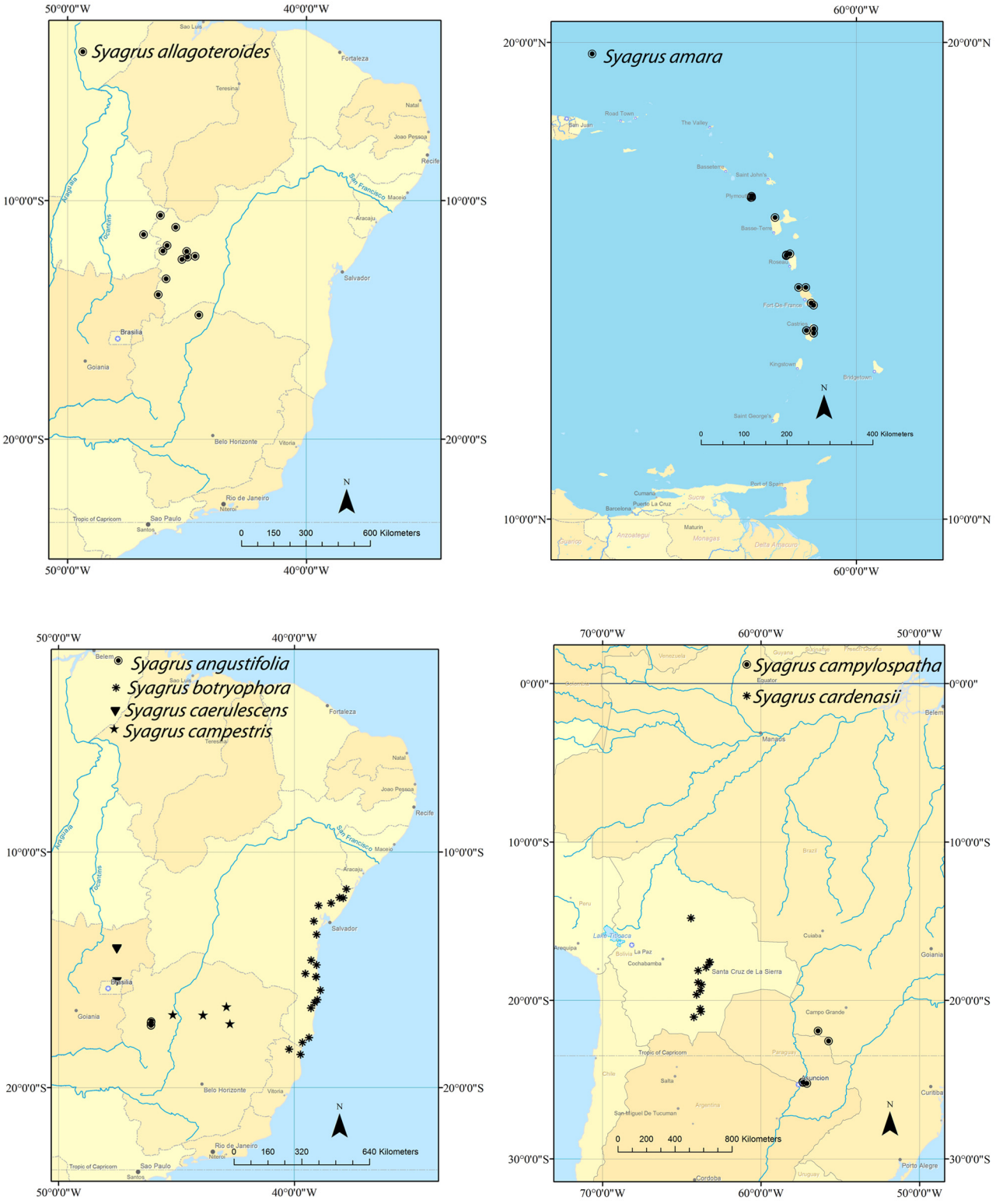

FIGURE 4. Distribution maps of *Syagrus allagopteroides, S. amara, S. angustifolia, S. botryophora, S. caerulescens, S. campestris, S. campylospatha,* and *S. cardenasii*.

Representative specimens:—BRAZIL. **Bahia:** Barreiras, 759 m, –11.88, –45.83, without date*, A. Cotrim. et al. 1632* (HUEFS!); Barreiras, 18 km W of BR 020 on road to Taguatinga (GO), 770 m, –12.12, –46.00, 26 October 1988*, L.R. Noblick & J.L. de S. Lima 4665* (BAH!, CEPEC!, F!, HTSA!); Barreiras, 18 km N of the BR 020 at

Posto Cerradão (66 km W of Barreiras). Cerrado vegetation with fine light brown sandy soils, 740 m elevation, –12.13, –45.00, 26 October 1988, *L.R. Noblick & J.L. de S. Lima 4669* (ALCB!, CEPEC!, HTSA!, F!, K!, U!); Côcos, Rod. Cocos. Coribe, 14 km da sede do municipio, 670 m, –14.80, –44.50, 18 April 2001, *J.G. Jardim et al. 3635* (HUEFS!); Côcos, 31 km W of Cocos on road to Serra da Suçuarana, Riacho do Meio, place called Samambaia, 600 m, –14.17, –44.55, 20 October 1988, *L.R. Noblick & J.L. de S. Lima 4652* (CAS!, CEPEC!, F!, HTSA!); Correntina, 36 km SW of Correntina on BR 349, 700 m elevation, –12.33,–44.65, 22 October 1988, *L.R. Noblick & J.L. de S. Lima 4655* (F!); Correntina, na estrada para Brasília, (local chamado Rosário [Posto Rosario na divisa com Goiás]), –13.94, –46.19, 5 March 2009, *H. Lorenzi 6642* (HPL!); Formosa do Rio Preto, próximo ao Rio Riacão, 540 m, –11.12, –45.47, 8 April 1989, *A.O. Scariot et al. 474, 476* (CEN!); Jaborandi, 12 km S of the Rio Arrojado on road, Correntina/Jaborandi, 600 m, –13.53, –44.28, 17 October 1988, *L.R. Noblick & J.L. de S. Lima 4634* (AAU!, BAH!, BH!, CEPEC!, F!, FTG!, HTSA!, K!), *4635* (CEPEC!, F!, GH!, HTSA!); Jaborandi, 5 km N of the village of Gatos, 640 m, –13.53, –44.28, 17 October 1988, *L.R. Noblick & J.L. de S. Lima 4638, 4639* (CEPEC!, F!, HTSA!); São Desidério, –12.367, –44.97, 24 October 1988, *L.R. Noblick & J.L. de S. Lima 4660* (F!, FTG!, HTSA!), *4661* (NY!); São Desidério, Chapada do São Francisco, estrada de terra entre Roda Velho e Estiva, 7 November 1997, *F.C.A. Oliveira et al. 861* (IBGE, UB!); São Desidério, estrada que liga Roda Velha a Estiva, 515, –12.47, –45.20, 10 April 1989, *A.O. Scariot et al. 482* (CEN!); Roda Velha, BR-020, 29 km após a divisa Goiás/Bahia, –13.28, –45.87, 5 December 1984, *J.T. Medeiros-Costa et al. 0261* (HTSA!); **Tocantins:** Mateiros, Região do Jalapão, Pedra da Balíza—divisa entre os estados de TO, MA, PI & BA, –10.62, –46.10, 7 May 2001, *A.B. Sampaio et al. 495* (HUEFS!); Rio de Conceição, SCC 234-C, Bacia do Tocantins, Sub-bacia Manuel Alves de Natividade (T5, area 7, Ponto 14a), entrada para balnearia, 571 m, –11.42, –46.81, 2 July 2009, *M.L. Fonseca et al. 6048* (UB!).

2. *Syagrus amara* (Jacq.) Martius (1847: 132). *Cocos amara* Jacquin (1763: 277). *Rhyticocos amara* (Jacq.) Beccari (1886: 353). *Calappa amara* (Jacq.) Kuntze (1891: 982). Neotype (designated here):—MARTINIQUE, closest town is Trois Ilets, S to SW of the town close to the Parc Naturel Regional de La Martinique. Secondary forest along a rocky stream valley, 135 m, 14.52, –61.05, 22 August 2009, *L.R. Noblick, A. Peter and P.-O. Albano 5545* (FTG!)

Figure 5 plate, Figure 4 map.

Solitary, moderate to large, unarmed palms, with the **Stem** 6–20 m × 14–24 cm. **Leaves** 9–22, leaf sheath plus the petiole 99–138 cm long; *sheathing leaf base* ca. 90–100 cm long; *pseudopetiole* 60–93 cm long; *petiole* 0–20 × 3.3–6 cm, 1.5–3.0 cm thick; *rachis* 206–364 cm long; *leaflets* slightly lighter on the abaxial surface, 99–156 along one side, in clusters of 2–4 (mostly 3), inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 22–70 × 0.2–0.8 cm, middle leaflets 63–98 × 3.5–6.0 cm, apical leaflets 16–37 × 0.3–1.3 cm with an asymmetric tip. **Inflorescence** erect or pendulous, spirally branched; *prophyll* 39–59 × 6–11 cm; *peduncular bract* 80–165 cm long, expanded portion 60–102 × 5.5–28 cm, including a 0–8(–10) cm beak, 13.5–32 cm perimeter, a 2–4 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 20–67 × 3–4(–4.5) cm, 1.5–3.0 cm thick, elliptical in cross-section, glabrous; *inflorescence axis* 46–84 cm long; rachis 35–59 cm long; *rachillae* 52–88, glabrous, 9–27 cm long at the apex, 23–55 cm long at the base; *staminate flowers* 7–10 × 5.5–8 mm at the apex, 10–13 × 5.5–8 mm at the base, green to yellow, sepals 2.5–3 × 3.5–4 mm, glabrous, with raised nerves, petals 6.5–8 mm long at the tip, 9.5–10 × 3–3.8 mm at the base, with acute tips, glabrous, nerves indistinct to slightly raised, stamens 5–7.5 mm long, anthers 4–7 mm long, filaments 2.5–3 mm long, pistillode 2 mm long; basal *pistillate flowers* pyramidal, ca. 5 mm long at the apex, 10–13 × 7–11 mm at the base, sepals 10–13 × 7–11 mm, sepals longer than the petals, both distinctly nerved, glabrous, yellow, petals 10–12 × 7–9 mm, glabrous, pistil 8–9 × 5.5–7.5 mm, part of the style, and pistil whitish-tomentose on the lower half, stigmas less than 1.0–1.5 mm long, glabrous, staminodal ring ca. 1.5–2.0 mm high, 6-dentate. **Fruit** ovoid-oblong, 4.1–7.0 × 3.4–4.7 cm, yellow to orange when mature, glabrous, epicarp less than 0.5 mm thick, mesocarp 4–7 mm thick, succulent and fibrous; *endocarp* ca. 4–6 × 3–4 cm, 2–4 mm thick on the sides, 5–7 mm thick on the ends, bony; *seed* globose or ovoid, ca. 3 × 2.5 cm, with ruminate endosperm. Germination remote-ligular.

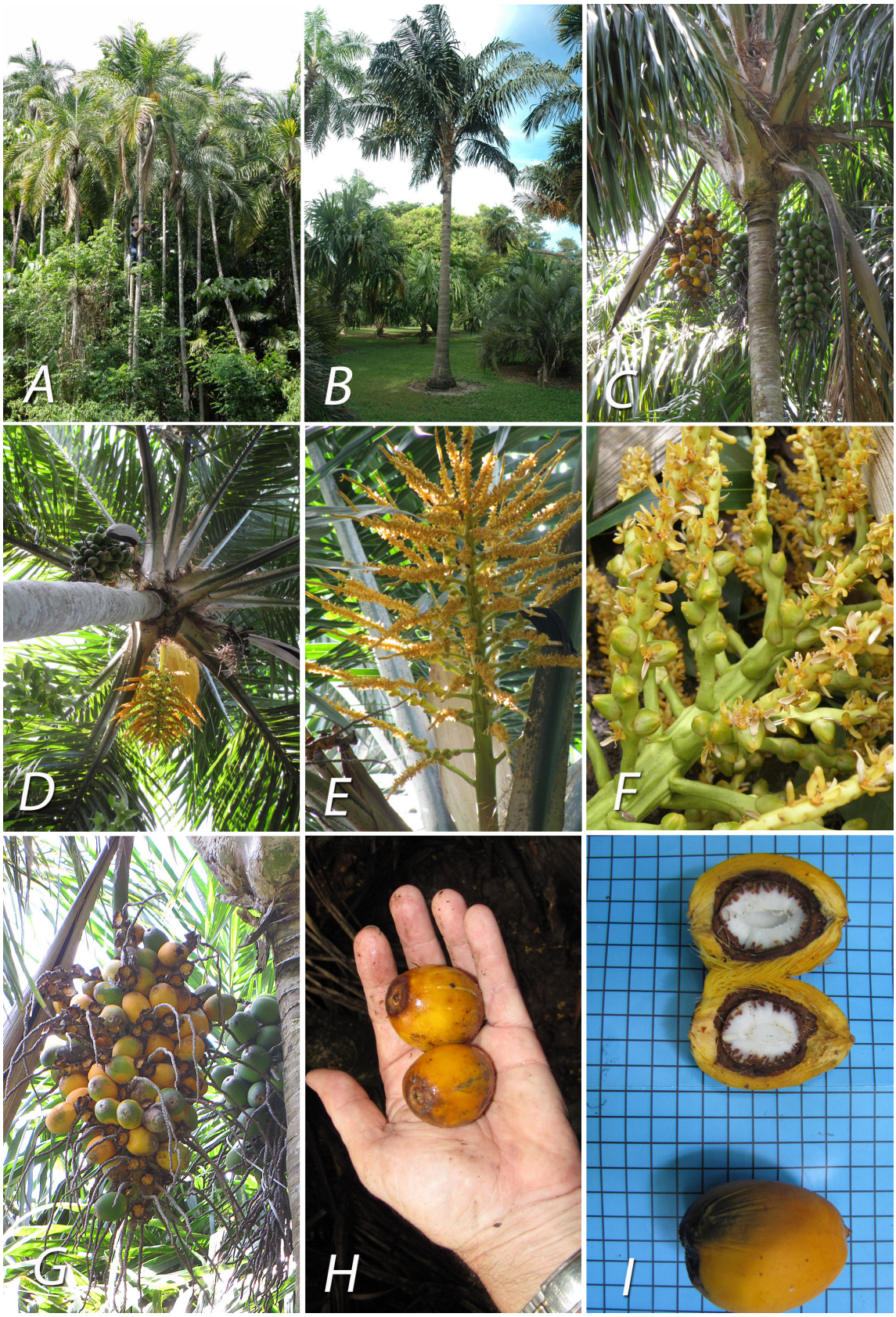

FIGURE 5. *Syagrus amara*. A. Species in habitat on Dominica. B. MBC garden specimen from Guadeloupe showing swollen stem base. C. Infructescences from St. Lucia. D. Canopy with immature infructescence and inflorescence. E. Closer shot of inflorescence. F. Close-up of open staminate flowers with larger unreceptive pistillate flowers. G. Infructescence with mature yellowish-orange fruit. H. Mature fruit. I. Fruit showing ruminate endosperm and internal cavity, grid = 1 cm.

Common name:—ti koko, petit coco, gloughlou (St. Lucia & Martinique), palmiste, palmier amer, petit coco (Martinique), mocho, moca palm, go go palm (Montserrat), coconier, coco cain, coco main, coco nain, yattahu, yattahou (Dominica), palmier amer, palmier rouman au matouba, petit cocos des bois (Guadeloupe), overtop palm.

Etymology:—The specific epithet, *amara,* means bitter, and refers to the bitter-tasting endosperm.

Distribution and habitat:—This species grows on only five islands in the Lesser Antilles: St. Lucia, Martinique, Dominica, Guadeloupe, and Montserrat. The species is known from three populations on St. Lucia on the Caribbean and Atlantic coast. It is most common on St. Lucia's western, Caribbean side, with only two smaller populations on the Atlantic side. In Martinique, it was collected from the northern portion near Grand Rivière, from the southwestern Caribbean side near Trois Ilets, and several smaller localities located mostly on the southern portion of the island. In Dominica, it was mostly collected along the northwestern portion of the island. On Guadeloupe it has been collected near St. Rose and Basse Terre on the western Caribbean side of the island. Finally, it can be found in at least three populations on Montserrat: Upper Blakes, Locust Valley, and Waterworks Estates. It grows in seasonally dry or secondary forests on steep slopes in rocky, clay or older decomposed volcanic soils or along the margins of rocky streams, from 9 m to 363 m elevation.

Conservation:—Because of its habitat, which is steep, and often rocky, there is not much pressure on it from agricultural concerns. Near the coast there may be some competition for building sites, but many of these sites would be difficult to build on. None of the areas of occupancy that the author visited were particularly large with the exception of those on Dominica. Several populations occur in remote or protected areas and some within volcanically active exclusion zones (Monserrat). While some populations my go extinct that are outside of these zones, the author does not see any threat of the species going extinct on any of these islands in the foreseeable future. Live specimens from four of the five islands are growing at Montgomery Botanical Center. It is classified as least concern, LC.

Phenology:—Flowering in the wild in March to July with some plants having fruit from May to August or September.

Uses:—This palm has ornamental potential. According to Hodge (1957), the immature seeds contain a bitter "milk" and fermented drinks were made from the fruit and sap.

Notes:—This is a medium to large palm with a noticeably swollen base. It is the only native *Syagrus* in the Caribbean. The large (to 7 cm long) yellow to orange fruit with white tomentum covered apex, thick endocarp (to 5–7 mm), and ruminate endosperm make it easy to identify.

Representative specimens:—DOMINICA: **St. John Parish**: Ti Baie; Morne Plaissance Road/ Ti Baie Closest Town Portsmith, 165 m, 15.54, –61.46. 13 July 2012, *L.R. Noblick & A. James 5619* (FTG!); **St. Peter Parish**: Near Mount Espagnol. Espagnol; Closest Town is Dublanc, 200 m, 15.53, –61.46, 13 July 2012, *L.R. Noblick & A. James* 5618 (FTG!); St. Peter Parish: Syndicate Road, 297 m, 15.53, –61.46, 14 July 2012, *L.R. Noblick & A. James 5620* (FTG!); GUADELOUPE. **St. Rose:** [16.33, –61.99], 25 March 1931, *A. Questel 613* (P!); MARTINIQUE. Grand Rivière: on the northern side of the island and E of the town, on the slopes and top of Cap. St. Martin, just W of the Rivière Trois Bras, 9 m, 14.86, –61.20, 23 August 2009. *L.R. Noblick et al. 5546* (FTG!); Le Marin, Property of Hubert Inimod, NW of the town facing towards the town of Le Marin, 239 m, 14.48, –60.89, 24 August 2009. *L.R. Noblick et al. 5548* (FTG!); Petit Bourg, ca 2.5 km SE of the town on the Petit Bourg/Regale road (N8), 14.53, –60.94, 158 m, 24 August 2009, *L.R. Noblick & A. Peter 5549* (FTG!); Diamant, vaillon entre Morne Gardier et Morne du Riz, 10 m, 6 September 1988, *C. Sastre 8591* (P!); MONTSERRAT. Blakes Estate: Upper Blakes Estate near the water tower. ca 338 m. 16.77, –62.19, 14 July 2010, *L.R. Noblick et al. 5560* (FTG!); Centre Hills; Centre Hills; Biodiversity Assessment Point 136, 306 m, 16.75, –62.20, 17 November 2005, *M.A. Hamilton et al. 323* (K!); North Centre Hills, 16.75, –62.19, 13 November 1944, *J.S. Beard 434* (K!); 1882, *A. Duss 18* (US); 1897, *A. Duss 3817* (US); 8 May 1891, *J.S. Hollings s.n.* (K!); ST. LUCIA. Anse La Chaloupe: 322 ft, 13.99, –60.89, 18 May 2002, *B.F. Gunn 20, 21* (MO!); Anse La Raye, Just N of Roseau along the Caribbean side of the island, 92 m, 13.96, –61.04, 19 August 2009, *L.R. Noblick et al. 5540* (FTG!); Dennery, Closest town of Dennery, ca. 2.5 km S of the city along the Atlantic side of the island, 73 m, 13.90, –60.89, 20 August 2009. *L.R. Noblick & V.C. Sealy 5541* (FTG!); Mandele, 200 m from Correctional Services towards Dennery, 22 May 2002, *B.F. Gunn 54* (MO!); Masquet, 13.96, –61.04, 16 May 2002, *B.F. Gunn 16, 17* (MO!); Rosseau, Masquet, 294 ft, 13.96, –61.04, 16 May 2002, *B.F. Gunn & M. Smith 12* (MO!).

3. *Syagrus angustifolia* Noblick & Lorenzi (2010b: 25). Type:—BRAZIL. Minas Gerais: João Pinheiro, collected on the road towards Brasilândia de Minas (km 167), 41 km from João Pinherio, 820 m, –17.35, –46.07, 4 March 2009. *H. Lorenzi, R. Pimenta & R. Campos 6636* (holotype HPL!, isotypes FTG!, K!, NY!, RB!, SP!)

Figure 6 plate, Figure 4 map.

Small, solitary or clustering palm less than 50 cm tall. **Stem** very short or subterranean, appearing acaulescent. **Leaves** 3–8; *sheathing leaf base* 6–15 cm long; *pseudopetiole* 7–20 cm long with smooth fibrous margins; *petiole* ca. 4.5–14 × 0.5–0.8 cm, 0.3–0.4 cm thick; *rachis* 29–57 cm long, abaxial surface of the pseudopetiole, rachis, and margins of some of the lower leaflets covered with a whitish indument; *leaflets* 16–25 along each side of the rachis, distributed regularly in pairs near the base, inserted in different planes, lanceolate, medium green, glabrous on both sides, except for the tomentum on the lower leaflet margins, with acuminate, asymmetrical apex, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets ca. 10–18 × 0.1–0.2 cm, middle leaflets 18–24 × 0.8–1.0 cm, apical leaflets 10–19 × 0.2–0.4 cm. **Inflorescence** spicate or unilaterally branched; *prophyll* 7–43 × 1.0–2.5 cm; *peduncular bract* 17–40 cm long, the expanded part 11–27 × 1.7–2.6 cm, including a 0–1 cm beak, 2.8–6 cm perimeter, less than 1 mm thickness, woody, sulcate, covered with a white to grayish white indument on its exterior; *peduncle* 5–19 × 0.4–0.5 cm, glabrous to covered with a thin white indument; *inflorescence axis* 7–18 cm long; *rachis* absent or 2–10 cm long; *rachillae* (1–)2–8, 3.5–12 cm long; *staminate flowers* 4.5–6.0 mm long at the apex, 6.0–11.5 × 4 mm at the base, sepals 1.0–2.5 × 1.0–1.3 mm, glabrous, petals 10–11 × 2.0–2.5 mm with acute tips, petals normally 3, but may have as many as 4 petals on the basal staminate flowers, nerves indistinct to slightly raised, stamens 3–4 mm long, anthers 2.5–3.0 mm long, filaments 1.5–2 mm long; *pistillate flowers* elongate pyramidal, 11 × 5–6 mm at the apex, 14–15 × 7 mm at the base, glabrous, sepals 8.5–9.0 × 4–5 mm, petals 9–10 × 2.5–3.0 mm, glabrous, pistil 8 × 4 mm, glabrous, stigmas 2 mm long, glabrous, staminodal ring ca. 1.0–1.5 mm high, 6-dentate. **Fruit** ellipsoid, 2.8–3.5 × 1.5–1.7 cm, reddish brown with an epicarp less than 1 mm thick, mesocarp thickness not measured, sweet pulpy; *endocarp* 2.2–2.9 × 0.8–1.1 cm, 0.8–1.5 mm thick, hard; *seed* 8–9 mm in diameter with no internal cavity, endosperm homogeneous. Germination remote-tubular.

Common name:—coco-de-vassoura.

Etymology:—The specific epithet, *angustifolia,* means narrow leaf and is one of the characters that one notices about this species and its narrow leaflets.

Distribution and habitat:—Endemic to the state of Minas Gerais, Brazil, with populations located between João Pinheiro and Brasilândia, in open or sparsely vegetated cerrado, generally in fine grained, powdery sand, at high elevation (ca. 800 m).

Conservation:—This species is not known to have a large distribution in an area between João Pinheiro and Brasilândia, Minas Gerais. The area in which it grows is very rocky and hilly and is not appropriate for soybeans or other crops. These areas are often used for pasture; however, there is no immediate threat to this species. Nonetheless, because of its restricted distribution and populations discovered to date, it is classified as endangered EN B1+2ab(ii,iii).

Phenology:—Flowering with immature fruits in June.

Uses:—The tasty and nutritious fruits, which are easily accessible, are eaten by small rodents. The plant has a potential for cultivation in gardens.

Notes:—This is a low-growing, clustering palm with narrow leaflets. It is like *S. graminifolia*, but with larger, shorter clumps, with unilaterally arranged rachillae. The rachillae are more closely spaced and the pistillate flowers are also more closely spaced (congested) on the rachillae. It also has slightly thicker rachillae that are attached to the rachis at more obtuse angles than those of *S. graminifolia*. Its fruits are longer (3.0–3.5 vs. 2–2.5 cm) than *S. graminifolia* and it also has narrower fruits and endocarps.

Representative specimens:—BRAZIL. **Minas Gerais:** João Pinheiro, ca. 50 km N of the city near km 168 on MG-101. Elevation ca. 827 m, –17.36, –46.08, 28 January 2014, *L.R. Noblick & H. Lorenzi 5648* (ESA!, HPL!, FTG!, NY!); João Pinheiro, ca. 65 km N of the city near km 151 on MG-101 (João Pinheiro/Brasilândia). Elevation ca. 865 m, –17.24, –46.07, 28 January 2014, *L.R. Noblick & H. Lorenzi 5649* (ESA!, FTG!); João Pinheiro, 890 m, –17.20, –46.10, 18 November 1981, *O.A. Salgado 243* (HBR!).

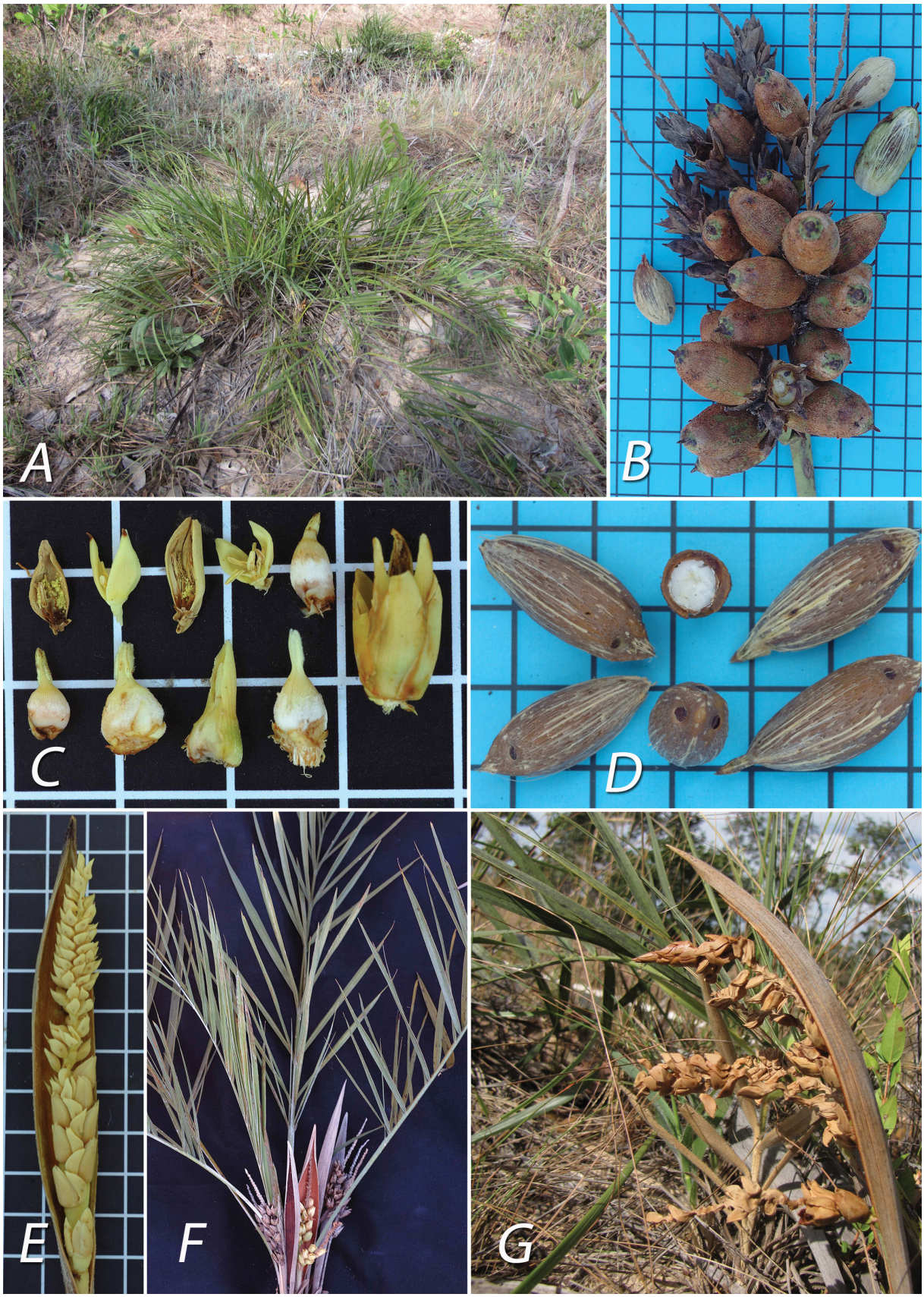

FIGURE 6. *Syagrus angustifolia*. A. Habit in Minas Gerais with inflorescence. B. Infructescence. C. Flowers. The first four flowers in the top row are staminate, followed by a pistil and a pistillate flower. The second row are all pistils. However, the third one still has the petals attached. D. Endocarps. E. Spicate inflorescence. F. Crown with inflorescences showing leaf shape. G. Older branched inflorescence. All grids are in centimeters.

4. *Syagrus botryophora* (Mart.) Martius (1845: 292). *Cocos botryophora* Martius (1826: 118). *Calappa botryophora* (Mart.) Kuntze (1891: 982). Lectotype (designated by Glassman [1972: 88]):—BRAZIL. Bahia: *Martius s.n.* (M!)

Figure 7 plate, Figure 4 map.

Moderate, solitary, unarmed, palms. **Stem** erect, columnar, 6–18 m tall, 13–25 cm in diameter, with leaf scar intervals not measured. **Leaves** (8–)10–19; *sheathing leaf base* (30–)50–75 × 5–8 cm, with fibrous margins, the abaxial surface often covered with a brown tomentum; *pseudopetiole* 40–50 cm long; *petiole* 1.5–10 × 2–3.5 cm, 1.2–2 cm thick; *rachis* 178–280(–295) cm long; *leaflets* green adaxially, slightly paler green, and glabrous abaxially, (76–)103–149 along one side, regularly distributed in one plane, but the two planes form a V with each other with a recurved rachis; no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none or only a few inconspicuous ones along the abaxial midvein, basal leaflets 37–50 × 0.3–1.3 cm, middle leaflets (31–)43–72 × 2.2–3.9 cm, apical leaflets 13–45 × 0.4–1.5 cm mostly with symmetric tips. **Inflorescence** erect or pendulous, spirally branched; *prophyll* ca. 55 × 11 cm; *peduncular bract* ca. (48–)58–85 cm long, expanded portion 40–67 × 10–33(–38) cm, bearing a (2.5–)4–10(–12) cm beak, 8–12 mm thick, woody, deeply sulcate, green-gray to gray on exterior, white becoming purple in interior, deeply convex in shape; *peduncle* ca. 11–28 × 1.5–2 cm; *inflorescence axis* 30–69 cm long; *rachis* 6–22 cm long; *rachillae* 25–60, (10–)19–51 cm long, each rachilla, especially lower ones, subtended by a bract 4–6(–12) × 5–10 mm; basal *staminate flowers* 12–14 × 6–8 mm, white to cream, apical flowers 10–11 × 6–8 mm, sepals 1.5–2 × 2–3 mm, petals 8–11 × 4–7 mm on apical flowers, 12–13 × 7–10 mm at the base, glabrous, 1–2 mm thick with broadly acute tips, nerves indistinct, stamens 5–9 mm long, anthers 4–9 mm long, filaments 1–3 mm long, pistillode absent to 1 mm long, 3(–5) parted; *pistillate flowers* 8–12 × 7–10 mm, white to greenish-white, sepals 7–10 × 6–9 mm, petals 6–9 × 5–6 mm, barely valvate at the tip, glabrous, venation usually not apparent, pistil 5–8 × 3–4 mm, mostly glabrous, but at times a few sparse hairs at the very base, stigmas 3 mm long, staminodal ring ca. 0.5–1.5 mm high. **Fruit** ellipsoid, 3.5–5.0 × 2.2–3.0 cm, persistent perianth (cupule) light brown, 12–15 mm wide, 6–8 mm deep, ring 2 mm in height, epicarp smooth to fine fibrous, often with a bit of tomentum at apex, yellowish-green to yellow, when fruit is mature, less than 1 mm thick, mesocarp mucilaginous, sweet, succulent and fibrous, 1–2 mm thick; *endocarp* 3–4 × 2–2.4 cm, 1.5–2 mm thick, , smooth surface, bony, trivittate, smooth within, medium brown, with no clusters of fibers; *seed* 2–3 × 1.3–1.5 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—pati, patioba (used especially for immature forms with undivided leaves).

Etymology:—The specific epithet, *botryophora,* comes from two Greek derivatives meaning cluster bearing and probably refers to the compact clusters of fruits.

Distribution and habitat:—This species grows along the Eastern Atlantic coast of Brazil (southern Sergipe, Rio Real, to northern Espírito Santo). It grows on the Atlantic forest coastal plain (below 400 m) in red to yellow clay lateritic soils. In Bahia, it is found all along the coast, being most abundant in the southern Bahian rain forests. It grows best within the confines of the forest environment in lateritic clayey soils. It is a rapidly growing palm that can quickly take advantage of any opening in the canopy.

Conservation:—This species is widely distributed in the Atlantic rainforest where much of the forest has been removed for timber and to clear the land for pasture. However, *S. botryophora* is a pioneer species, producing lots of fruits and seeds, which germinate readily and grow quickly. The Atlantic forest is very fragmented; nevertheless there are several reserves (CEPEC) and national parks (Monte Pascoal, etc.) where this palm is protected. There is no immediate threat and it is classified as least concern, LC.

Phenology:—Flowers May through January with fruits maturing February through June.

Uses:—It provides wood for construction ("ripas") and for this reason is often destroyed close to habitations (Bondar1939a). Its trunk is used locally for rural construction and its fruits are rich in edible oil. The fruits have a thin endocarp and the oil-rich seeds are easily extracted. It is an extremely ornamental plant with landscape potential in tropical and subtropical countries. It germinates within 3–5 months. Rapid growth and a certain tolerance to mild freezes make it a great candidate for horticulture, but it is not very tolerant of catastrophic wind events and can be toppled or snapped.



FIGURE 7. *Syagrus botryophora.* A. Specimen in flower in southern Bahia, note recurved leaves and evenly spaced leaflets. B. Specimen from Minas Gerais, note roundish crown. C. Taller specimen from Itapebi, Bahia. D. Canopy of specimen from MBC. E. Closer shot of infructescence. F. Infructescence with immature fruit. G. Thick peduncular bract characteristic of this species. H. Close of immature fruit.

Notes:—*Syagrus botryophora* is easily distinguished from all other *Syagrus* palms by its very thick (8–12 mm) peduncular bract; thick (1–2 mm), creamy white, broadly acute staminate petals with almost rounded tips; strongly recurved leaf rachis; and regularly arranged leaflets lying in a single plane, but forming a V with the opposite side. Only *S. pseudococos* has thick peduncular bracts; and similar but larger, thick staminate petals with rounded tips. However, its staminate petals are yellow, not white; it has ruminate and not homogenous endosperm; and a very distinctive endocarp with a "Chinese hat" apex.

This is one of the fastest growing *Syagrus.* Measurements made at Montgomery Botanical Center, estimate its growth rate at 1.5 m a year (A. Henderson pers. comm.). The younger trees hold onto their lower leaves for an extended period of time, but eventually the trunk becomes self-cleaning.

Representative specimens:—BRAZIL. **Bahia**: G. *Bondar s.n.* (F-619734!, F-619760!, F-619764!); *A.F.M. Glaziou 17854* (FI);, 1–2 km SW of Araçás and W of BA 093, Fazenda Papuçu, 50–100 m elevation, –12.17, –38.43, 23 November 1988, *L.R. Noblick & R. Soeiro 4690* (BAH!, BH!, CEPEC!, F!, K!, NY!); Belmonte, Estação Experimental de Gregório Bondar (CEPLAC/CEPEC), 7 km E of the village of Barrolândia, –15.86, –38.88, 50–100 m, 16 January 1989, *L.R. Noblick 4739* (CEPEC!, F!, K!, NY!, RB!, US!); Belmonte, Barrolândia, Estação Gregório Bondar (EGRGB/CEPLAC), ca. 7 km W of Barrolândia, 40–50 m, –15.85, –38.90, 29 September 1994, *L.R. Noblick et al. 5002, 5004* (IPA!); Cairu, Ilha de Tinharé, Fazenda Pilhões ca. 0.5 km NE of Cairu on the opposite side of the estuary, 0–15 m, –13.50, –39.05, 9 December 1988, *L.R. Noblick 4720* (AAU!, ALCB!, CEPEC!, F!); Cardeal da Silva, 6–7 km N of Cardeal da Silva, 50–100 m, –11.95, –37.92, 1 December 1988, *L.R. Noblick & R. Soeiro 4700* (CEPEC!, F!, FTG!, HRB!, IPA!); Dom Macedo Costa, Fazenda Mocambo, –12.93, –39.17, 30 May 1985, *L.R. Noblick & M.J. Lemos 3812* (F!, HUEFS!); Entre Rios, Litoral Norte, –11.93, –38.08, 12 December 2000, *M.L. Guedes 7679* (ALCB); Fazenda Rio do Negro, ca. 15 km southeast of Entre Rios, –12.02, –38.03, 10 July 2012, *A. Popovkin 1165* (HUEFS); Ilhéus, 1835, *M. Blanchet 100j* (G!); Ilhéus, Ramal entr. km 2 estr. Vila Rio Engenho/Sto. Antonio. Fazenda Theobroma prox. marg. Rio Santana, –14.79, –39.05, 1 May 1988, *L.A. Mattos Silva 2359* (CEPEC!, MBM!); Itamaraju, Fazenda Pau-brasil, ca. 5 km a NW de Itamaraju. Folha SE-24 (17-40d), 19 September 1978, *S.A. Mori et al. 10710* (CEPEC!); Itambé, Rodovia BA-265, km 8 do trecho BR-415 (cruzamento)/Caatiba e a 15 km NW de Itapetinga em linha reta, prox. a Fazenda São João. Região de Mata Mesofila Sul Baiana, 400 m, 3 March 1978, *S.A. Mori et al. 9388* (CEPEC!); Jandaíra, 4–5 km S of Jandaíra, small remnant coastal rain forest in a narrow valley, 100–150 m, –11.57, –37.78, 3 December 1988, *L.R. Noblick & R. Soeiro 4708* (CEPEC!, F!, HRB!, MBM!); Jussarí, ca. 7.5 km da estrada Jussari/Palmira, ramal a esquerda acesso p/ a sede Faz. Teimoso. RPPN Serra do Teimoso, –15.16, –39.53, without date, *P. Fiaschi 1646* (CEPEC); Lage, 8 km W of Lage, secondary forest, 4 July 1969, *S.F. Glassman & J.T. Medeiros-Costa 8724* (BH!, F!, HRB, MO!, RB!); Mucuri, Fazenda Martinica, ca. 2 km S of Rio Mucuri and 4–5 km W of the BR 101, 50–100 m, –18.08, –39.65, 3 February 1989, *L.R. Noblick & Brito 4796* (CEN!, CEPEC!, F!, K!); Nova Viçosa, 22 km SE of the village of Helvécia on the –18.08, –39.65, property of Bahia Sul Cellulose, 50–100 m, –17.88, –39.37, 2 February 1989, *L.R. Noblick & Brito 4782* (CEPEC!, F!, K!, MO!); Paraguaçu, –12.27, –38.97, 25 February 2002, *M.L. Guedes 9506* (ALCB); Porto Seguro, Reserva Ecológica da CEPLAC, 150 m, –16.62, –39.29, 22 September 1985, *J.L. de S. Lima & J.T. Medeiros-Costa 58* (HTSA!); Col. near the intersection on the Eunopolis-Porto Seguro road and the Rio-Salvador highway, 21 January 1975, *R. Read & Daniels 3476* (US!); Porto Seguro, área da Estação Ecológica do Pau-Brasil (ESPAB), ca. de 16 km a W de Porto Seguro, Rod. BR-367 (Porto Seguro/Eunápolis), –16.38, –39.13, 1 April 1986, *F.S. Santos 563* (CEPEC); Porto Seguro, área da Estação Ecológica do Pau-Brasil (ESPAB), ca. de 16 km a W de cidade; Santo Cruz Cabrália, –16.27, –39.02, 17 November 2001, *Pacheco 53* (ALCB); São Sebastião do Passé, Lamarão do Passé, mata 300E/003, 17 December 1982, *L.R. Noblick & I. Britto 2512* (HUEFS!); Salvador, Agua Fria, Colonia de Congugy, 29 September 1918, *H.M. Curran 14* (GH, US!); Santa Cruz Cabrália, Estação Ecológica do Pau Brasil (CEPLAC/CEPEC), 16–17 km W of Porto Seguro and 47 km E of Eunápolis on BR 367, 40–50 m, –16.38, –39.13, 21 January 1989, *L.R. Noblick 4762* (CEPEC!, F!, K!, SP!); Santa Cruz Cabralia, 16 km W Porto Seguro, Rod. BR-367 (Porto Seguro/Eunápolis), Area da ESPAB, –16.38, –39.13, 24 July 1986, *F.S. Santos 655* (CEPEC!); Ubatã, vicinity of Gongogi, coming from Ubata, 17 January 1975, *R. Read 3445* (US!); Una, Reserva Biológica do Mico-leao (IBAMA). Entrada no km 46 da Rod. BA-001 Ilhéus/Una, –15.29, –39.08, 14 April 1993, *L. Amorim 1263* (ALC, CEPEC, NY); Una, 1 km W of the city of Una at the Estação Experimental de Lemos Maia (CEPEC/CEPLAC), –15.30, –39.07, 12 January 1989, *L.R. Noblick 4737* (CEPEC!, F!, FTG!, K!); Uruçuca, 45 km de Uruçuca, –14.59, –39.28, 15 April 1978, *S.A. Mori & Kallunki 9897* (CEPEC!, NY!); **Espirito Santo**: Conceição da Barrra, Norte do ES, entre o Corrego da Preguiça e

Rio Itaúnas, 10 November 1953, *A.P. Duarte 3782* (JBRJ); Conceição da Barra, Área 213 da Aracruz Celulose S.A, –18.59, –39.73, 23 March 1992, *O.J. Pereira et al. 3115* (VIES); Linhares, Reserva Florestal da CVRD, canteiro ao lado da casa de hóspedes, 17 September 1987, *H.Q. Boudet Fernandes 2191, 2195* (MBML!, RB!); Linhares, Reserva Florestal da CVRD, 22 September 1987, *H.Q. Boudet Fernandes 2225* (MBML!); Linhares, 27 April 1989, *D.A. Folli 913* (CVRD); Linhares, 23 November 1989, *D.A. Folli 1013* (CVRD); Linhares, área de viveiro, *A.C. Marcato et al. 348* (CVRD); Pinheiros, Reserva Biológica de Córrego do Veado, trilha da anta, –18.37, –40.21, 14 August 2010, Ribeiro *et al.* 236 (VIES). **Minas Gerais:** 1905, *Simard s.n.* (US-17854).

5. *Syagrus caerulescens* Noblick & Lorenzi (2010b: 28). Type:—BRAZIL. Goiás: Municipio of Alto Paraíso de Goiás, Chapada dos Veadeiros, 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, 1,370 m elevation, –14.09, –47.52, 7 March 2009. *H. Lorenzi, R. Pimenta & R. Campos 6649* (holotype HPL!, isotypes ESA!, K!, NY!, RB!, SP!)

Figure 8 plate, Figure 4 map.

Short, solitary palm 25–60 cm tall. **Stem** short, subterranean, appearing nearly acaulescent ca. 0–15 × 5–8 cm. **Leaves** 2–4(–6), less than 1 m long; *sheathing leaf base* 12–20 × 5 cm long; *pseudopetiole* with fibrous margins, 9–17 cm long; *petiole* 3–14 × 0.6–1.5 cm; *rachis* with white tomentum along the abaxial side, 44–87 cm long; *leaflets* 40–56 (112) along each side of the rachis, linear, stiff coriaceous, dark green on the upper surface, bluish green on the lower, with acute, asymmetrical apex, distributed irregularly in closely spaced clusters of 2 or 3, inserted in various planes, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein, transverse veins inconspicuous; basal leaflets 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, spicate or rarely branched; *prophyll* 8–12 × 1.8–3 cm long; *peduncular bract* 17–20 cm long, expanded part 8–15 × 4–6 cm, variably 1–4 mm thick; *peduncle* (4–)11–14 × 0.5–0.8(–1.3) cm; *inflorescence axis* 8–13 cm long; *rachis* absent; *rachilla* 1 (rarely 2 or 3), 8–10 cm long; *staminate flowers* (9–)13.6–15.7 × 5.0–8.3 mm, sepals 1.4–2.1 × 1.1 mm, glabrous, petals (8–)12.0–13.6 × 2.8–5.0 mm with acute tips, nerves indistinct to slightly raised, stamens 6.4–8.0 mm long, anthers 4.3–7.0 mm long, filaments ca. 1.5–3.0 mm long; basal *pistillate flowers* elongate conical, ca. 11–12 × 6–10 mm, glabrous, sepals 10–12 × 6–9.3 mm, petals 9–10 × 3–6.7 mm, with valvate tip ca. 2/5 the length of the petals, ca. 4 mm long, glabrous, pistil slightly lepidote, 8.6 × 5 mm, stigmas less than 3 mm long, glabrous, staminodal ring ca. 1 mm high, 6-dentate. **Fruit** ovoid, 2.0–2.5 × 1.5–2.0 cm, epicarp with reddish brown lepidote less than 1 mm thick, mesocarp thickness not measured, succulent and fibrous; *endocarp* nearly globose to oblate, 1.2–1.5 × 1.2–1.3 cm, 0.8–1.3 mm thick; *seed* not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—palmeirinha-azul

Etymology:—The specific epithet, *caerulescens,* means bluish, and reflects its common Brazilian name "palmeirinha-azul" or little blue palm.

Distribution and habitat:—Endemic to the state of Goiás, Brazil, in campo rupestre in the Chapada dos Veadeiros National Park, growing generally in rocky, sandy soils.

Conservation:—*Syagrus caerulescens* grows within the protective boundaries of a national park (Chapada dos Veadeiros). It grows in both rocky and sandy soils and is only threatened when growing in agriculturally valuable soils outside the park. There is no immediate threat and it is classified as least concern, LC.

Phenology:—Palm was seen flowering in July; however no fruit was present at that time of year.

Uses:—A beautiful palm with attractive foliage that makes it ideal for landscaping. The tasty and nutritious fruits, which are easily accessible, are eaten by small rodents. This palm possesses potential for cultivation in gardens.

Notes:—This palm's attractive bluish color is due to the thick, waxy, bluish coating on the lower side of its leaves. It frequently has few leaves, but this may be due to 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.

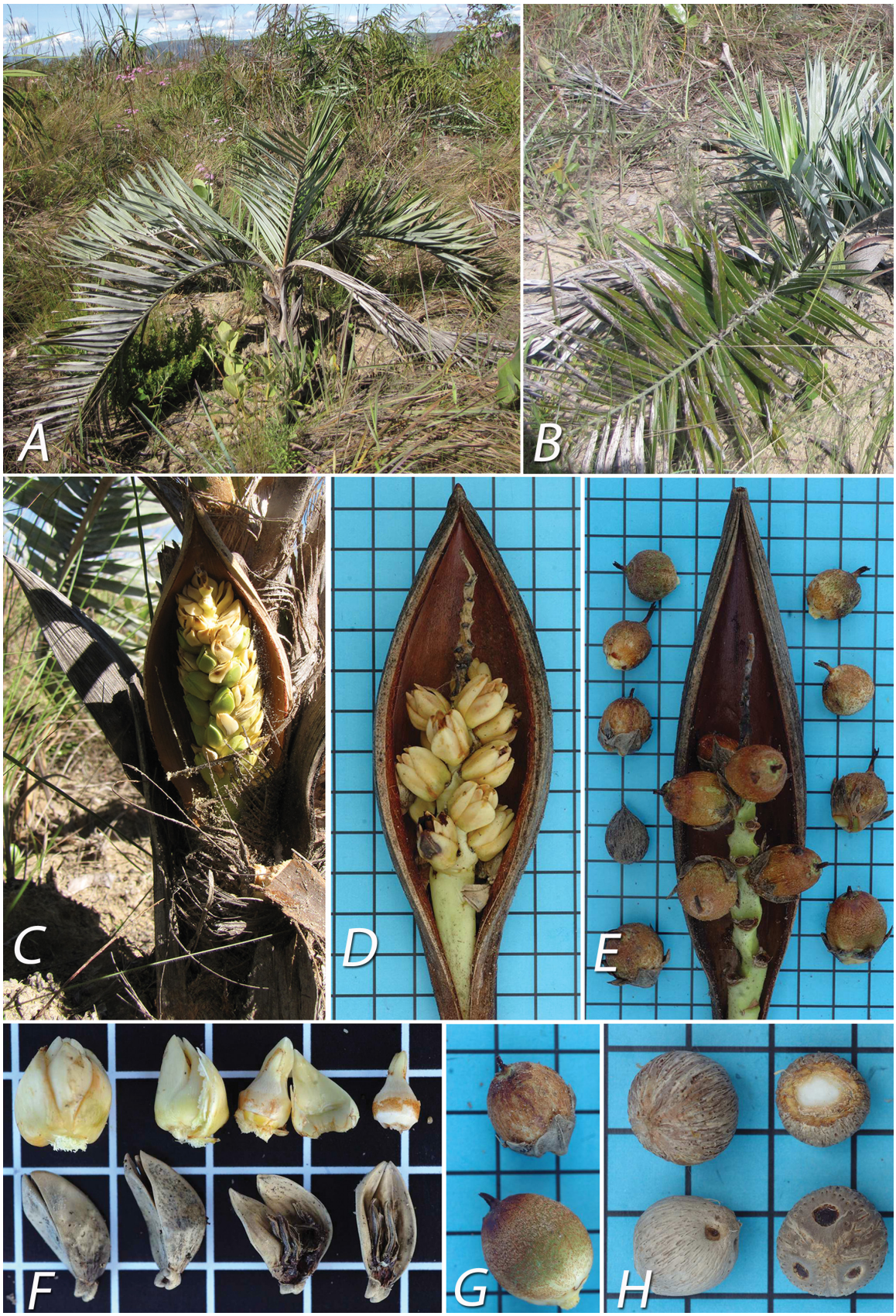

FIGURE 8. *Syagrus caerulescens*. A. Habit in Minas Gerais. B. Leaf with a greenish upper and bluish lower surface. C. Inflorescence on the plant. D. Spicate inflorescence, showing the pistillate flowers and thick bract. E. Infructescence with fruits. F. Flowers with pistillate flowers and pistil above and older staminate flowers below. G. Fruits. H. Endocarps. All grids are in centimeters.

Representative specimens:—BRAZIL. **Goiás:** Agua Fria, Estação Repetidora da TeleBrasília de Roncador, 1000 m, 12 June 1993, *G. Hatschbach et al. 59334* (FTG!, MBL); Alto Paraíso de Goiás, December 2009, *Faria 881* (UB!); Alto Paraíso de Goiás, Cachoeira, 24 May 2008, *R.C. Martins et al. 923* (HEPH); Alto Paraíso de Goiás, em beira de estrada sentido TO, lado direito [east side], ca. 3 km da cidade, 7 May 2008, *R. Tsuji & E. Franco 2622* (HPL!); Alta Paraíso do Goiás, próximo ao Hotel Carmelot, saindo de Alta Paraíso sentido TO, 1280 m, –14.13, –47.52, 19 June 2008, *R. Tsuji et al. 2688* (HPL!); Cavalcante, beira da estrada entre o Engenho II e Brocotó, 17 January 2010, *R.C. Martins 1066* (UB!); Chapada das Perdizes, 20 July 1963, *E.P. Heringer 8926A* (UB!); Formosa—Sentido Alto Paraíso-GO, antes do Post Fiscal, 1196 m, –15.49, –47.52, 18 June 2008, *R. Tsuji et al. 2685* (HPL!); São João de Aliança, July 1990, *Cavalcanti et al. 639* (CEN).

6. *Syagrus campestris* (Mart.) Wendland (1854: 17). *Cocos campestris* Martius (1826: 121). *Calappa campestris* (Mart.) Kuntze (1891: 982). Lectotype (designated by Dahlgren 1959, plate 380):—BRAZIL. Minas Gerais: *Martius s.n.* (M! [F neg. 18559])

Cocos urbaniana Dammer (1902: 22). *Syagrus urbaniana* (Dammer) Beccari (1916: 468). Lectotype (designated by Dahlgren 1959, plate 396):—BRAZIL. Minas Gerais: Caraça [Ouro-Preto], 18 February 1884, *A.F.M. Glaziou 15558* (lectotype P! [F neg. 38693], isolectotypes C, F!, FI, K!, MO!, R!).

Figure 9 plate, Figure 4 map.

Short, clustering to solitary palm, 1–3 m tall. **Stem** ca 1–3 m × 8–15 cm. **Leaves** 6–10; *sheathing leaf base* ca. 36–46 cm long; *pseudopetiole* 30–50 cm long; *petiole* 4–26 × 0.6–1.0 cm, 0.3–0.5 cm thick; *rachis* 52–74 cm long with brown indument; *leaflets* linear lanceolate with asymmetric tips, initially lighter green on the abaxial surface, 35–64 along one side, in clusters of 2–5, inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis but scattered patches along the proximal portions of the abaxial midvein; basal leaflets 14–26 × 0.1–0.35 cm, middle leaflets 18–33 × 0.8–1.4 cm, apical leaflets 4.0–10 × 0.1–0.25 cm. **Inflorescence** unilaterally branched; *prophyll* 14–23.5 × 3 cm; *peduncular bract* 30–66 cm long, expanded portion 21–22 × 4.0–5.6 cm, including a short beak, 2.8–5.6 cm perimeter, 3–4 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 15–27 × 0.6–1, 0.3–0.6 cm thick, elliptical in cross-section, glabrous; *inflorescence axis* 15–49 cm long; *rachis* 8–9 cm long; *rachillae* 8–20, 8–13 cm long, glabrous; *staminate flowers* 11.3–13.2 × 2.2–3.7 mm at the apex, 13.9–15.3 × 2.9 mm at the base, green to yellow, sepals 1.8–3.2 × 0.8–1.5 mm, glabrous, with no raised nerves, petals 9.5–12.4 × 2.2–3.3 mm with acute tips, nerves indistinct, stamens 4.7–6.0 mm long, anthers 3.4–4.8 mm long, filaments 1.7–2.7 mm long, pistillode ca. 0.3–1.0 mm long; *pistillate flowers* elongate conical, 14.5–17.5 × 5.1–6.2 mm at the apex, 20–25 × 7.0 mm at the base, yellow, glabrous, sepals 13.2–15.3 × 4.4–5.8 mm, petals 13.2–15.0 × 4.0–5.8 mm, valvate tip ca. 3/5 the length of the petals, 8.0–9.5 mm long, glabrous, pistil 10.2–11.7 × 3.3–4.4 mm, glabrous, stigmas ca. 5.1 mm long, glabrous, staminodal ring ca. 1.8–2.2 mm high, 6-dentate. **Fruit** ellipsoid, 2.8–3.5 × 2.2–3.0 cm, yellowish-green when mature, glabrous, epicarp less than 0.5 mm thick, mesocarp 5–6 mm thick, succulent and fibrous; *endocarp* ca. 2.5–3.3 × 2.0–2.7 cm, 3 mm thick on the sides, 5 mm thick at its ends; *seed* ellipsoid ca. 17 × 9 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—acumã, coco-babão

Etymology:—The specific epithet, *campestris,* means pertaining to plains or fields, the typical habitat of this palm.

Distribution and habitat:—The species appears to be restricted to the campo rupestre (and high elevation cerrado) mainly in regions of eastern Minas Gerais, Brazil, in rocky sandy soils. However similar plants have been spotted in the Triangular Mineiro and even in western Bahia, which may be extensions of its distribution or perhaps an undescribed species.

Conservation:—This species appears to have a wide distribution in the northeastern portion of Minas Gerais and does not grow in agriculturally valuable soils. Although it is not clear if it grows within the boundaries of any parks or reserves, there is still no immediate threat. It is classified as least concern, LC.

Phenology:—It fruits abundantly in spring and summer (October–March).

Uses:—This clustering palm has ornamental potential with its small size and attractive leaves. The mesocarp is edible in spite of its mucilaginous texture.

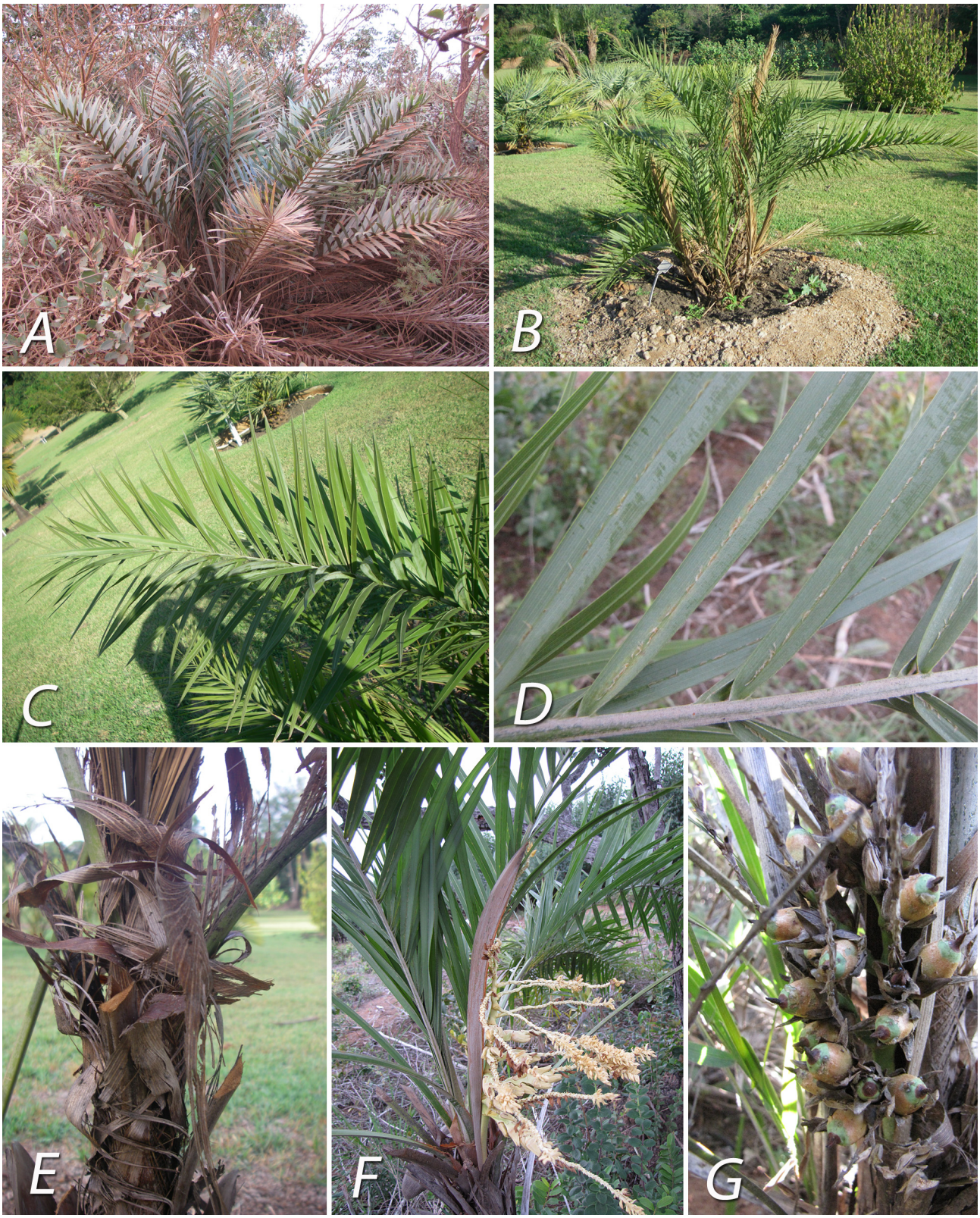

FIGURE 9. *Syagrus campestris*. A. Specimen near Caçaratiba, Minas Gerais with roadside dust. B. Garden specimen from Jardim Botânico Plantarum in Brazil collected near Turmelina, Minas Gerais. C. Leaf showing stiffer leaflets that are not pendulous. D. Ramenta on midvein of leaflets. E. Persistent fibers from leaf sheath. F. Inflorescence. G. Infructescence.

Notes:—This species is similar to *S. flexuosa*, but the leaflets are more coriaceous, perhaps a bit shorter, a bit wider and definitely stiffer. The leaflets are not pendulous at their tips, as are those of *S. flexuosa,* but are held stiff

and straight with no or little bending. Near Turmalina, *S. flexuosa* and *S. campestris* grew at the same elevation, so leaf differences are not due to elevation. It also appears to have smaller inflorescences and fruits than *S. flexuosa*. Cross-sections of the leaflets of *S. campestris* reveal that they have considerably more fibers in the leaves than *S. flexuosa*. Glassman (1987) synonymized it with *S. flexuosa,* but the name has now been restored (Lorenzi *et al.* 2010). It differs from *S. cataphracta* by having slightly wider middle leaflets, no waxy bloom on the underside of the leaf, and the presence of ramenta scales along the proximal portion of the midvein, which are lacking in *S. cataphracta*.

Representative specimens:—BRAZIL. **Goiás:** Vallée de Chica Costa, 10 August 1894, *A.F.M. Glaziou 22261* (C, F, FI, G, K, MO, P! US); **Minas Gerais:** Terra da Carassa, 1816–1821, *A. de Saint-Hilaire 287* (P 02147217! ...219) [P02147220 leaf looks like a *S. campestris* definitely not *S. flexuosa*]; Almeida Campos [near Uberaba], nas proximidades do municipio, 2 August 2009, *E. Franco 67* (HPL!) [possible new species]; Uberaba, 30 November 2009, *H. Lorenzi et al. 6783* (HPL!); Bocaiúva, na estrada para Montes Claros, a ca. de 21 km de Montes Claros, 3 February 2009, *H. Lorenzi 6591* (HPL!); Cacaritiba, 20 January 2010, *H. Lorenzi 6802* (HPL!); Grão Mogol, estrada para Virgem da Lapa, ca. 2 km de Grão Mogol (próximo a antena de televisão), 900 m, –16.56, –42.88, 13 July 2001, *V.C. Souza et al. 25863* (ESA!); Minas Novas, Mata de Açauã, –17.22, –42.59, 10 October 1987, *M.C.T. Pedralli & J.R. Stehmann s.n.* (BHCB 13397); Montes Claros, ao sul do municipio de Montes Claros, sentido Bocaiúva, –16.91, –43.87, 9 June 2009, *R. Campos s.n.* (HPL 12544); Montes Claros, a cerca de 17 km do inicio da rodovia trevo para Bocaiúva, –16.90, –45.15, 13 November 2008, *H. Lorenzi 6536* (HPL!); Montes Claros, just S of the town of Bocaiúva, –16.91, –43.87, 9 June 2009, *L.R. Noblick & R. Campos 5536* (HPL!); Turmalina, no distrito de Caçaratiba, a 4 km de Rodovia BR-367 (sentido Caçaratiba), –17.29, –42.73, 17 December 2003, *H. Lorenzi 4278* (HPL!).

7. *Syagrus campylospatha* (Barb.Rodr.) Beccari (1916: 465). *Cocos campylospatha* Barbosa Rodrigues (1900: 9) Type:—PARAGUAY. In campis Cordillera de Altos, without date, *E. Hassler 1733* (holotype G!, isotypes K!, NY!, P!)

Cocos acaulis Drude subsp. *glauca* Drude (1900: 23). Type:—PARAGUAY. In campo aprisco arenoso, 1893, *Regnell A1879* (holotype S).

Cocos apaensis Barbosa Rodrigues (1903a: 100). *Syagrus apaensis* (Barb.Rodr.) Beccari (1916: 466). Type:—PARAGUAY. Arroyo Trementino, in region of Rio Apa, *E. Hassler 7688* (holotype G!).

Cocos hassleriana Barbosa Rodrigues (1903b: 101). *Syagrus hassleriana* (Barb.Rodr.) Beccari (1916: 466). Type:—PARAGUAY. In arenosis prope Concepcion, *E. Hassler 7164* (holotype G!).

Figure 10 plate, Figure 4 map.

Small, clustering to colonial palm less than 150 cm tall. **Stem** horizontal, stoloniferous. **Leaves** 3–6; *sheathing leaf base* ca. 17–40 cm long; *pseudopetiole* 20–40(–58) cm long; *petiole* 10–27 × 0.5–1.2 cm, 0.3–0.5 cm thick; *rachis* 50–120 cm long; *leaflets* slightly lighter on the abaxial surface, linear, stiff, erect, terminating in a hardened spine a the tip, 23–50 along one side, in clusters of 2 or 3(–4), inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 8–13 × 0.1–0.5 cm, middle leaflets 13–38 × 0.7–1.1 cm, apical leaflets 8–23 × 0.1–0.4 cm with an asymmetric tip. **Inflorescence** erect, spirally branched; *prophyll* ca. 23 × ca. 2 cm; *peduncular bract* 30–62 cm long, expanded portion 16–37 × 1.8–6.0 cm, including a beak not measured, perimeter 5.5–9 cm, 1.5–3 mm thickness, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 11–42 cm × 6–7.5 mm thick, elliptical in cross-section, glabrous; *inflorescence axis* 16–25 cm long; *rachis* 8–15 cm long; *rachillae* 18–23, glabrous, 5–12 cm long at the apex, 10–23 cm long at the base; *staminate flowers* 4.5–6 × 2–2.5 mm at the apex, 7–8 × 2–2.5 mm at the base, green to yellow, sepals 3.5–5.5 × 1.5–2.2 mm, glabrous, smooth, petals 3.5–5.5 × 1.5–2.2 mm at the apex, 6–7.5 × 1.5–2.2 mm at the base, glabrous, nerves indistinct to slightly raised at the base of the petal, with acute tips, stamens 2.5–5.0 mm long, anthers 2–3.8 mm long, filaments 1–3 mm long, pistillode 1 mm long; basal *pistillate flowers* elongate conical, 6–10 × 4–6 mm, yellow, sepals, glabrous, 5.5–7.5 × 3–4 mm, petals 5–7.5 × 2–4 mm, valvate tips 1/3 to ½ the length of the petal, ca. 2–3 mm long, glabrous to tomentose, often with slightly raised veins near the margins, pistil 4–5.5 × 1.5–2.5 mm, glabrous, stigmas 1–2.5 mm long, glabrous, staminodal ring 0.8–1.5 mm high, 6-dentate. **Fruit** ovoid, 2–3 × 1.2–2 cm, green with yellowish bases when mature, mostly glabrous, but tomentose at the apex, epicarp thin less than 0.5 mm thick, mesocarp 5–8 mm thick,

succulent and fibrous, mucilaginous; *endocarp* 1.8–2.0 × 1.4–1.6 cm, 2.5–3.0 mm thick; *seed* ellipsoid to ovoid ca. 1.2–0.8 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—yatáy-mi, yatáy-pequeño.

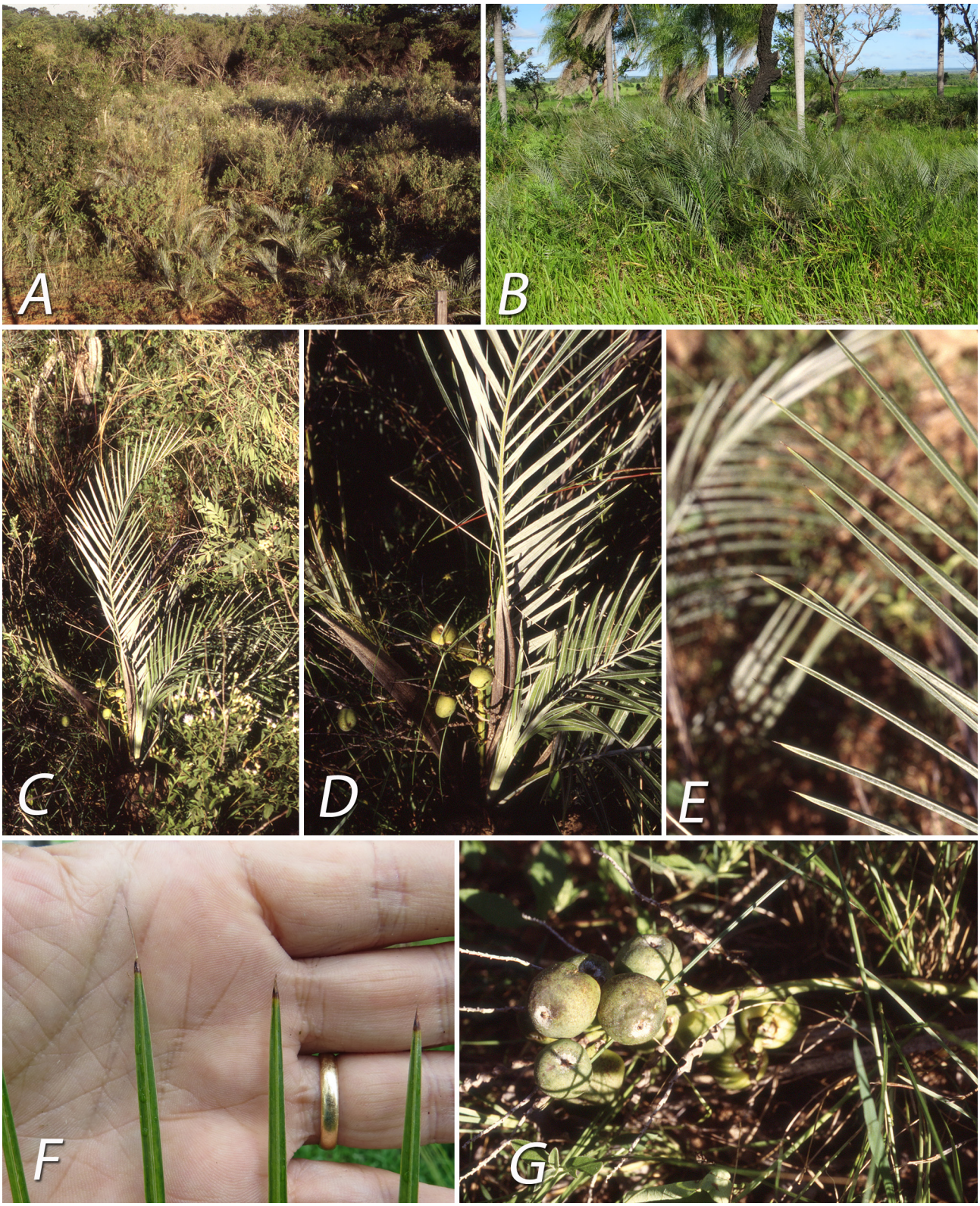

FIGURE 10. *Syagrus campylospatha*. A. Population near Emboscada, Paraguay. B. Colonial habit near Bela Vista, Mato Grosso do Sul, Brazil. C. Single palm with long narrow leaf. D. Specimen with mature fruits. E. Spine-tipped leaflet tips. F. Close up of hardened spines on brownish leaflet tips. G. Infructescence with mature fruit.

Etymology:—The specific epithet, *campylospatha,* translates as bent spathe or bent peduncular bract. Such a character has never been noticed in this species, but perhaps it was in the material that Barbosa Rodrigues inspected.

Distribution and habitat:—Endemic to the Paraguay and Mato Grosso do Sul, Brazil on the frontier with Paraguay, in sandy soils, which can be periodically flooded,

Conservation:—This is actually a "weedy" species that persists in pastures and along roadsides, as cattle do not like its spike-tipped leaflets. It has an ample distribution and persists under the severest of circumstances in over-grazed pastures both in Brazil and in Paraguay. It produces an abundance of fruits and appears to reproduce vegetatively as well, growing into large colonies. Therefore it is classified as least concern, LC.

Phenology:—Fruits sparsely in summer (February–March). This palm has been seen both in fruit and flowering in early March. Seed is difficult to germinate, taking from 18–33 months.

Uses:—This palm, with its attractive glaucous, bluish gray foliage, possesses potential for cultivation in gardens.

Notes:—This is an acaulescent, clustering palm with spine-tipped pinnae that cattle avoid, and a unique leaflet anatomy with many narrow girder-type vascular bundles that connect the adaxial and abaxial surfaces (bundle sheath extensions).

Representative specimens:—BRAZIL. **Mato Grosso do Sul**: Bela Vista, 245 m, –22.57, –55.72, 22 June 2009, *H. Lorenzi et al. 6694* (HPL!); Bela Vista: ca. 18 km N of the city on BR-060 near km 657. 276 m, –21.92, –56.38, 24 January 2014, *L.R. Noblick & R. Pimenta 5646* (ESA!, HPL!, FTG!); PARAGUAY. **Concepcion**: prope Concepcion, 2 August 1901, *E. Hassler 7164* (G); Concepción Estancia Agüerito, Potrera Laurel, December 1991, *F. Mereles 4282* (FCQ!); **Cordillera**: Cordillera de Altos, 1914, *Chodat, R. 721* (G); Cordillera de Altos, *E. Hassler 1733* (G!, K, NY); Cordillera de Altos, October 1904, *E. Hassler 2163* (G); Emboscada, –25.17, –57.33, March 1984, *W.J. Hahn 2200* (MO!, PY!); Emboscada, ca. 1 km S of center of the town of Emboscada, 180 m, –25.14, –57.34, 19 February 1996, *L.R. Noblick et al. 5128* (FCO!, FTG!, PY!); Emboscada, December 1971, *A. Schinini 4222* (CTES, G); Loreto, 16 October 1986, *T.M. Pederson 14638* (G!, MBM!); Tobati, 98 m, ca. 2 km de Tobati, Depto. Cordillera, lado esquerda pavimentado p/Arroyos e Esteros, –25.24, –57.09, 24 March 2009, *H. Lorenzi et al. 6653* (HPL!); Cordillera, Valenzuela, 1882, *B. Balansa 4776* (P); **Paraguari**: Plaine de Pirayu, June 1877, *B. Balansa 2711* (BH, P!); Paraguari, 1893, *C.A.M. Lindman A1879* (S); **Without Locality**: *F. Mereles 1180* (FCQ!); Arroyo Trementina, Rio Apa, 2 October 1901, *E. Hassler 7688* (G); 1914, *R. Chodat s.n.* (G [G-62689]).

8. *Syagrus cardenasii* Glassman (1967a: 238). Type:—BOLIVIA, Prov. of Chuquisaca: Sucre, between Montagudo and Muyupampa, without date, *M. Cardenas* 5500 (holotype BH!, isotypes MO, US!)

Figure 11 plate, Figure 4 map.

Medium-sized, usually clustering, rarely solitary palm. *STEMS* caulescent, 2–6 per cluster, ca. 0.5–4 m × 5 cm. **Leaves** 6–12; *sheathing leaf base* ca. 10–30 × ca. 4 cm; *pseudopetiole* ca. 38–120 cm long; *petiole* ca. 22 × 0.9–1.5 cm, thickness not measured; *rachis* 50–200 cm long; *leaflets* slightly lighter on the abaxial surface, linear with asymmetrical, bifid tips, (13–)32–75 along one side, in clusters of 2–4, inserted at various angles, giving the leaf a plumose appearance, often glaucous, abaxially tomentose, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 25–29 × 0.1–0.2 cm, middle leaflets (16–)30–69 × 0.5–1.9 cm, apical leaflets 10–20 × 0.2–0.3 cm with an asymmetric tip. **Inflorescence** erect, spirally branched; *prophyll* 8–40 × 3.5–4 cm; *peduncular bract* 100–130 cm long, expanded portion (10–)20–50 × 2–3.5 cm, including a 0–0.5 cm beak, 3–5.5 cm perimeter, 1–3 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument, especially on the lower portion of the bract; *peduncle* ca. (15–)65–75(–90) cm × 7–9 mm, 4–5 mm thick, elliptical in cross-section, slightly tomentose; *inflorescence axis* 14–37 cm long; *rachis* 8–22 cm long; *rachillae* 6–18, glabrous, 5.5–21 cm long at the apex, 7.5–23 cm long at the base; *staminate flowers* 5–10 × 2–3 mm, yellow, sepals 1–3(–4) × 2–3 mm, glabrous, petals 5–9.5 × 1.5–5 mm with acute tips at the apex, glabrous, 10–11 × 1.5–5 mm at the base, nerves indistinct, stamens 3.5–8 mm long, anthers 5–6 mm long, filaments 1.5–3.5 mm long, pistillode less than 1 mm long; *pistillate flowers* elongate conical to pyramidal, 8–13 × 6–8 mm at the apex, 8–18 × 6–10 mm at the base, yellow, glabrous, sepals 7–16 × 4.5–7.5 mm, glabrous, petals 8–16 × 4–6.5 mm, valvate tips usually ½ or more of the petal length, ca. 5–8 mm long, glabrous on upper portion, but with brownish lepidote scales on their base, pistil 6–7.5 × 4–6.5 mm, glabrous on the upper part but lepidote to

tomentose on the lower half, stigmas 2.5–4.0 mm long, glabrous, staminodal ring ca. 1–2(–5) mm high, 6-dentate. **Fruit** ovoid 2.0–4.2 × 1.7–2.0 cm, green, yellowish green to orangish when mature, glabrous, epicarp thin less than 0.5 mm thick, mesocarp 1–2 mm thick, sweet-tasting, succulent and fibrous; *endocarp* ca. 1.8–2.0(–4) × 1.4–1.7 cm, 2–2.5 mm thick on the sides, 3–3.5 mm thick at the ends; *seed* ovoid ca. 1.1–1.9 × 0.5 cm, endosperm homogeneous. Germination remote-ligular.

Common name:—coricito, corosito, janchicoco, motzcuchi, sará.

Etymology:—The specific epithet, *cardenasii,* honors Martín Cárdenas Hermosa (1899–1973), who gathered the type collection in 1959 and is considered one of the most important botanists in Bolivia's history. He recorded some 6,500 species of plants for Bolivia and also described 180 species of cactus (Pinto 2008).

Distribution and habitat:—This palm is endemic to Bolivia (Glassman 1987) growing in dry and open Cerrado regions. The plant is well established and known in Luis Calvo in the NE of Chuquisaca and also found in Santa Cruz in the provinces of A. Ibáñez, Cordillera, Florida, Sara and Vallegrande (Moreno & Moreno 2006). The species grows on mountain sides in well-drained soils, in sandy to rocky soils in pastures among rocks and in open low, semideciduous forests. It grows at an elevation of 350–1,450 m (Moraes Ramírez 2004).

Conservation:—This palm is not rare and not threatened due to its habitat on steep rocky hillsides in western Bolivia. It recovers well from annual fires in pastures, in spite of having all of its leaves burned off (Moreno & Moreno 2006). It is classified as least concern, LC.

Phenology:—Perhaps flowering and fruiting year around with flowers seen ca. March/April/May along with young fruits. Mature fruits seen in February.

Uses:—This palm has ornamental potential with its small size and attractive foliage. The mesocarp and the seed are edible. The domestic and wild animals also appreciate them. The plant is ornamental and occasionally cultivated.

Notes:—This is a variable clustering palm that is nearly acaulescent or with short thin stems. It resembles a *S. flexuosa*, but the rachillae are inserted at nearly perpendicular angles to the rachis and they spiral completely around the rachis, instead of being unilaterally arranged.

Representative specimens:—BOLIVIA: **Beni:** Forest inventory on Indian mound, –14.80, –64.41, 13 August 1993, *W.L. Balée et al.* 5030 (MO); **Chuquisaca:** Luis Calvo, Iviaboti, 6 km al N de Cumandayli, 1,445 m, –19.38, –63.83, 8 September 1999, *Murguía 2697a* (LPB, MO); Sud Cinti, entre Orocoté y El Palmar, 1,000–1,150 m, –19.38, –63.82, 31 May 1995, *Holst et al. 4954* (LPB, USZ); Hernanando Siles, 25 km NW Monteagudo-Padilla, 1,300 m, 7 October 1991, *Kessler 3322* (LPB); 24 km de Monteagudo en camino a Padilla, 1,200 m, –19.63, –64.05, 28 June 1995, *Kessler et al. 4931* (LPB); Serranía Ithiandruro, hacienda Aperiate, 80 cm en camino a Monteagudo y Rosario de Tigure, 1,400 m, –19.32, –64.88, 21 March 1996, *Serrano et al. 2000* (LPB). Chuquisaca, Sud Cinti, ca. 11 km al NW de la comunidad de Las Abras camino hacia la comunidad de El Palmar. Pendiente superior cerro Alto de Rosas, 862 m, –21.04, –64.22, 6 October 2005, *R. Lozano 1376* (HSB, MO, NY); Chuquisaca, Hernando Siles, Segunda Sección Huacareta, Canton Rosario del Ingri. Villa Hermosa, 1491 m, –20.52, –63.82, 2 January 2008, *M. Jiménez 829* (HSB, MO); Chuquisaca, Luis Calvo, Municipio Villa Vaca Guzmán. Canton Iguembe, 1241 m, –20.70, –63.79, 17 October 2007, *M. Jiménez 487* (HSB, MO); Chuquisaca, Luis Calvo, Cantón: Monteagudo, Loc.: Monteagudo, 1 February 1997, *L.R. Moreno 158* (JBSC, NY); **Santa Cruz:** Andres Ibáñez, 3 km SW of center of La Bélgica, 360 m, –17.583333, –63.25, 2 January 1990, *M.H. Nee et al. 38573* (JBSC, MO, NY!); Andres Ibanez, Monumento Natural Espejillos, 795 m, –17.90, –63.45, 30 April 2008, *G.A. Parada et al. 926* (MO, NY, USZ); Cordillera Caparisito, 35 km ca. a Camiri, 1,200 m, 21 January 1980, *Michel 77* (LPB, MO); Florida. Road E from Bemejo towards the antennas, 2.8 km (by road) from the Santa Cruz-Samaipata Highway, –18.11, –63.95, 17 May 1998, *M.H. Nee 49433* (MO, NY!, US, USZ); Sara, La Bélgica—Colpa—Rio Jorge, 9 May 1989, *L.R. Moreno 1* (JBSC, LPB, NY!); Vallegrande, 18 km de Masicuri en camino a Boyuibe, 550 m, –18.98, –63.73, 9 July 1995, *Kessler et al. 5254* (LPB); Vallegrande, Canton: Masicuri, 5 km de Masicuri en camino a Vallegrande, 700 m, 25 February 1991, *L.R. Moreno 76* (JBSC, NY); Vallegrande, 2 km SSE Los Sitanos, canyon of Rio Los Sitanos, 1,400 m, –18.87, –63.95, 26 December 1989, *M.H. Nee & Vargas 38458* (F!, JBSC, MO, NY!); Vallegrande, Entre Las Vueltas y Corosito, 1388 m, –18.87, –63.96, 28–29 November 2011, *G.A. Parada et al. 3845* (MO, USZ); Vallegrande, 1400 m, –18.87, –63.95, 2 September 1989, *I.G. Vargas Caballero 285* (LPB, MO, NY, USZ); Warnes, 2 km NW la Bélgica, 360 m, –17.57, –63.22, 19 February 1989, *Betella 95, 96* (NY, USZ); Colpa, 32 km N Santa Cruz, 400 m, December 1992, *M. Moraes & A.J. Henderson 1314A* (LPB, MO); Santa Cruz, *L.R. Moreno 59* (JBSC); Santa Cruz, *L.R. Moreno 90* (JBSC); *M. Saldias & Calerón 4708* (USZ).

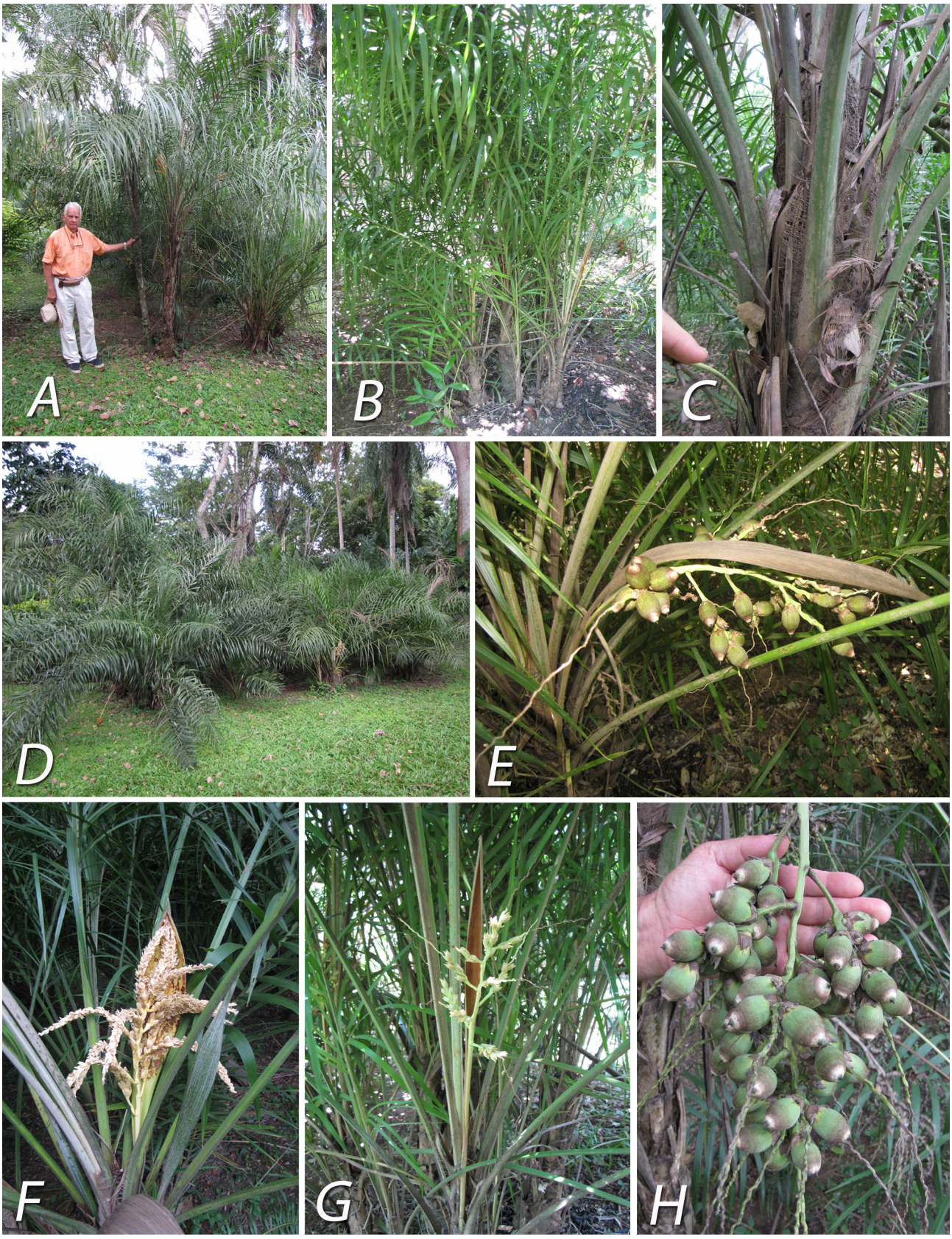

FIGURE 11. *Syagrus cardenasii*. A. Cultivated specimen with Luiz Moreno near Santa Cruz, Bolivia. B. Clustering habit. C. Close of leaf sheath fibers. D. Canopy of a multistemmed specimen. E. Infructescence. F. Inflorescence with open staminate flowers. G. Inflorescence with receptive pistillate flowers. H. Infructescence with hand for scale.

9. *Syagrus cataphracta* (Mart.) Noblick *comb. et stat. nov. Cocos flexuosa* var. *cataphracta* Martius (1826: 120). No specimens cited by Martius, but mentioned Brazil. Bahia: Caetité as the locality. Neotype (designated here):—BRAZIL. Bahia: Caetité, Passagem da Pedra, 9 km sul da cidade perto o reservatorio da água para cidade [9 km S of the city close to the city reservoir], –14.07, –42.50, 26 May 1985*, L.R. Noblick & Clodoaldo [José de Morais] 3787* (F!, HUEFS!)

Figure 12 plate, Figure 13 map.

Small to moderate, usually clustered but sometimes solitary, unarmed palm. **Stem** erect, 1–2.5(–4) m × (2–)3–10 cm (ca. 15 cm in diameter with persistent leaf sheaths), dark gray, but usually obscured by persistent petiole bases. **Leaves** 6–10 in crown; *sheathing leaf base* 28–35 cm long, fibrous; *pseudopetiole* 17–34 cm in the sun but up to 70–173 cm in the shade of denser vegetation or when still without a stem, *petiole* 11–49 (130–157) × 0.6–1.0 cm, 0.3–0.5 cm thick with smooth margins; *rachis* 47–87 cm long; *leaflets* dark, glossy green above, glaucous or white waxy beneath, usually with no ramenta present along midrib, 22–71 along one side, irregularly distributed in clusters of 2–4, in divergent planes; basal leaflets 11–24 × 0.1–0.8 cm, middle leaflets 15–36 × 0.5–1.7 cm, apical leaflets 5–30 × 0.1–0.4 cm mostly with acuminate, asymmetric tips. **Inflorescence** erect, unilaterally branched; *prophyll* 10–17 × 1.8–2.0 cm; *peduncular bract* ca. 33–55 cm long, expanded portion 15–39 × 2.5–5.5 cm, including a 0.5–2 cm beak, 4–6.5 cm perimeter, 1–2 mm thickness, woody, sulcate, glaucous with patches of light brown tomentum, becoming glabrous with age; *peduncle* ca. 11–35 cm × 6–10 mm, 3–5 mm thick cm, elliptical in cross-section; *inflorescence axis* 16–30 cm long; *rachis* 7.5–16 cm long; *rachillae* (4–)7–16, 10–20 cm long at the base, 7–16 cm long at the apex, each rachilla subtended by a bract 0–7 mm long; *staminate flowers* 4–8 mm long at the apex, 7.3–14.6 × 1.8–3.7 mm at the base, yellow, sepals 1.0–2.2 × 0.5–1.5 mm, glabrous, nerves none to obscurely visible, petals 5.8–12.8 × 0.7–3.3 mm at the base, 4.4–7.3 mm long at the tip with acute to acuminate tips, glabrous, nerves indistinct to obscurely visible at the base, stamens 4.0–5.8 mm long, anthers 2.2–4.8 mm long, filaments dorsifixed 0.7–3.1 mm long, pistillode ca. 0.4 mm; *pistillate flowers* elongate pyramidal, 9–16.4 × 3.7–8.8 mm at the apex, 9–20 × 5.8–12 mm at the base, dark yellow, sepals 8.8–18 × 3.7–8.2 mm, glabrous to scaly lepidote on the lower portion at least, no visible veins to slightly raised veins, petals 8.8–14.3 × 2.9–7.7 mm at the apex, 11–20 × 2.9–6.6 mm at the base, with slightly raised veins, valvate tips ¼–1/3 the length of the petal, ca. 2.2–7.7 mm long, pistil 5.1–11.7(–15.3) × 1.8–3.7(–6.6) mm, glabrous, stigmas 3.7–5.9 mm long, staminodal ring 0.7–2.9 mm high. **Fruit** ellipsoid, 2.5–3.0 × 1.4–1.5 cm, persistent perianth (cupule) light tan, epicarp smooth, glabrous or with patchy brown tomentum, green to yellowish-green at maturity, epicarp less than 0.5 mm thick, mesocarp 2 mm thick, whitish, sweet, succulent and fibrous; *endocarp* bony, brown, trivittate, 2.2 × 1.0 cm, 2 mm thick on the sides, with fibers present and scattered; *seed* 1.5 × 0.7 cm, endosperm homogeneous. Germination unknown.

Common name:—côco-de-raposa, ariri, côco-ariri, côco-de-ariri, côco-de-vaqueiro, côco-da-vassoura.

Etymology:—The name, *cataphracta*, meaning chain mail or breast-plate, may refer to the armored stem with its persistent leaf bases protecting it like armor.

Distribution and habitat:—Found in some high elevation disjunct cerrado, campo rupestre areas in the central part of the Bahia, Brazil, on sandstone outcrops or in fine sand (Abaira, Jussiape, Mucugê, Palmeiras, and Caetité).

Conservation:—Because this species grows in very rocky, campo rupestre vegetation in areas that are not agriculturally valuable, it is not considered to be threatened. It is also well protected within the borders of a national park in Bahia (Chapada Diamantina), and for the moment, it is classified as least concern, LC.

Phenology:—Flowers and fruits year around, but flowering appears to peak between November and April with fruiting in July to October.

Uses:—This palm has been used as an ornamental, although not commonly so. The fruits are edible. In Bahia, the leaves are layered in with wet mandioca (cassava) paste to distribute the pressure throughout the paste so that all parts of the paste are squeezed equally to remove water-soluble toxins, before drying over heat to make flour.

Notes:—*Syagrus cataphracta* is a small clustering, caulescent species and is easily distinguished from other *Syagrus* species by the large pistillate flowers, unilaterally arranged rachillae, dark bluish-green leaves with narrow clustered pinnae which have a whitish, waxy bloom beneath (especially when young). It has stiff, plumose leaves and large ellipsoid fruits. It has been confused with *Syagrus flexuosa* by its clustering habit, unilateral inflorescence and large flowers and fruits. However differs in having thinner stems, darker leaflets, and a waxy bloom on the underside of its somewhat coriaceous leaflets.

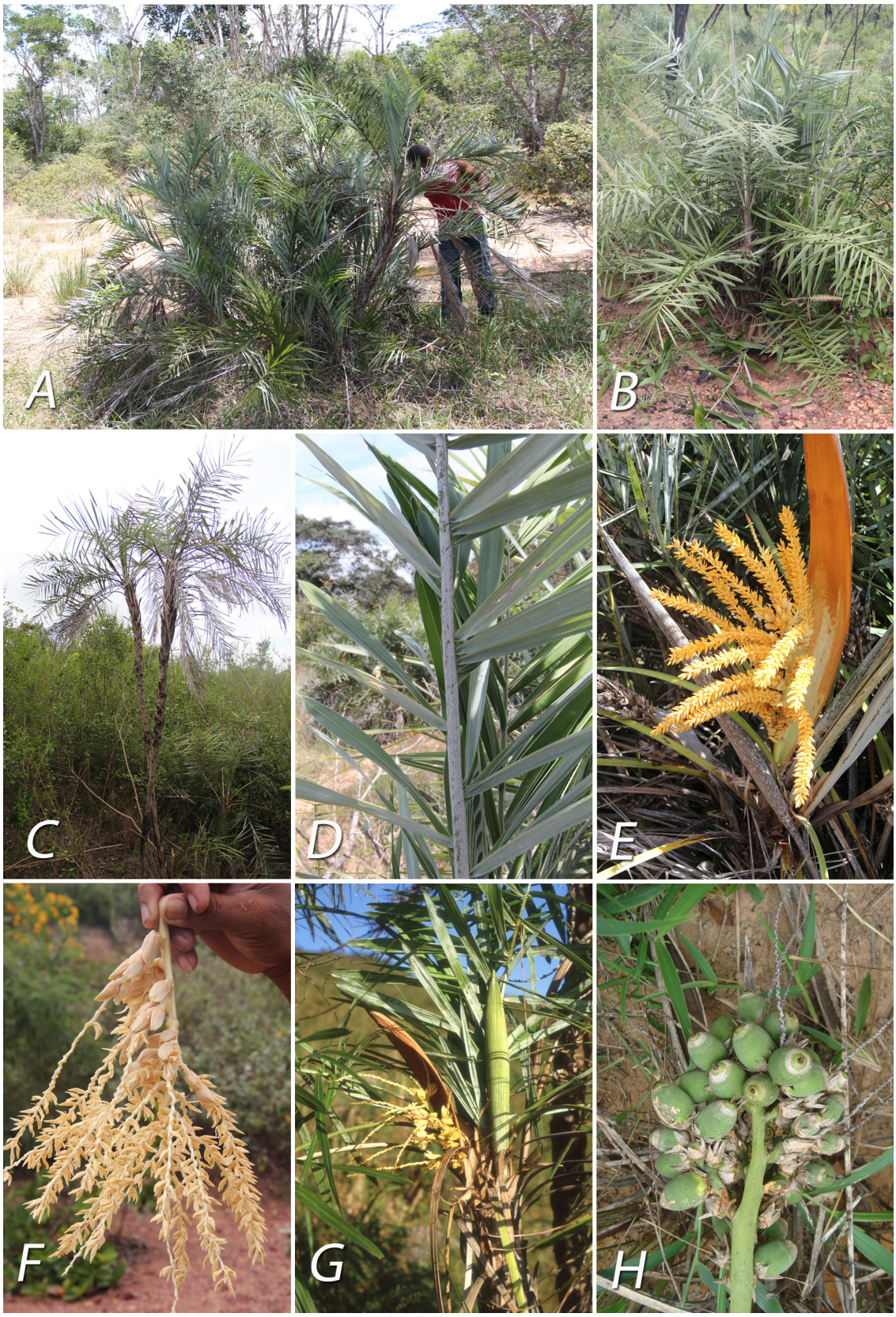

FIGURE 12. *Syagrus cataphracta*. A. Clustering habit near Barra de Estiva, Bahia. B. Juvenile nearly stemless habit near Mucugê, Bahia. C. More mature palms near Mucugê, Bahia, showing thin stems with persistent leaf bases. D. Abaxial side of leaf showing waxy bloom. E. Inflorescence. F. Inflorescence showing unilaterally oriented rachillae. G. Inflorescence with receptive pistillate flowers and leaflets with abaxial waxy bloom near Palmeiras, Bahia. H. Infructescence. Photos A–F by Carlos Alex Guimarães and photo H by Ricardo Pimenta.

Martius described a variety of *Cocos flexuosa* from Bahia, but cited no specimens to confirm its identification. He named it *Cocos flexuosa* var. *cataphracta* and wrote, "caudice altiore, toto dense squamoso" [tree trunk taller, totally densely scaly]. Martius used the name 'cataphracta,' and must have been referring to the stem retaining its coat of persistent leaf bases. Morphologically, *Noblick 3787* from Caetité agrees with Martius' description, and its leaflet anatomy was found to be nearly identical to those of the Chapada Diamantina region (Palmeiras, Lençois, Mucugê, Jussiape and Seabra). Therefore, *Cocos flexuosa* var. *cataphracta* is elevated to species level and placed in *Syagrus*.

Several characters distinguish *S. cataphracta* from the typical *S. flexuosa*. *Syagrus cataphracta* has leaflet anatomy that is typical of Eastern Brazil palms with large groups of clustered fiber strands running along the upper or adaxial part of the leaf (Noblick 2013a). These large fiber strands are absent in *S. flexuosa.* Occasionally small fibers or fiber clusters may be present in *S. flexuosa*, but never the large ones present in *S. cataphracta*. *Syagrus cataphracta* leaflets usually have a white-glaucous or waxy coating on the underside of their stiffer, more coriaceous leaflets. *Syagrus flexuosa* has leaflets that are longer, more membranaceous and more pendulous at their tips and lacks the white, waxy bloom. Finally, *S. cataphracta* are normally smaller and less robust than *S. flexuosa* (1–2.5 vs. 3–5 m).

Representative specimens:—BRAZIL. **Bahia:** 1941, *G. Bondar s.n.* (F-404609!); Abaira, beira da Estrada Abaira-Catolés, 16 August 1998, *A.M. Giulietti et al. 1463* (HUEFS!); Abaira, Distrito Catolés, Estrada para Serrinha e Bicota, 20 April 1998, *L.P. de Queiroz et al. 5062* (HUEFS!); Andaraí, 15–20 km from Andaraí, along the road to Itaeté, which branches East off the road to Mucugê, 600 m, –12.85, –41.20, 13 February 1977, *R.M. Harley 18657* (CEPEC!, K!); Andaraí, nova rodovia Andaraí/Mucugê, a 15–20 km ao S de Andaraí. ca. 800 m, 21 December 1979, *S.A. Mori & Benton 13124* (CEPEC!, NY!); Barra da Estiva [formerly a part of Jequié], 1941, *G. Bondar s.n.* (F-620821!); Barra da Estiva, 4 km SW of the city, 940 m, –13.63, –41.32, 11 August 1988*, L.R. Noblick et al. 4592* (CEPEC!, F!, K!); Caetité, Serra Geral de Caitite [sic] 9.5 km S of Caitite [sic] on road to Brejinhos das Ametistas, 1000 m, –14.12, –42.50, 13 April 1980, *R.M. Harley 21351* (CEPEC!, K!); Caetité, Passagem da Pedra, 9 km sul da cidade perto o reservatorio da água para cidade, –14.07, –42.50, 26 May 1985*, L.R. Noblick & Clodoaldo 3787* (F!, HUEFS!); Ituaçu, –13.69, –41.39, 1 July 1978, *Araujo 55* (HRB!, RB!); Jussiape, ca. 16 km antes de Jussiape, na estrada de Capão de Volta, –13.45, –41.52, 10 June 2000, *R.M. Harley & A.M. Giulietti 53948* (HUEFS!); Jussiape, ca. 10 km de Jussiape, em direção a Barra da Estiva, –13.45, –46.54, 15 June 2002, *L.P. de Queiroz et al. 7128* (HUEFS!); Jussiape, Caraguatai, "Tobira" na serra, 1–2 km oeste de arrial de Tobira, 1000–1200 m, –13.37, –41.68, 27 January 1986*, L.R. Noblick & J. Lobo 4516* (F!, HUEFS!); Lençois, BR-242, km 216, a 12 km ao N de Lençois, 400 m, –12.56, –41.39, 1 March 1980, *S.A. Mori 13328* (CEPEC!, F!, NY!); Lençóis, Chapada Diamantina, Foz do rio Capivara, situado a 14 km de Lençóis, 950 m, –12.64, –41.37, 8 March 2000, *M.T.S. Stradmann 721* (ALCB!, CEPEC); Mucugê, 1035 m, –12.97, –41.49, 2 October 2005, *Carvalho-Sobrinho et al. 750* (HUEFS!); Mucugê, Alto do Morro do Pina, Estr. de Mucugê a Guiné, a 25 km N de Mucugê, –13.01, –41.37, 20 July 1981, *A.M. Giulietti et al. 1530* (K!, SPF!, UFP); Mucugê, na estrada para Barra da Estiva a 16 km de Mucugê-BA, –13.01, –41.37, 5 February 2009, *H. Lorenzi 6593* (HPL!); Palmeiras, estrada de Mucugê para palmeiras, 1000 m, –12.75, –41.50, *D. Cardoso, & A.A. Concepcion 583* (HUEFS!); Palmeiras, Morro do Pai Inácio, 2 September 1985*, J.L. de S. Lima & L.R. Noblick 99–107* (HTSA!); Palmeiras, Morro do Pai Inácio, 1000–1060 m, –12.45, –41.47, 19 November 1983*, L.R. Noblick et al. 2821* (HUEFS!); Palmeiras, A mais ou menos 7 km da Serra do Pai Inácio, –12.73, –42, 2 September 1985*, J.L. de S. Lima 69a* (HTSA); Palmeiras, Pai Inácio, 900 m, –12.45, –41.47, 28 June 1995, *M.L. Guedes 1988* (ALCB!, UFP); Palmeiras, Pai Inácio, 900 m, –12.45, –41.47, 4 January 1966, *A.M. de Carvalho 2148* (ALCB!); Palmeiras, Pai Inácio, –12.45, –41.47, 28 June 1997*, M.L. Guedes 5229* (ALCB!); Palmeiras, Chapada Diamantina, Morro do Pai Inácio, 800 m, –12.45, –41.45, 19 September 1998*, M.L. Guedes 6162* (ALCB!); Paraguaçu, Itaêté, Fazenda Baixão, Rio Una, 13 April 2001*, M.L. Guedes 8855* (ALCB!); Seabra, Veredinha, 290 km W of Salvador, –12.42, –41.77, 21 August 1976, *S.F. Glassman 13037–13040* (CEPEC!, F!, MO!, SP!); Seabra, Lagoa de Boa Vista, 800–900 m, –12.40, –41.78, 28 September 1985*, L.R. Noblick 4386* (F!, HUEFS!).

10. *Syagrus cearensis* Noblick (2004b: 70). Type:—BRAZIL. Ceará: Municipio de Pacatuba, near Fortaleza, 29 km south, Serra de Aratanha, 12 August 1994, *L.R. Noblick, A. Ferreira & V.B. de Souza 4951* (holotype EAC!, isotypes FTG!, IPA!, NY!)

Figures 14–15 plates, Figure 13 map.

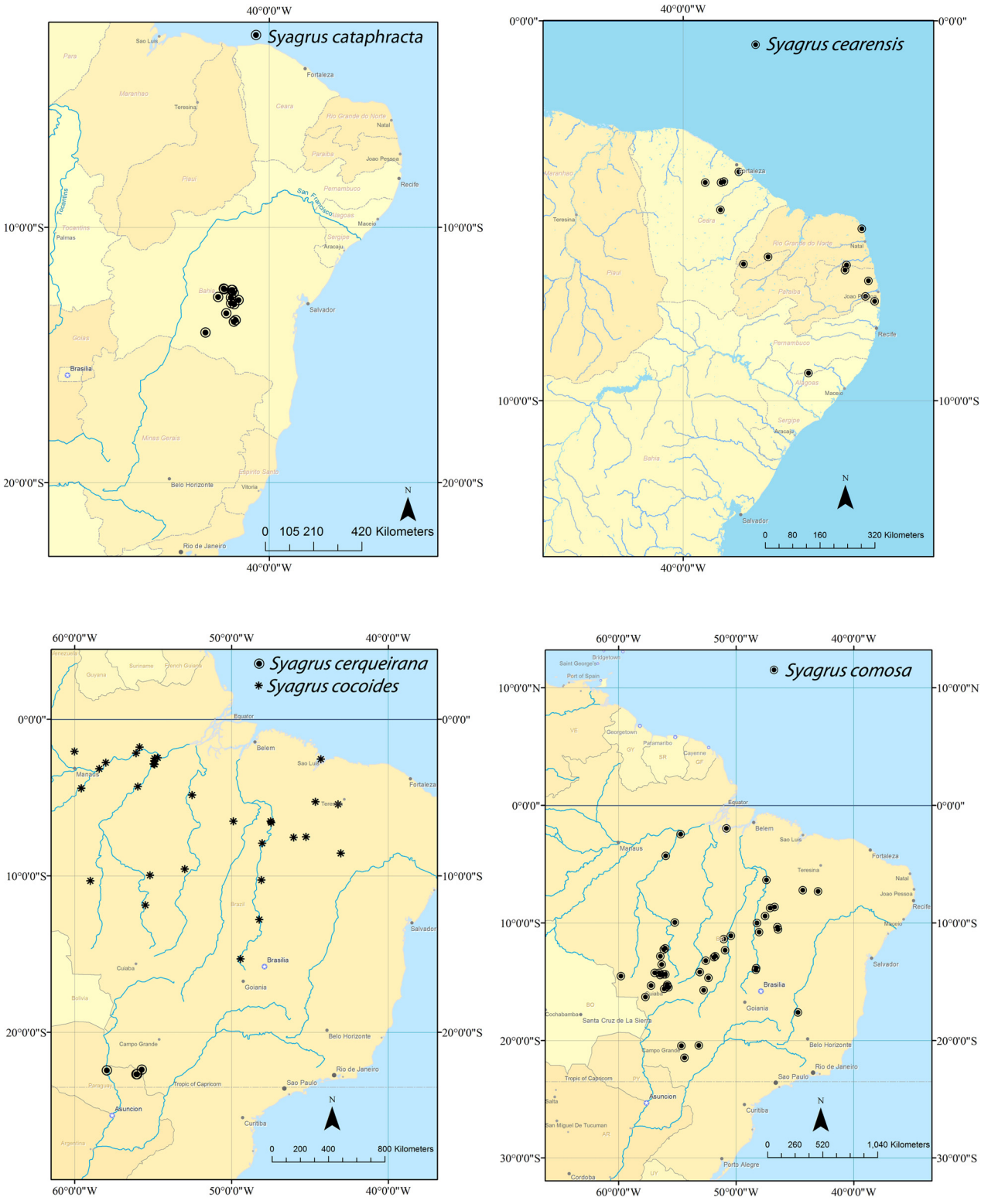

FIGURE 13. Distribution maps of *Syagrus cataphracta, S. cearensis, S. cerqueirana, S. cocoides* and *S. comosa.*

Palm clustering with 2–4 stems growing in one plane to multi-stemmed clusters, occasionally solitary. **Stem** caulescent, to 4–10 m × 10–18 cm, internodes 9–16 cm long at the base, shortening to 2–7 cm long towards the apex, producing a rough trunk with slightly stepped nodes. **Leaves** 10–15, *leaf sheath* plus the petiole ca. 75–115 cm long; sheathing leaf base 18 or more cm long, ca. 18 cm wide at the base, fibrous with papery membrane

disintegrating between the fine principal warf fibers that persist along the margins of the pseudopetiole, *pseudopetiole* ca. 40–100 cm long; *petiole* 0–2 × 4 cm, 2 cm thick; *rachis* 2.3–3.2 m long, a fine light brown to grayish indument covers the abaxial side of the sheath, continuing up the abaxial side of the petiole, sometimes onto the lower portion of the leaf rachis, the upper parts of the leaf rachis become glabrous with age; *leaflets* medium green becoming lighter when dried, concolorous, adaxial surface with prominently raised transverse veins when dried, leaflets ca. 100–130 along one side, irregularly distributed in loose clusters of 2–5, inserted in divergent planes, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 80–95 × 2–2.5 cm, middle leaflets 68–100 × 3–4 cm, apical leaflets 31 × 0.4 cm, usually one lobe of the asymmetric tip attenuate, the other rounded, occasionally both rounded. **Inflorescence** spirally branched; *prophyll* ca. 30–45 cm long; *peduncular bract* ca. 102–115 cm long or more, expanded portion 50–74 × 13–16 cm, including a beak of 4–11 cm, 14–26 cm perimeter, 1–3 mm thickness, woody, sulcate, exterior covered with a thin indument; *inflorescence axis* 45–85 cm, *peduncle* ca. 40–80 × 2.5–3 cm, 1.5–2.5 cm thick, elliptical in cross-section, with a sparse lepidote indument; *rachis* 33–60 cm long; *rachillae* 35–45, glabrous, 30–50(–106) cm at the base, 9–17 cm long at the apex, each rachilla, especially the lower ones, with a triangular rachis bract ca. 5 mm long; *staminate flowers* 12–21 × 5–7 mm, yellow, sepals (3–)5–6 × 0.5–1 mm, petals 12–20 × 4–5 mm with acute tips, nerves indistinct, stamens 6–8 mm long, anthers 4–6 mm long, filaments 2 mm long, pistillode less than 0.5 mm long; *pistillate flowers* oblong, pyramidal, 17–25 × 8–10 mm, usually slightly lepidote on the basal portion, sepals 14–25 × 7–10 mm, petals 11–14 × 6–8 mm, upper ½ of the petal length valvate, ca. 5–7 mm long, unnerved to slightly nerved, pistil 10 × 6 mm, lepidote indument on upper portion, glabrous on lower behind the staminodal ring, stigmas 2 mm long, staminodal ring ca. 3 mm high, 6-dentate. **Fruit** nearly globose, 3.5–4.0(–5) × 3–4 cm, light orange when mature, color often obscured by a thin dark brown indument or lepidote, epicarp less than 0.5 mm thick, mesocarp 7–10 mm thick, succulent and fibrous; *endocarp* ca. 4 × 2.3 cm, 3–5 mm thick; *seed* ellipsoid ca. 1.8 × 1.2 cm, with homogeneous endosperm, with a substantial central cavity ca. 6 mm in diameter. Germination remote-tubular.

Common name:—catolé, coco-catolé, coco-babão, babão (babão translates as mucus refers to the slimy juices of the mesocarp).

Etymology:—The epithet, *cearensis,* honors one of the states to which the palm is native, Ceará, Brazil.

Distribution and habitat:—Northeastern Brazil: Ceará, Rio Grande do Norte, Paraíba, Pernambuco and Alagoas. This species grows at the base of the mountains or in pastures at an elevation of about 100–750 m above sea level. They are locally common in mountainous areas and seasonal forests on the hills and mountains along the Atlantic coast, as well as in the arboreal caatinga in the interior in areas of greater rainfall due to elevation ("brejos").

Conservation:—This palm has an ample distribution. It produces an abundance of fruits and grows rapidly in disturbed areas. The mountainous areas and rocky soils where it grows are not agriculturally valuable sites, and so this palm is not under any immediate threat. It is also being cultivated widely in the U.S. It is sometimes taken from the wild for landscaping. Therefore, with ample populations and little threat, this palm is classified as least concern, LC.

Phenology:—Flowering and fruiting probably year around, but collected in flower and fruit during the months of July through September (spring months in Brazil).

Uses:—This palm has great ornamental potential. The character especially attractive about this palm is its tendency to grow as twins.

Notes:—This palm has an unusual propensity to form twins from a single seed. This may be the result of precocious branching, because some individuals continue to sprout additional basal stems forming a large cluster and two-seeded endocarps are unknown in this species. Some of the other distinct attributes of *S. cearensis* are: pale yellowish fruits that are flattened at their apex; fruit nearly as long as wide, evenly covered with a fine dark brown lepidote indument, presence of triangular rachis bracts; sepals of staminate flowers usually narrowly linear and strongly keeled; and a large seed cavity. Few species of *Syagrus* consistently possess a seed cavity. Other examples of rock-loving palms with hollow seed cavities are *S. lorenzoniorum* and *S. picrophylla*. This palm was misidentified on several occasions as *Syagrus oleracea* by Glassman (1965, 1968c, 1987). However, it is easily distinguished not only by its twining or clustering habit, but also by its smaller (4–5 vs. to 7 cm), brown lepidote-covered fruits with a somewhat flattened rather than rounded apex with endosperm containing a distinctive hollow cavity.

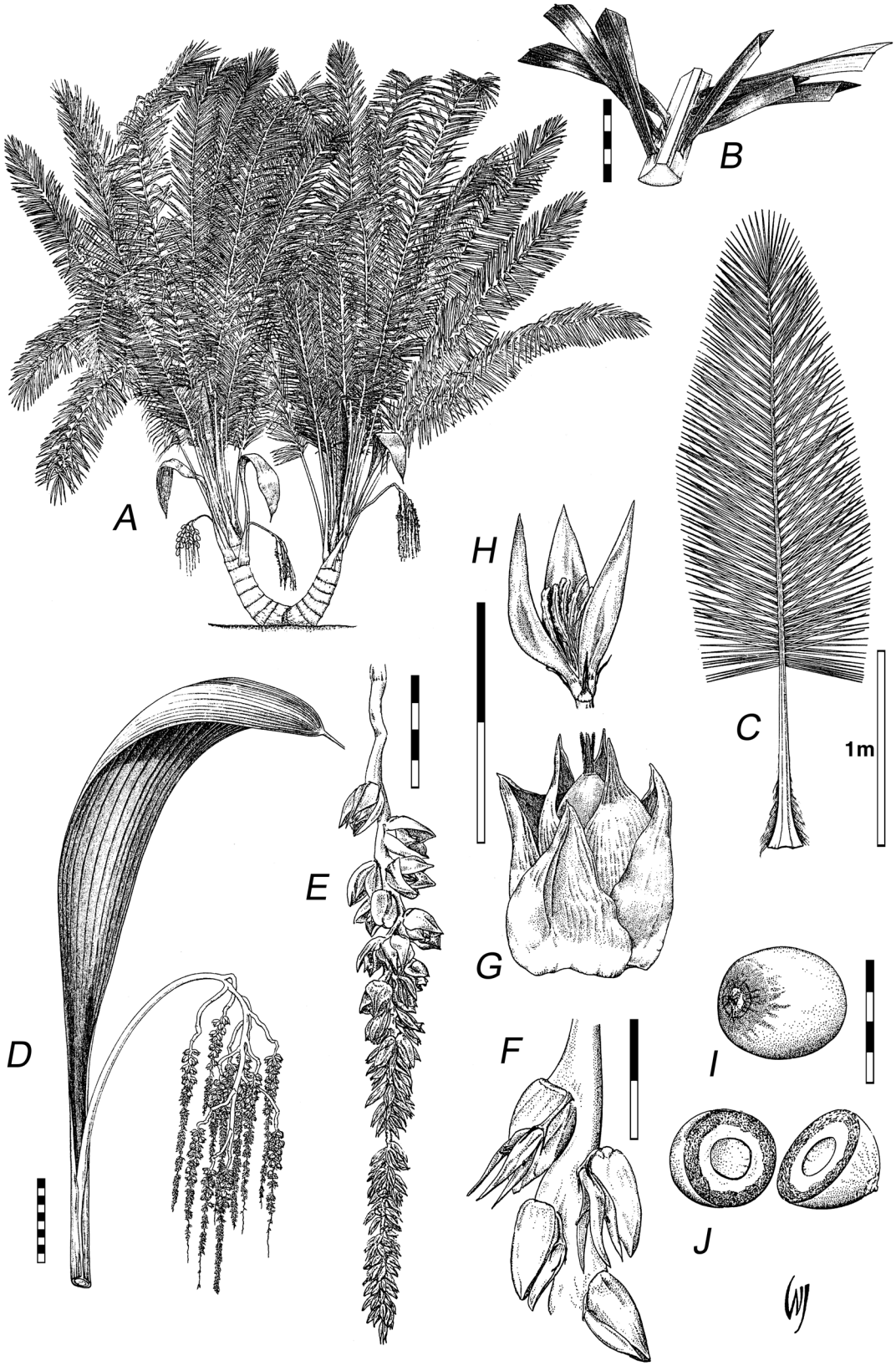

FIGURE 14. *Syagrus cearensis.* A. Habit. B. Section of leaf rachis showing inserted leaflets. C. Leaf. D. Inflorescence. E. Primary branch. F. Basal portion of primary branch showing staminate flowers with pedicels alongside the larger pistillate flowers. G. Receptive pistillate flower. H. Staminate flower showing the narrowly lanceolate sepals. I. Fruit covered with lepidote tomentum and flat apex. J. Cross-section of mature fruit showing a distinct central seed cavity. Habit, leaf and fruit drawn from MBC accession number 94654*E and inflorescence and flowers drawn fresh from 94654*Q. Drawn by Wes Jurgens.

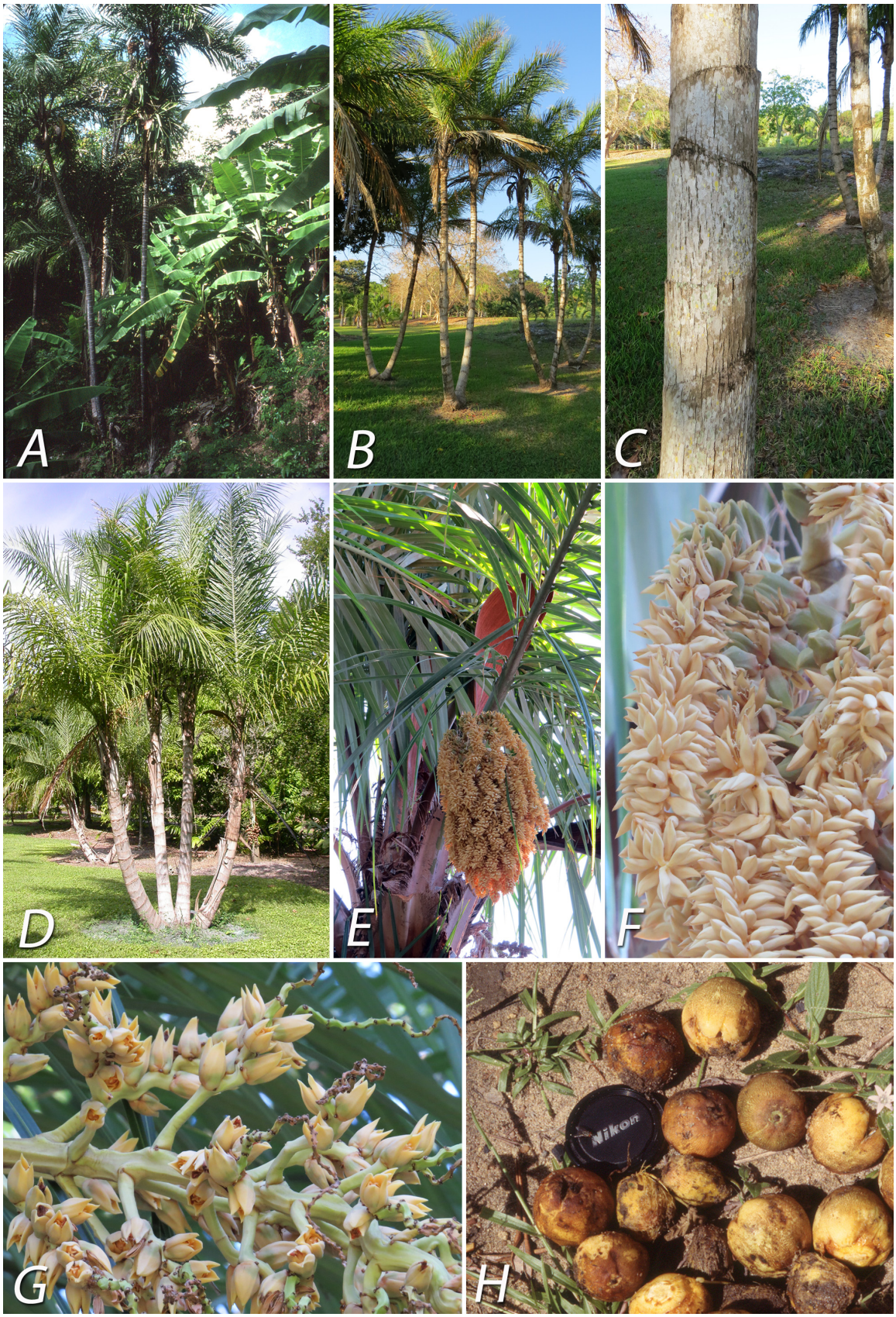

FIGURE 15. *Syagrus cearensis.* A. Habit near Pacatuba, Ceará, Brazil (*Noblick et al. 5951*). B. Twin habit at MBC. C. Stem. D. Palms occasionally form four stems or more. E. Inflorescence. F. White staminate flowers with a few opening and with green unreceptive pistillate flowers. G. Receptive pistillate flowers. H. Mature fruits. Note flattish lepidote covered apex.

Representative specimens:—BRAZIL. Alagoas: União dos Palmares, 19 November 1985, *R.P. de Lyra-Lemos & A. I. L. Pinhero 1049, 1050* (MAC!, PEUFR!); São José da Lage, near AL-110, 17 October 1986, *R.P. de Lyra-Lemos & G .L. Esteves 1240* (PEUFR!); **Ceará**: 1929, *B.E. Dahlgren s.n.* (F-613592!); 1940, *B.E. Dahlgren s.n.* (F 613724!); Araçoiaba, Olho d'Agua, 8 km N of Araçoiaba, –4.25, –39.00, 13 August 1994*, L.R. Noblick et al. 4953* (EAC!, FTG!, IPA!, TEPB!); Forteleza region, near Mejecana, 1935, *B.E. Dahlgren s.n.* (F-620753a!); Maranguape, 1940 *B.E. Dahlgren s.n.* (F-619724!); Maranguape, Serra da Pacatuba (close to Forteleza), top and bottom of the Serra, 1993 *Luiz Antonio F. Matthes s.n.* (FTG! FTG 67903); Pacoti, localidade de Monte Claro, –4.21, –38.92, 13 July 1984*, J.L. de S. Lima 093* (HTSA!); Palmácia, –4.25, –39.42, 22 October 1985*, J.L. de S. Lima 63a* (HTSA!); Quebrangulo, Reserva Biológica da Pedra Talhada, localité de Quebrangulo, 790, –9.23, –36.44, 4 March 3, 2013, *Groupo Pedra Talhada 3756* (JPB!); Quixadá, João Maurício, Serra do Estevão, –4.97, –39.02, 28 April 1992, *L.P. Felix, s.n.* (EAC!); **Paraíba:** 1935, *Luetzelburg 26815* (BH); Arauna, 570 m, –6.56, –35.74, 29 November 2003, *M.C. Pessoa 40* (JPB); Conde, 22 km N of Goiana, Pernambuco on BR-101, 14 km N of the Paraíba/Pernambuco state border, –7.38, –34.96, 1 July 1997, *L.R. Noblick & J. T. de Medeiros-Costa 5132* (IPA!); Mamanguape, –6.84, –35.13, 1 January 1900, *L.P. Felix 2634* (JPB); Mamanguape, Camaratuba, –7.25, –35.20, 22 November 1984*, J.L. de S. Lima 76* (HTSA); Monteiro, Sítio Olho Daguinha, Serra do Peru, no caminho para o Alto da Serra, 23 April 2011, *J.A. Siqueira Filho 2502* (HVASF); Santa Rita, 20 August 1962, *S. Tavares 960* (HST); **Pernambuco**: Cabrobó, Distrito de Umãs, 3 December 2008, *Ferraz 68* (HVASF); Cabrobó, Topo da Serra do Livramento, 10 July 2009, *M. Oliveira 4350* (HVASF); Condado, Eng. Vargem Grande, 21 August 1966, *Andrade-Lima 66-4723* (IPA!); Goiana, 11 November 1966, *J.T. Medeiros-Costa 66-0009* (IPA!); Lagoa de São José, 5 km N of the city, ca. 11 km N of the Pernambuco/Alagoas state line. –9.27, –36.70, 500–600 m, 21 September 1994*, L.R. Noblick et al. 4981* (FTG!, IPA!); Neves, 2 km W of Neves, 1969, *S.F. Glassman & J.T. Medeiros-Costa 8706* (F!); Paudalho, without date, *J.T. Medeiros-Costa 69/126* (U); Pombos, BR-232, 5 November 1966, *J.T. Medeiros-Costa 66-0003* (IPA!); Pombos, 1969*, S.F. Glassman & J.T. Medeiros-Costa 8701* (F!); Triunfo, 27 March 1970, *J.T. Medeiros-Costa 0133* (IPA!); Tapera, December 1926, *D.B. Pickel 1208* (IPA!) [det. as *S. oleracea* by Burret May 1928]; **Rio Grande do Norte**: Almio Afonso, Sítio Serra de São Miguel, 500 m, –6.21, –37.76, 5 September 1993, *E. Sobrinho 94* (MOSS); Luís Gomes, estrada para Tigre de Cima, na margem do rio, próximo á ponte da Baixa do Almeida, –6.40, –38.41, 28 August 2008, *Oliveira 2247* (MOSS); Maxaranguape, Comunidade Caraúbas, acesso pela BR 101 e RN 160, 25 m, –5.47, –35.30, 6 August 2010, *D.F. Torres 209* (UFRN); São Bento, Morro do Cruzeiro, ca. 1 km da cidade, –6.42, –35.70, 24 August 2012, *Jardim 6381* (UFRN).

11. *Syagrus cerqueirana* Noblick & Lorenzi (2010b: 28). Type:—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, 680 m, –22.37, –55.73, 8 September 2008, *H. Lorenzi & M. Pinho 6514* (holotype HPL!, isotype K!)

Figure 16 plate, Figure 13 map.

Small solitary or clustering palm less than 1 m tall. **Stem** short or subterranean, appearing acaulescent. **Leaves** medium-green, 5–9 per stem; *sheath* 15–30 cm long; *pseudopetiole* 13–23 cm long; *petiole* 7–24 cm long, both with smooth margins; *rachis* 43–75 cm long; *leaflets* 28–62 on each side of the rachis, linear with long acuminate, asymmetric to bifid apex, arranged in clusters of 2 or 3, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 19.0–28.5 × 0.4–0.7 cm, middle leaflets 20–33 × 0.5–1.2 cm, apical leaflets 7.5–22 × 0.1–0.3 cm. **Inflorescence** erect, unilaterally branched; *prophyll* 8–14 × 2.2–2.5 cm; *peduncular bract* 18–27 cm long, expanded portion 13–18 × 2.3–3.0 cm; *peduncle* 4–9 cm long, thickness not measured; *inflorescence axis* 13–24 cm long; *rachis* 2–9 cm long with 4–12, unilaterally branched; *rachillae* 6–15 cm long; *staminate flowers* 7–8 × 3–5 mm, sepals 2.5 × 1.0–1.5 mm, glabrous, petals 4 × 1.0–1.3 mm with acute tips, nerves indistinct to slightly raised, stamens 3 mm long, anthers 1.5–2.0 mm long, filaments 1.5 mm long; *pistillate flowers* elongate conical, 10.0 × 6.5 mm at the apex, 12.0–12.5 × 7.5 mm at the base, glabrous, sepals 10–12 × 5 mm, petals 11 × 4–5 mm, ca. ½ of the petal length slightly valvate, ca. 4–5 mm long, glabrous, pistil 9 × 4 mm, glabrous, stigmas 4 mm long, glabrous, staminodal ring ca. 1 mm high, 6-dentate. **Fruit** ovoid, 2.3–3.5 × 1.2–2.2 cm, brownish-yellow, epicarp less than 1 mm thick, mesocarp thickness not measured, succulent and fibrous; *endocarp* 1.8–2.2 × 0.8–1.1 cm, 0.8–1.5 mm thick; *seed* 1.3–1.4 × 0.9–1.0 cm, endosperm homogeneous with no central cavity. Germination remote ligular.

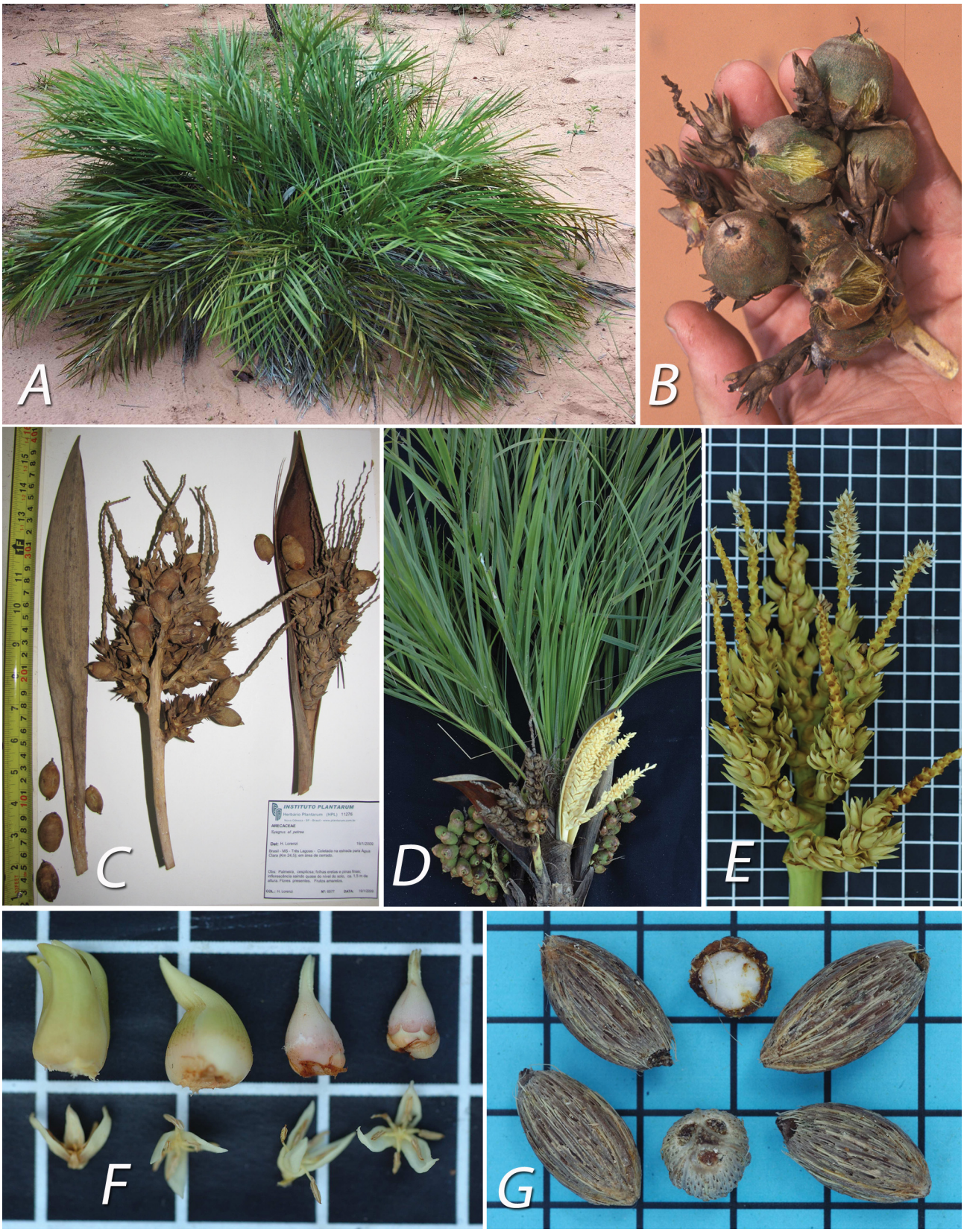

FIGURE 16. *Syagrus cerqueirana*. A. Habit. B. Infructescence, *Noblick et al. 5126*. C. Herbarium sheet showing unilateral infructescence, *H. Lorenzi 6577*. Yellow scale is in inches and centimeters. D. Close up of inflorescence and infructescence on the plant. E. Inflorescence with pistillate flowers. F. Pistillate flowers and pistils above and staminate flowers below. G. Endocarps. All grids are in centimeters.

Common name:—acumã-mirim.

Etymology:—This palm is named in honor of a friend and palm enthusiast, Luiz Sergio Coelho de Cerqueira of Pará, who aided both of the author and Harri Lorenzi while doing palm research in the Amazon region and due to his untimely death will be sorely missed.

Distribution and habitat:—Paraguay (region of the Cerra Cora National Park) and in the southern part of the Brazilian state of Mato Grosso do Sul, in cerrado, generally in sandy to rocky clay soils. It also may be in São Paulo, in cerrado, generally in sandy to rocky clay soils. This palm appears to compete well with other aggressive roadside vegetation. At this writing it is one of three acaulescent *Syagrus* in Paraguay, the other two being the diminutive *S. lilliputiana* and the colonial *S. campylospatha*.

Conservation:—This species is protected within the borders of a national park (Cerra Cora) in Paraguay. Outside of such parks and reserves, it is threatened, as it grows in soils that are valuable for soybean agriculture. Therefore, this palm is classified as vulnerable, VU B2ab(ii,iii) C1.

Phenology:—Fruits sparsely in summer, and seeds are generally eaten by insects. The germination rate is slow and low. Flowering specimens also seen in June.

Uses:—Palm is an attractive ornamental by the rounded form of some of its clusters and by its bright green coloration. It fits in very well with the composition of rock gardens in full sun.

Notes:—This is a clustering acaulescent or short stemmed palm that has unilaterally branched inflorescences (rachillae attached to one side of the rachis). It often grows in colonies.

This palm has traditionally and mistakenly been called *S. petraea* in Paraguay. However it differs significantly from the type Bolivian *S. petraea*. A comparison of their leaflet anatomy with that of the Bolivian material collected from the type locality confirms that they are different. *Syagrus cerqueirana* has small vascular bundles on both surfaces of the leaflet and very few nonvascular fibers on either surface, while the Bolivian *S. petraea* has small vascular bundles only along the abaxial surface and an abundance of nonvascular fibers along the adaxial surface. *Syagrus cerqueirana* has leaflet anatomy similar to *S. allagopteroides* (Noblick 2013a), which grows above 600 m in Bahia, Goiás and Minas Gerais, but it is a larger plant with a leaf rachis 43–75 vs. 23–52 cm and middle leaflets 20–33 vs. 12–20 cm. Also *S. allagopteroides* tends to be solitary, but *S. cerqueirana* tends to be clustering.

Representative specimens:—BRAZIL. **Mato Grosso do Sul:** Entre Goiás and Cuyaba, November–December 1844, *Weddell 2990* (P! [P-01797440 identified as *S. campestris*]); Aquidauana, 24 June 1946, *J.R. Swallen 9520* (US!); Ponta Porã, road to Antonio João, near the service station, Posto Aquibadá, ca. 21 km N of Ponta Porã, –22.37, –55.74, 10 October 2001, *H. Lorenzi 2804* (FTG!); Ponta Porã, na estrada entre Ponta Porã e Antônio João, nas proximidades do trilho do trem, 14 March 2005, *R. Tsuji & E.R. Salviani 1029* (HPL!); Ponta Porã, estrada p/ Antônio João (do direito junto a estrada do ferro), a ca. 21 km de P. Porã e a 1 km do posto fiscal Aquibada-Paraguai, 8 September 2008, *H. Lorenzi 6512* (HPL!); Três Lagoas, na estrada para Água Clara (km 24.5) 12–15 km S of Três Lagoas on the road to Brasilândia, 19 January 2009, *H. Lorenzi et al. 6577*, *6578* (HPL!); PARAGUAY. **Amambay**: Parque Nacional Cerro Corá, –22.67, –56.08, January 1983, *W.J. Hahn et al. 1765* (MO); Amambay, Cerro Cora National Park, W side of the main entrance road into the park, 270 m, –22.66, –56.03, 18 February 1996*, L.R. Noblick et al. 5126* (FCQ!, FTG!, PY!); Amambay, camino entre Ruta 5 y Bella Vista, 42 km S de Bella Vista, May 1974, *A. Schinini & E. Bordas 8992* (CTES!, F!); Amambay, Cerro Corá, August 1980, *A. Schinini & E. Bordas 20288* (C, CTES!, F!, G, MICH, MO!, UC); Amambay, Parque Nacional Cerro Corá, –22.67, –56.08, 6 January 1988, *J.C. Solomon et al. 7014* (MO, PY); Amambay, P. N. Cerro Cora, camino al Cerro Trebol, –22.42, –57.97, 5 May 1989, *N. Soria 3634* (FCQ!); Amambay, Parque Nacional Cerro Corá, camino al Cerro Muralla, 6 January 1988, *E.M. Zardini et al. 4090* (FCQ!);.

12. *Syagrus cocoides* Martius (1826: 130). *Cocos syagrus* Drude in Martius (1881: 406) (superfluous name). *Calappa cocoides* (Mart.) Kuntze (1891: 982). Lectotype (designated by Glassman [1987: 48]):—BRAZIL. Pará: Rio Negro ad Almeirim, without date, *C.F.P. von Martius s.n.* (M! [F neg. 18564]), cf. Dahlgren 1959, plate 381

Syagrus cocoides var. *linearifolia* Barbosa Rodrigues (1875: 40). ("Cyagrus"). Type:—BRAZIL. [Pará]: ad fl. Trombetas, Agua Fria, *Barbosa Rodrigues 380* (destroyed). Lectotype (designated by Glassman [1972b: 210]):—BRAZIL, Barbosa Rodrigues (1903a) volume 1, t. 73B, 1903a.

Cocos weddellii Drude in Martius (1881: 311). *Calappa weddellii* (Drude ex Mart.) Kuntze (1891: 982). Type:—BRAZIL. Goiás: Sertão d'Amaroleite, *Weddell 2690* (holotype P!).

Cocos drudei Beccari (1887: 445). *Syagrus drudei* (Becc.) Beccari (1916: 466). A superfluous name for *C. weddellii* Drude, not *C. weddelliana* Wendland (1871: 114). Type:—not designated.
Syagrus brachyrhyncha Burret (1937: 686). Type:—BRAZIL. Pará: Rio Maycurú, *Huber 112* (holotype B).

Figure 17 plate, Figure 13 map.

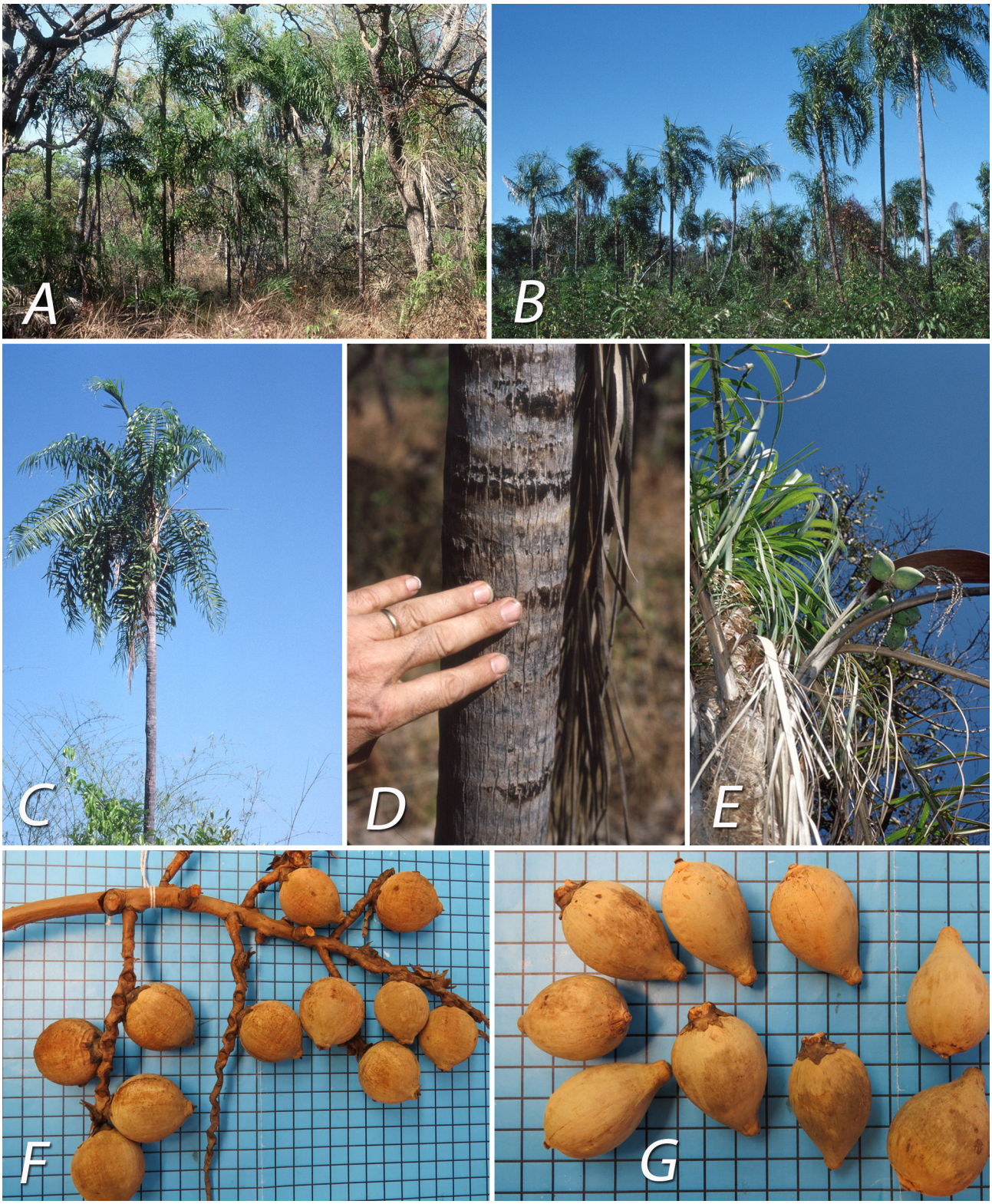

FIGURE 17. *Syagrus cocoides*. A. Palms in a forested cerrado in southern Piauí. B. Population in a more open habitat near Teresina, Piauí. C. Habit. D. Narrow stem. E. Infructescence. F. Infructescence from Piauí (*Noblick & Lopes 4954*). G. Characteristic "pear-shaped" fruits from Goiás (*Balick et al. 1616*). All grids are in centimeters.

Medium-sized, solitary, palm 1.5–10 m tall. **Stem** ca. 1.3–9 m × 6–12 cm. **Leaves** 14–22; *sheathing leaf base* ca. 45–55 × 12–22 cm; *pseudopetiole* 55–90 cm long; *petiole* (0–)1–14(–24) × 0.6–1.5 cm, 0.6–0.8 cm thick; *rachis* 80–180 cm long; *leaflets* slightly lighter on the abaxial surface, 55–95 along one side, in clusters of 2–5(–6), inserted at various angles, giving the leaf a plumose appearance, no ramenta scales present where the leaflets are inserted on the rachis, but a few very small ones along the abaxial midvein along the proximal portion of the leaflets; basal leaflets 23–67 × 0.3–0.9 cm, middle leaflets (27–)34–55 × 1.1–2.1 cm, apical leaflets 20–42 × 0.4–0.5 cm with an asymmetric tip. **Inflorescence** erect or pendulous, spirally branched; *prophyll* 30–40(–60) × 2.5–3 cm; *peduncular bract* 100–168 cm long, expanded portion (18–)30–70(–85) × (3–)5–8 cm, including a 1.5–6 cm beak, 4–9(–17) cm perimeter, 1–3 mm thickness, narrow, woody, sulcate, exterior with waxy bloom; *peduncle* ca. (52–)85–117 cm × 6–8 mm, 4–6 mm thick, elliptical in cross-section, glabrous; *inflorescence axis* (15–)21–58 cm long; *rachis* 3–25(–28) cm long; *rachillae* 3–20(–30), glabrous, 14–32 cm long at the apex, 15–45 cm long at the base; *staminate flowers* 10–15 mm long at the apex, 15–19 × 4–9 mm at the base, green to yellow, sepals 1.5–2 × ca. 1 mm, glabrous, indistinct nerves, petals 10–15 × 2–6 mm at the apex with acute tips, glabrous, nerves indistinct, stamens 6–7(–8.5) mm long, anthers 5.5–6(–8) mm long, filaments ca. 1 mm long, pistillode less than 0.5 mm long; basal *pistillate flowers* conical, glabrous, 8–14 × 8–10 mm, yellow, sepals 6–8 × 5–8 mm, petals 6.5–10 × 4–6 mm, glabrous, valvate tips ½–2/3 the length of the petal, ca. 4–5 mm long, pistil 5–7 (8–11) × 3–3.5(–6) mm, white wooly tomentose on at least the lower half, stigmas less than 2–4(–5) mm long, glabrous, staminodal ring 2–3 mm high, 6-dentate. **Fruit** globose to obpyriform (pear-shaped but attached at the broad end), 3.5–5.8 × 1.5–3.5 cm, yellow-green when mature, glabrous except for the very tip, epicarp less than 1 mm thick, mesocarp ca. 1 mm thick, succulent and fibrous; *endocarp* ca. 5.5 × 3.3 cm, ca. 2 mm thick on its sides, ca. 4 mm at the base, 6–10 mm thick at its apex; *seed* ellipsoid to ovoid, ca. 2.0–2.9 × 1.4–2.2 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—lous, jatá-uba, jatá-uva, piririma, ariri, iriri, pati, pupunha-brava, cunham-hen, uapirima.

Etymology:—The specific epithet, *cocoides,* alludes to the fact that the nut is coconut-like. This was the first species to be put in the genus *Syagrus*.

Distribution and habitat:—This species is amply distributed throughout eastern Amazonas, Pará, Maranhão, Piauí, Tocantins, Goiás and Mato Grosso, Brazil. It grows in the Amazonian or pre-Amazonian forest (várzea de terra firme), gallery forest and cerrado generally in rocky terrain to 500 m elevation.

Conservation:—This species is under no threat because of its habitat and wide distribution. It is often left behind in fields after the rest of the forest has been cleared. It probably can be found within the boundaries of several national parks. Therefore, this species is classified as least concern, LC.

Phenology:—Flowering around December and fruiting in August and September.

Uses:—Its trunks are used locally in rural construction. The fruits are rich in edible oils. The plant possesses ornamental attributes.

Notes:—This is a small-crowned palm commonly with large pear-shaped fruit (to 6 cm), plumose leaves with closely-spaced, and narrow leaflets. The leaflets are more or less membranaceous in texture, and they lack large fiber bundles or large fibrous strands (Noblick 2013a). The 6 cm long, ovoid to pear-shaped fruits are fairly large for a *Syagrus*, and the fibrous mesocarp has sometimes been observed to split irregularly at the apex at maturity.

Representative specimens:—BRAZIL. **Amazonas:** Estrada Manaus-Porto Velho, Trecho compreendido entre os rios, Castanho e Araça, 12 July 1972, *M.F. Silva 533* (INPA!); Almeirim, Prov. Rio Negro, Almeirim, *Martius 3244* (MO); Balbina, Vila de Balbina, Estrada da Cachoeira Morena km 20, 1996, *Rabelo 42* (INPA); Borda, Rio Madeira, 3 km S of town, –4.39, –59.59, 29 December 1990, *A.J. Henderson 1503* (NY!); Borda, Rio Madeira, BR 230 Estrada Transamazonica, 3 km E of Sucunduri, –4.39, –59.59, 6 May 1985, *A.J. Henderson 337* (INPA, NY!); Borba, 3 km Sul de Borba, –4.39, –59.59, 15 May 1995, *F. Kahn 3588* (CEN!); Itacoatiara, Fazenda do Sr. Manoel Abdon. Mata as margens do Rio Urubu, –3.14, –58.44, 26 January 1983, *J.T. Medeiros-Costa & Dionísio Coelho 233* (IPA!); Itacoatiara, a Mil Madereira, km 227, Manaus-Itacoatiara, Platô, –3.14, –58.44, 2002, *Souza s.n.* (INPA); Itapiranga, Rio Uatuma, atrás do igarapé Catitu, –2.749, –58.02, 19 August 1979, *C.A. Cid Ferreira et al. 522* (INPA, NY!, RB!, US); Presidente Figueiredo, Vila de Balbina, –2.03, –60.03, 1983, *Barrett 118* (INPA); **Goiás:** Gurupi, 1963, *G. Eiten & L.T. Eiten 5562* (F!); Rio dos Indios, 4 September 1898, A. *A.F.M. Glaziou 22264a* (P!); Miracema do Norte, 112 km south from city of Guará along the Belém-Brasília highway (BR-14), 250 m, 11 September 1963, *G. Eiten & L.T. Eiten 5501* (SP!); Santa Isabel, Parque Nacional do Araguaia-Ilha do Bananal, Lago da Mata, –15.30, –49.43, 25 June 1979, F.C. da *Silva et al. 368* (SP!, UB!); **Maranhão:**

Balsas, along road, ca. 25 km west of Balsas, Fazenda of Sr. Damion, –7.53, –46.04, 3 December 1981, *M.J. Balick 1343* (NY!); Balsas, Along road, ca. 25 km west of Balsas, Fazenda of Sr. Damion, –7.53, –46.04, 4 December 1981, *M.J. Balick 1345,1346* (NY!); Barro do Corda, –5.26, –44.65, 26 February 1983, *E.L. Taylor E1049* (NY!); Carolina, ca. 18 km east from city of Carolina along road to Riachão. On second highest plateau along road coming into Carolina from east, –7.38, –47.29 to –47.35, 9 September 1963, *G. Eiten & L.T. Eiten 5490* (F, SP!); Carolina, Serra da Madeira, 480, –7.18, –47.43, 4 July 1993, *J.A. Ratter et al. 6738* (UB!); Loreto, "Ilha de Balsas" region, between the Rios Balsas and Parnaíba, ca. 5 km N of city or Ribeiro Gonçales along jeep road between "Côco da Aparecida" & Rio Parnaíba, 400–450 m, –7.50, –45.25, 2 September 1963, *G. Eiten & L.T. Eiten 5449* (SP!); São Luis, 14 December 1958, *W.A. Engler 739* (MG!); São Luis, Island of Sao Luiz. Estrada do Olho d'Agua, –2.53, –44.30, 2 February 1939, *R. de L. Fróes & Krukoff 11622* (A, F!, GH!, MO, NY!); São Luis, Island of São Luiz, ca. 7 km from the center of the city, Reserva Floresta do Sacavem (Parque Estadual do Bacanga) near bus station, 1–30 m, –2.75, –44.25, 27 August 1994, *L.R. Noblick & N. Figueiredo* 4965 (FTG!, UFMA!); Timom, 30 January 1981, *Andrade-Lima 81-9018* (IPA!); Tuntum, Palmeirinhas, on unpaved road S from BR226, without date, *B.E. Dahlgren s.n.* (F-612366!); **Mato Grosso:** Aripuanã, Estrada Juruena-Aripuanã, ca. 50 km E (em linha reta) de Aripuanã, Base da Serra Morena, –10.30, –59.02, 8 July 1997, *V.C. Souza et al. 18529* (ESA!, UFMT!); Novo Mundo, Parque Estadual Cristalino, –9.95, –55.20, 21 July 2006, P.F.C. *et al.* 267 (HERBAM); Rio Teles Pires, Cachoeira Cachoeirão, –11.86, –55.50, 25 September 1985, *C.A. Cid Ferreira 6240* (NY!); Sinop, Estr. para Porto dos Gaúchos a 25 km da BR 163. Faz. Missionária, Rio Teles Sta. Terezinha, Faz. Codeara. Serra da Viúva, a 12 km S da cidade, 10 October 1985, *C.A. Cid Ferreira 6413* (NY!); Tangará, da Serra próximo à Progresso, 29 October 1995, *M. Macedo & R. Godinho 4446* (UFMT); **Pará:** Altamira, Igarpé Ipixuna, affluent of Rio Xingu; 5 m S of settlement, Araweté Indian Reserve, –4.82, –52.52, 6 November 1985, *W.L. Balée & B.G. Ribeiro 1920* (MO!, NY!); Barra do R. São Manoel, 14 January 1952, *J.M. Pires 3933* (IAN!); Belterra, 17 July 1947, *G.H. Black 47-1051* (IAC!); Belterra, –2.64, –54.94, 20 July 1947, *G.A. Black s.n.* (IAC!); Belterra, FLONA Tapajós km 67, 190 m, –2.84, –54.97, 9 September 2010, *J.Z. Shimbo 2* (UB!); Belterra, FLONA Tapajós km 67, 200 m, –2.86, –54.90, 29 July 2010, *J.Z. Shimbo 4* (UB!); Bôa Vista on Tapajos R., 1929, *B.E. Dahlgren & Stella 138 (F!);* Cachimbo, 1955, *W. Brockerman 240* (SP!); Canaã dos Carajás, Serra do Sossego, –6.50, –49.88, 21 January 2003, *H. Lorenzi et al. 3619* (HPL!); Curuatinga, Planalto de Santarém, 18 February 1955, *R. de L. Fróes 31559* (IAN!); Faro (Rio Yamanda, 1907, *A. Ducke 8348* (FI, MG); Iguapé da Lama, planalto de Santarém, 25 June 1954, *R. de L. Fróes 30967* (IAN!); Itaituba, Farias, –4.28, –55.98, 7 October 1977, *M.F. da Silva & Coêlho 2310* (INPA); Jatobá, a 60 km do 1st acampamento (Ilha do Belo Horizonte), 19 October 1986, *R.T.P Vasconcelos et al. 377* (MG!); Jurutí, Mineração Alcoa, Rio Juruti, afluente do Rio Amazonas, –2.15, –56.09, 2002, *Ramos et al. 2858* (INPA); Jurutí, Ramal da comunidade Santa Terezinha, –2.15, –56.09, 2007, *A. Jr. Amaral et al. 3141* (INPA); Mineração Rio do Norte, Porto Trombetas-Mina Saracá, 1999, *Barbosa et al. 333* (INPA); Monte Alegre, Serra do Irecé, 15 December 1908, *A. Ducke 9146* (MG!); Monte Dourado, Rio Jari, 27 November 1967, *E. Oliveira 3885* (IAN!, NY!); Monte Dourado, Região do Rio Jari. Rio Jarí, Margem da estrada que liga Monte Dourado a Caracurú, 11 November 1967, *E. Oliveira 3590* (IAN!, NY!); Monte Dourado, Rio Jari, ao lado da estrada que liga ao Planalto, atrás do aviario, 9 June 1968, *E. Oliveira 4463* (IAN!, NY!); Oriximiná, caminho para os campos de Ariramba, Serra da Preciosa, –1.77, –55.87, 9 June 1980, *G. Martinelli 6819* (RB!); Pombal, Porto Agronomico, Paraná do Tapará, 7 July 1952, *G.A. Black 52-15480* (IAN!); Repartição, Cuminá, Afluente do Trombetas, 20 March 1924, *Kuhlmann 1699* (RB!); Rio Jarí, Monte Dourado, 27 November 1967, *E. Oliveira 3885* (NY!); Santarém, Vila de Alter-do-Chão, –2.44306, –54.7083, 1996, *Miranda et al. 04* (INPA); Santarém, Rio Tapajôs, Villa de Alter do Châo, –2.44, –54.71, 27 December 1991, *R. Pardini 69* (INPA, NY); Santarém, Alter-do-Chão, –2.447, –54.71, 1996, *Rabelo 32* (INPA); Santarém, Alter do Chão, on the Santarém road, –2.48, –54.92, 4 October 1993, *J.A. Ratter et al. 6930* (UB!); Santarém, Serra de Santarém, 1877, *P. Schwacke 236* (RB!); Basin of Rio Trombetas. 20 km up Rio Mapueira from Cachoeira Porteira on east bank, 31 May 1974, *D.G. Campbell et al. 22409* (NY!); 3 Ponto 13, –9.55, –52.98 [coordinates are within Para, ca. 11.5 km N of the Mato Grosso border], 27 October 1977, *J.G. Guimarães [B.C. dos Passos]1065* (HBR!, RB); km 1305, Cuiabá-Santarém Highway (from Santarem), 22 November 1977, *Balick 941* (NY!); without a specific locality, *Martius s.n.* (P! [P-00726046]); **Piauí:** 30 May 1973, *Andrade-Lima 73-7371* (IPA!); Itaueira, –8.00, –43.04, 18 November 1986*, J.L. de S. Lima 61* (HTSA); Teresina, between Campo Major and Theresina [sic], 1935, *B.E. Dahlgren s.n.* (F-620827!); Teresina, A mais ou menos 15 km de Teresina para Monsenhor Gil, –5.42, –43.20, 18 November 1985*, J.L. de S. Lima 59, 60a* (HTSA!); Teresina, 2 km S of the rodoviaria policial on BR-316 E of the road, 100–200 m elevation, –5.17, –42.75, 16 August 1994, *L.R.*

Noblick & A.S. Lopes 4954 (FTG!, TEPB!); **Tocantins:** Aguiarnópolis, margem esquerda do Rio Tocantins, área do canteiro de obras, –6.58, –47.47, 150 m, 18 February 2005, *P. Pereira-Silva et al. 9340* (CEN, UFMT); Colinas do Tocantins, Parcela de Monitoramento C5 do empreendimento da Linha de Transmissão LT 500 Kv Colinas, São João do Piauí, –7.90, –48.05, 13 March 2010, *Saddi 360* (RB); Palmas, Serra do Lageado, –10.25, –48.10, March 1994, *F. Bucci 185* (HEPH); Paranã; Canteiro de obras do UHE São Salvador, –12.78, –48.23, 280 m, 2 June 2006, *G.P. Silva et al. 10790* (CEN); Presidente Kennedy, –8.54, –43.04, 400–500 m, 1 February 1980, *T.C. Plowman 8267* (NY!); Tocantinópolis, Posto Indígena Sao José, ca 20 km west of Tocantinópolis, (FUNAI Reservation-Apinajé Tribe), –6.50, –47.50, 11 September 1983, *M.J. Balick 1616* (CEN!, NY!).

13. *Syagrus comosa* (Mart.) Martius (1847: 134). *Cocos comosa* Martius (1826: 122). *Calappa comosa* (Mart.) Kuntze (1891: 982). Lectotype (designated by Dahlgren 1959, plate 382):—BRAZIL. Goiás: without locality, *Martius s.n.* (M! [F neg. 18562])

Cocos acaulis Drude (1881: 426). *Calappa acaulis* (Drude ex Mart.) Kuntze (1891: 982).
Syagrus acaulis (Drude) Beccari (1916: 465). Type:—BRAZIL. Piauí: monibus Serra Douro, *Gardner 3495* (holotype M, isotype K!).

Figure 18 plate, Figure 13 map.

Small to moderate-sized palms, usually solitary, caulescent, occasionally short, subterranean, growing so close as to appear clustering. **Stem** (0–)1–4 m × 6–15 cm (rarely to 8 m, 2–7 m tall, fide Glassman 1987), erect, dark gray, but often concealed by persistent petiole bases, with leaf scar intervals ca. 1.5–3 cm long. **Leaves** 5–12 in crown, spirally arranged, spreading; *sheathing leaf base* 10–11 × 8 cm, with fibrous margins; *pseudopetiole* 25–56 cm long with smooth to fibrous margins, *petiole* 10–44 × 1.3–3.7 cm, 1.2 cm thick, brownish tomentose, with smooth or fibrous margins; *rachis* (49–)80–134(–140) cm long; *leaflets* medium to dark green on both surfaces, 38–82(–164) along one side, irregularly distributed in clusters of 2–4, in divergent planes; ramenta scales or tomentum present where the leaflets are inserted on the rachis and also along the abaxial midvein; basal leaflets 14–46 × 0.2–0.8(–2.2) cm, middle leaflets (25–)30–55(–67) × (1.4–)2.0–3.8 cm, apical leaflets (9–)13–39(–45) × 0.5–2.6 cm mostly with acute, asymmetric tips. **Inflorescence** erect, spicate or spirally branched; *prophyll* (14–)20–46 × 1.5–8 cm; *peduncular bract* ca. (39–)52–90(–100) cm long, expanded portion 17–35 (60–72 fide Glassman, 1987) × (3–)4.5–8(–13) cm, bearing a 0.7–5.0 cm beak, 8.5–12.5 cm perimeter, 2.5–4(–7) mm thickness, woody, deeply sulcate, brownish tomentose, becoming glabrous with age; *peduncle* ca. (15–)27–75 × 0.5–1.5 cm; *inflorescence axis* 13–32 cm long; *rachis* absent or very short 0–17 cm long; *rachillae* 3–21 or rarely spicate, (8–)12–23(–27) cm long, each first order branch, especially lower ones, subtended by a bract (0–)2–6 mm long; *staminate flowers* 10–13 × 4–6.5 mm at the base, 6–10 long at tip, sepals 1–3 × 1–3 mm, glabrous, smooth, not keeled, petals 7–12 × 2.5–5 mm with broadly acute tips, white to cream, glabrous, indistinct nerves, nearly 1 mm thick, stamens 4–6 mm long, anthers 2–5(–6) mm long, filaments 0.2–2 mm long, pistillode obscure or to 1 mm; *pistillate flowers* nearly globose, (5–)6–10 × (4–)5–8.5 mm, white, sepals (5–)6–10 × 3–7 mm, glabrous, no visible venation, only slightly or not keeled, petals 5–6 × 4–5 mm, glabrous, obscurely veined, valvate tips 1/3–1/2 the length of the petal, ca. 3 mm long, pistil, (3–)4–5(–7) × 3–4(–5) mm, glabrous, stigmas 2 mm long, staminodal ring ca. 1.5–3 mm high, entire. **Fruit** ellipsoid, 2.0–3.2 × 1.4–2.1 cm, light green to greenish yellow, especially at the base, when mature, persistent perianth (cupule) beige to brown, 9–10 mm wide, 4–7 mm deep, ring 3–5 mm in height, epicarp relatively smooth with obscure fibers, less than 1 mm thick, mesocarp 0.5–2 mm thick, fibrous mucilaginous; *endocarp* 2.3–2.5 × 1.5 cm, 1–2 mm thick on the sides, 3–5 mm thick at its ends, bony, caramel colored, trivittate, smooth, shiny on interior, with no clusters of fibers; *seed* 17–19 × 9–10 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—catolé, babão, coco-babão, gabiroba catolé, guariroba-do-campo, palmito-amargoso, jerivá, pati, acumã rasteiro (used for the "acaulescent" plants).

Etymology:—The specific epithet, *comosa,* refers to bearing a tuft of leaves.

Distribution and habitat:—This species is distributed over most of the cerrado or savanna regions of Brazil: western Bahia, Distrito Federal, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Piauí, São Paulo and Tocantins. It is rare to occasional in western Bahia, having only been seen in the far western municípios of São Desidério and Barreiras. It also grows in Bolivia (eastern Santa Cruz). It grows usually in cerrado vegetation in flat or uneven rocky terrain along rocky ridges in quarzitic soils at an elevation of 700–1200 m.



FIGURE 18. *Syagrus comosa*. A. Habit near Jerumenha, Piauí (*Noblick 4955*). B. Larger tree near Chapada dos Guimarães, Mato Grosso (*Noblick & Lorenzi 5638*). C. Stem with leaf sheaths. D. Stem. E. Infructescence with a few yellow mature fruits near Brasilia, Distrito Federal. F. Inflorescence with pistillate flowers. G. Inflorescence with opening staminate flowers. H. Shorter palm from Goiás, just north of Brasilia, DF.

Conservation:—Because of its habitat and wide distribution, this species is not threatened. It is also protected within the borders of several national parks and preserves. The trees produce an abundance of fruits. Therefore, this species is classified as least concern, LC.

Phenology:—Flowering and fruiting year around with flowering from February to October but peaks from March to May and fruit maturing from August to February. Many of the fruits are damaged by insects.

Uses:—This moderately-sized palm has potential as an ornamental, principally the younger acaulescent forms, but its main drawback is that it is a very slow-growing when young. Under ideal circumstances it grows faster when it gets older (Harri Lorenzi, pers. comm.). The fruits are edible, but the palm heart is bitter (Bondar 1964). Its palm heart is used only in regional cooking and used medicinally to cure digestive problems.

Notes:—This is a small slow-growing palm with coriaceous leaves that show raised veins on its upper surface especially when dried, thick peduncular bracts and small rounded flowers. *Syagrus comosa* can be distinguished by its closely spaced leaflets, thick, deeply sulcate, woody, light brown to orange-brown-colored peduncular bract, its short rachis, whitish flowers, rounded pistillate flowers and smooth light green-colored fruits. The acaulescent forms often produce only spicate inflorescences, which motivated Drude (1881) to a describe a new species (*Cocos acaulis*) and Beccari (1916) to later transfer it to *Syagrus* as *S. acaulis*, but arborescent forms with spicate inflorescences can be found as well.

Representative specimens:—BOLIVIA, **Santa Cruz:** Parque Nacional Noel Kempff Mercado, Las Gamas, 700 m, –14.67, –60.77, 6 October 1993, *Saldias et al. 3462* (NY). BRAZIL. **Bahia:** Barreiras, 24 April 1972, *Andrade-Lima 72-6877* (IPA!); Barreiras, 759 m, –11.62, –48.04, without date, *A. Cotrim et al. 160, 251* (HUEFS!); Barreiras, 769 m, –11.88, –45.83, without date, *A. Cotrim et al. 566* (HUEFS!); Barreiras, 110 km SW of Barreiras, cerrado, scattered, associated with acaulescent *Attalea* [*A. barreirensis*], 23 August 1976, *S.F. Glassman 13049, 13050* (BH!, F!, MO!, RB!, SP!); Formosa do Rio Preto, Primavera, 465 m, –11.04, –45.07, 3 November 2007, *G. Araújo et al. 378* (HUEFS!); Formosa do Rio Preto, Projeto Ouro Verde, 814, –11.45, –46, 13 November 1995, *G. Pereira-Silva 3167* (CEN!); Formosa do Rio Preto, Projeto Ouro Verde, rodovia "Anel da Soja", reservas de cerrado entre plantios de soja, 710, –11.44, –46.07, 14 November 1995, *B.M.T. Walter 2924* (CEN!); Jaguarari, –10.45, –44.31, 30 July 1984, *J.L. de S. Lima 64* (HTSA!); São Desidério, Espigão Mestre, ca. 10 km N of Rio Roda Velha, ca. 100 km WSW of Barreiras, 9 March 1972, *W.R. Anderson et al. 36881* (NY!, UB!); São Desidério, 8 km W of São Desidério on road to Sítio Grande, 600 m, –12.37, –44.97, 24 October 1988, *L.R. Noblick & J.L. de S. Lima 4658* (BAH!, CEPEC!, F!, FTG!, HTSA!, NY!); São Desiderio, A mais a menos 8 km na estrada p/ Sítio Grande, –12.64, –45.64, 24 October 1988, *J.L. de S. Lima 133a* (HTSA!); **Distrito Federal**: Brasília, Planaltina, BR-020, 9 March 1977, *A.C. Allem & J.G.A. Vieira 883* (CEN); Brasília, EEJBB, 30 March 2004, *I.N.C. de Azevedo 25* (HEPH); Brasília, Parque Recreativo e Reserva Ecológica do Gama, –16.08, –48.10, 25 January 2001, *D.S. Brito 165* (UB!); Brasília, Fazenda Sucupira, –16.50, –48.00, 16 April 2007, *P.S. Carvalho & Correia 228* (UB!); Brasília, Zona de Jardim Botánica, cerro Cristo Redentor, 14 May 2012, *Carvalho-Silva et al. 1621* (MA, UB!); Brasília; Na DF-100 a 99,7 km do CENARGEN / EMBRAPA a esquerda, Vereda, 1085 m, –15.88, –47.38, 5 May 1992, *T.A.B. Dias et al. 99* (CEN); Brasília; A 32 km do CENARGEN. Pegar a DF-170 e seguir nela, –15.55, –48.05, 4 June 1992, *T.A.B. Dias & R.F. Vieira 186* (CEN); Brasília; Parque Nacional de Brasília, 3 August 2006, *C.A. Faria et al. 232* (CEN); Brasília, Estação Ecológica de Águas Emendadas, 20 April 1972, *M.B. Ferreira, 1188* (HEPH); Brasília, IBGE, 8 September 1977, *E.P. Heringer 15* (HEPH); Brasília, Barragem do Paranoá, –15.78, –47.93, 10 April 1962, *E.P. Heringer 8924-1118* (HEPH, NY!, UB!); Brasília, Barragem do Paranoá, –15.78, –47.93, 10 April 1962, *E.P. Heringer 8925-1119* (NY!); Brasília, Bacia do Rio São Bartolomeu, 9 July 1979, *E.P. Heringer 1772* (IBGE, MO, US); Brasília, Area de Inundação do Rio São Bartolomeu, 11 March 1980, *E.P. Heringer 3786* (MO!, US!); Brasília, Parque Recreativo e Reserva Ecológica do Gama, –16.08, –48.10, 10 November 2000, *B.M. Gomes 100* (UB!); Brasília, St Bartolomeu River valley, 25 April 1990, G.F. *Guala 1294* (US); Brasília, Fazenda Água Limpa, –15.78, –47.93, 25 February 1970, *M. Haridasan 496* (UB!); Brasília, Reserva Ecológica do IBGE, 1100 m, –15.95, –47.87, 4 October 2009, *J.L. de S. Lima s.n* (HCF); Brasília, ca. 15 km E of Lago Paranoá, DF-6, –15.78, –47.93, 25 February 1970, *H.S. Irwin* 26619[-1119] (NY!, RB!, SP!, UB!); Brasília, Chapada da Contagem, –15.78, –47.93, 8 December 1998, *R.C. Martins & Mendes 219.* (UB!); Brasília, Jardim Botânico, –15.50, –47.75, 23 November 2008, *R.C. Martins 100.* (UB!); Brasília, Estação Ecológica de Águas Emendadas, 8 October 1982, *C.M. Maury 271* (HEPH); Brasília, Estação Ecológica de Águas Emendadas 19 January 1983, *C.M. Maury 383* (HEPH); Brasília, EEJBB Cristo Redentor, 18 September 2003, *L.C. Milhomens 251* (UB!); Brasília, EEJBB, 112 m, 1 July 2004, *K.R. Moreira 80* (CEN); Brasília, SQN 2008, –

15.75, –45.88, *E. do Nascimento & B. Catarina 52* (UB!); Brasília, Parque Nacional de Brasília, –15.72, –47.97, 20 July 2006, *Neiva 167* (UB!); Brasília, Fazenda Agua Limpa, ca. 20 km SSW of the city of Brasília. Ecological Reserve of the Universidade da Brasília –15.78, –47.93, 4 May 1992*, L.R. Noblick 4859.* (FTG! NY!, UFG!); Brasília, Fazendinha Agua Limpa (study area of the University of Brasília), –15.78, –47.93, 7 February 1996*, L.R. Noblick & H. Cropper 5109.* (NY!, UB!); Brasília, Memorial das Diads do Brasil, –15.78, –47.93, 23 February 2010, *T. Nogales & Ianhez 90* (UB!); Brasília, JBB 102 m, –15.87, –47.85, 27 April 1989, *P.E.A.M. de Oliveira 1094* (HEPH); Parque Nacional de Brasília, –15.87, –47.82, without date, *V.F. Paiva 103a* (UB!); Brasília, Fazenda Água Limpa. Próximo da Sede, –15.95, –47.90, 17 April 2002, *C.E.B. Proença et al. 2594* (UB!); Brasília, Fazenda Água Limpa, –15.78, –47.93, 23 September 1976, *J.A. Ratter 3641* (UB!); Brasília, Fazendinha Agua Limpa (University of Brasília field station), near Vargem Bonita, ca. 18 km SSW of Brasília TV tower, –15.78, –47.93, 11 February 1978, *J.A. Ratter 4253* (NY); Brasília, EEJBB, 104 m, –15.92, –47.90, 5 September 2003, *R.R. da Silva 850* (HEPH); Brasília, Parque Nacional de Brasília, June 2006, *Roveratti & Santos 402* (CEN); Brasília, Fazenda Sucupira, Campos na entrada da Fazenda Sucupira, –15.92, –48.03, 26 August 1998, *A.B. Sampaio 237* (UB!); Brasília; Borda do Parque Nacional de Brasília, 1300 m, –15.64, –47.92, March 2006, *J.R. Santos et al. 284* (CEN); Brasília, Fazenda Água Limpa (UB!), 1140 m, –15.95, –47.92, 19 May 1989, *A.O. Scariot 551* (CEN); Brasília, ARIE do Cerradão, –15.85, –47.82, 27 February 2008, *J.S. Silva et al. 356* (NY!, UB!); Brasília, Reserva Ecológica do IBGE, August 1995, *M.A. Silva 2711* (IBGE); Brasília, Chapada do Rio Preto, *Sucre & E.P. Heringer 604* (UB!); Brasília, a cerca de 22 km do Posto Colorado a direita, 960 m, –15.77, –47.92, 8 April 1994, *R.F. Vieira et al. 1867* (CEN); **Goiás:** Region of S. Serra Dourada, 1965, *E.Y. Dawson 15521* (BH); Alto Paraíso de Goiás, estrada de terra para Nova Roma, a cerca de 6 km, 1200 m, –14.12, –47.43, 13 March 1995, *T.B. Cavalcanti et al. 1290* (CEN); Alto Paraíso de Goiás, –14.07, –47.51, 6 May 2008, *R. Tsuji & E. Franco 2619* (HPL!); Alto Paraíso, ca. 5 km da cidade na estrada da terra para acesso ao Hotel Fazenda Água Clara, 10 December 2008, *R. Tsuji 2727* (HPL!); Alto Paraíso de Goiás, 7 km de Alto Paraíso para Nova Roma, –13.77, –47.50, 21 May 1994, *C.B.R. Munhoz et al. 103* (UB!); Alto Paraíso de Goiás, nr. Fazenda Canastra, 30 km from Alto Paraíso de Goiás, 1700 m, –14.03, –47.43, 30 May 1994, *J.A. Ratter 7292* (UB!); Amorinópolis, Serra dos Caiapós-á 40 km de Amorinópolis para Rio verde, –16.62, –51.09, 17 April 1971, *J.A. Rizzo 6243* (UFG!); Caiapônia, base de Serra do Caiapó, entrada pela propriedade do S. Lóla, –17.28, –51.89, 4 September 2009, *R.C. Martins et al. 1018* (UB!); Cristalina, Serra dos Cristais; ca. 8 km S. of Cristalina, –16.77, –47.61, 6 March 1966, *H.S. Irwin et al. 13655* (GH, NY!, UB!); Formosa, Formosa, Rio Tiquira, –15.54, –47.30, 18 April 1967 NY, *E.P. Heringer 11447* (NY!, UB!); Goiás, Serra de Santa Rita-No distrito de Jeroaquara, –15.93, –50.14, 24 April 1971, *J.A. Rizzo 6264* (UFG!); Gurupi, 320 km south of Guará (or 80 km south of village of Barra Holanda) along the Belém-Brasília highway (BR-14), ca. –11.5 and between –48.83 and –49.17, 11 September 1963, *G. Eiten & Eiten 5505* (F!, SP!); Jataí, BR-364-GO, –17.88, –51.71, November 1983, *P.C. Hutchison 8544* (UEC!); *Martius s.n.* (MO); Minaçu, Reserva da Serra da Cana Brava, perto da antena de TV, –13.53, –48.22, 10 June 1995, *C.E.B. Proença 1274* (UB!); Minaçu, 6 km após a barreira (direção Minaçú), 24 April 1995, *H.G.P. Santos et al. 425* (CEN); Minaçu, estrada Minaçu-AHE Serra da Mesa, km 12, 500 m, –13.83, –48.28, 20 June 1995, *B.M.T. Walter et al. 2379* (CEN!); Mineiros, Parque Nacional das Emas-Jatobá, park entrance ca. 85 km SW of Mineiros on GO-341, –18.08, –53.08, 10 May 1992*, L.R. Noblick 4870* (F!, FTG!, K!, UFG!); Mossâmedes, Reserva Biológica da Serra Dourada-Divisa dos municípios de Mossâmedes ao sul e Goiás ao norte. Área da UFG, –16.13, –50.22, 5 April 1969, *J.A. Rizzo 4091* (UFG!); Mossâmedes, Reserva Biológica da Serra Dourada-Divisa dos municípios de Mossâmedes ao sul e Goiás ao norte. Área da UFG, –16.13, –50.22, 4 May 1969, *J.A. Rizzo 4209* (UFG!); Mossâmedes, Reserva Biológica da Serra Dourada-Divisa dos municípios de Mossâmedes ao sul e Goiás ao norte. Área da UFG, –16.13, –50.22, 5 October 1969, *J.A. Rizzo 4521* (UFG!); Niquelândia; Margem direita do Rio Bagagem, 390 m, –13.97, –48.32, 20 July 1995, *B.M.T. Walter et al. 2429* (CEN); Pirenópolis, Alta da Serra dos Pireneus-Alto da Serra dos Pireneus, na base dos três picos, –16.13, –50.22, 13 March 1971, *J.A. Rizzo 6052, 6058* (UFG!); Pirenópolis, Serra dos Pireneus-Alto da Serra dos Pireneus, nas base dos três picos, –16.13, –50.22, 13 April 1971, *J.A. Rizzo 6198* (UFG!); Pirenópolis, Serra dos Pireneus-Alto da Serra dos Pireneus, na base dos três picos, –7.53, –46.04, 4 June 1971, *J.A. Rizzo 6409* (UFG!); Uruaçu; Projeto de colonização agrícola Batavo / Campo, 470 m, –8.63, –46.72, 22 November 1995, *B.M.T. Walter et al. 2983* (CEN!); 1816–1821, *A. de Saint-Hilaire 867* (P!); Entre Vista Alegre and Barro Vermelho, 27 August 1894, *A.F.M. Glaziou 22263* (C, F!, K, MO!, P!, US); Morro do Froto, prés Meiá Ponte, 7 September 1894, *A.F.M. Glaziou s.n.* (P! P02147735); **Maranhão:** Balsas, Projeto de Balsas, Condomínio Kissy, Lote 23, 470 m, –7.53, –46.04, 10 March 1995, *Pereira-Silva et al. 3501* (TEPB, UFG); Balsas, Along road,

ca. 25 km West of Balsas, Fazenda of Sr. Damion, –7.53, –46.04, 4 December 1981, *M.J. Balick 1344* (NY); Rondonópolis, Bororo Indian Village, "Córrego Grande", and vicinity, on north shore of Rio São Lorenço, 64 km due WSW of Rondonópolis, 180 m, –16.60, –55.22, 4 December 1976, *G. Eiten 103* (UB!); *G. Eiten 5456* (F!, BH!, SP!); **Mato Grosso:** Agua Boa, Serra do Roncador, ca. 60 km N of Xavantina, 550 m, –14.05, –52.16, 24 May 1966, *Irwin 15965* (BH!, F!, MO!, NY!, UB!, US!); Aldeia Serra do Borda, caminho para o córrego, 5 November 1990, *M. Macedo & A.R. Ferreira 7451* (UFMT!); Alto Paraguai, Crista da Serra da Bocaina. 15 km SW (em linha reta) de Alto Paraguai. Estrada para Tira Sentido, –14.37, –56.35, 20 May 1997, *Souza 16577* (ESA!, UFMT!); Barra do Garças, ca. 35 km (straight line) ENE of Barra do Garças, 500 m, 4 May 1973, *W.R. Anderson 9712* (F!, MO!, NY!, UB!); Barra do Garças, 260 km along new road NNE of the village of Xavantina (1.5 km due SE of Royal Society, 450 m along path R-3, 30 August 1968, *G. Eiten & L.T. Eiten 8450* (UB!); Barra da Garças, na Serra do Taquará, 688 m, –15.69, –52.35, 12 March 2004, *H. Lorenzi 4741* (HPL!); Barra de Garças, Morro do Cristo, Serra Azul, 1 April 1999, *M. Macedo & A.R. Ferreira 6842* (UFMT!); Barra do Garças, Parque Estadual da Serra Azul, –15.89, –52.26, 1 September 1996, *Maia 2* (UB!); Chapada dos Guimarães, km 40 da estrada entre Cuiabá e Chapada dos Guimarães margem esquerda, 17 September 1998, *E. Ferreira & A. Silva 519* (UB!, UFMT!); Chapada dos Guimarães, PANA Chapada do Guimarães, Córrego da Paciência, 29 July 1995, *M. Macedo & R. Godinho 4298* (UFMT!); Chapada dos Guimarães, Usina Hidroelétrica de Manso, 22 June 1999, *M. Macedo & I. Lopes 7070, 7071* (UFMT!); Chapada dos Guimarães, MT251, 45 km NNE of Cuiabá, –15.46, –55.75, 12 July 1984, *S.A. Mori et al. 16771* (CEPEC!, NY!); Chapada dos Guimarães, –15.46, –55.75, 19 February 1997, *A.G. Nave et al. 1075* (ESA! UFMT!); Chapada dos Guimarães, Parque Nacional da Chapada dos Guimarães, ca. 19 km E of the Rio Mutuca and 3 km W of the Monumento da Pedra in the National Park, elevation ca. 437 m, –15.37, –55.85, 12 January 2014, *L.R. Noblick & H. Lorenzi 5638* (ESA!, FTG!); Chapada dos Guimarães, 22 April 1983, *A.T. de Oliveira Filho 35* (UFMT!); Chapada dos Guimarães; Estrada Cuiabá-Chapada dos Guimarães, km 54, 490 m, –15.25, –55.83, 23 August 1987, *E.L. Perez et al. 2271* (CEN); Cuiabá, area da Usina Hidroelétrica do Rio Manso (Eletronoite) 10 km da guarita da entrada da Usina, 18 September 1998, *E. Ferreira & A. Silva 521* (UFMT!); Cuiabá/Barra do Bugres km 47 Faz. São Pedro, 1 April 1983, *G. Guarim Neto et al. 858* (UFMT!); Cuiabá, Serrinha São Vicente, 26 July 1995, *M. Macedo & R. Godinho 4285* (UFMT!); Cuiabá, Road Buriti to Cuiabá; rocky escarpment of Chapada dos Guimarães, –15.60, –56.10, 720 m, 22 October 1973, *G.T. Prance 19288* (INPA, NY!, U, US!); Cuiabá, UHE Manso, August 1998, *S. Rodrigues 81* (UFMT!); Diamantino, MT. BR 163, Rod. Cuiabá-Sinop a 160 km ao S de Sinop, margens da rodovia, –14.41, –56.45, 17 September 1985, *C.A. Cid Ferreira et al. 6065* (NY!); Diamantino, ca. 20 km após a limite do Municipio de Diamantino, 23 April 1983, *E.C.C. Moraes et al. 276* (UFMT!); Diamantino, 41 km de Diamantino em direção a Nobres. Serra do Tombador, –14.36, –56.15, 400 m, 17 May 1997, *V.C. Souza 16071, 16092, 16093* (ESA!); Diamantino, Fazenda Camargo, ca. de 7 km NW (em linha reta) de Diamantino, –14.41, –56.45, 22 May 1997, *V.C. Souza 16880, 16888* (ESA!, UFMT!); Diamantino, Fazenda Caeté (Parte da Fazenda Baronesa), 16 km ESE (em linha reta) de Diamantino, 23 May 1997, *V.C. Souza et al. 16967* Nobres(ESA!, UFMT!); Diamantino, Fazenda Caeté (Parte da Fazenda Baronesa), 15 km ESE (em linha reta) de Diamantino, 23 May 1997, *V.C. Souza et al. 16982* (UFMT!); Garapú, Vicinity of Garapú. ca. 1 km N.E. of Garapú, 300–400 m, –13.20, –52.57, 1 October 1964, *H.S. Irwin & T.R. Soderstrom 6525* (NY!); General Carneiro, Meruri, –15.71, –52.76, September 1963, *Hartmann 47* (SP!); General Carneiro, na estrada entre Barra do Garça e General Carneiro, ca. 50 km de Barra do Garça, 70 m, 21 January 2009, –15.71, –52.76, *H. Lorenzi 6584* (HPL!); General Carneiro, margem da BR 070, 31 March 1999, *M. Macedo & A.R. Ferreira 6841, 6845* (UFMT!); General Carneiro, a 60 km da cidade na estrada para Cuiabá-MT, –15.71, –52.76, 10 December 2009, *Seidenschnur & Beaman 1087* (HPL!); Guiratinga, Morro da Nica, 20 March 1999, *M. Macedo et al. 6943, 6944* (UFMT!); Luciara, Estrada para a Mata do Coco, ca. 14 km N de Luciara. Fazenda Três Pontas do Araguaia, –11.08, –50.43, 140 m, 19 March 1997, *V.C. Souza 14550* (ESA! UFMT!); Lucas do Rio Verde/Campo de Murundas, 10 January 1997, *E.A. Silveiro 8* (UFMT!); Nambik km 35 Tirecatunga Sapezal, 19 February 1996, *R. Godinho & M. Macedo 216* (UFMT!); Nobres, cerca de 30 km NE (em linha reta) de Nobres. BR-242, ca. 2 km do entroncamento com a BR 364/163. Serra da Caixa Furada, 19 May 1997, *V.C. Souza 16431, 16469* (ESA!, UFMT!); Nobres, cerca de 62 km NE (em linha reta) de Nobres. BR-242, –14.23, –56.53, 19 May 1997, *V.C. Souza 16532, 16545, 16546, 16547* (ESA!, UFMT!); Nobres, Arredores da Fazenda Quebó, cerca de 37 km ENE (em linha reta) de Nobres, –14.37, –56, 24 May 1997, *Souza 17074* (ESA!, UFMT!); Nova Eldorado, 7 July 1998, *Guarim Neto & M. Macedo s.n.* (UFMT!); Nova Xavantina, 6 km ao S de Nova Xavantina, –14.67, –52.35, *Argent, G.C.G. 6488* (UB!); Novo Marillândia, estrada entre a BR-364 e Novo Marillândia, ca. de 2 km da

BR-364 (ca. de 12 km N em linha reta de Novo Marillândia), –14.23, –56.92, 18 May 1997, *V.R. Souza et al. 16341-B* (ESA!); Novo Mundo, Parque Estadual Cristalino, –9.95, –55.20, 311 m, 19 August 2008, *Sasaki 2232* (HERBAM); Novo Mundo, Parque Estadual Cristalino, –9.95, –55.20, 336 m, 30 January 2008, *Sasaki 2035* (HERBAM); Novo Mundo, Parque Estadual Cristalino, –9.95, –55.20, 418 m, 2 February 2008, *Sasaki 2150* (HERBAM); Nova Xavantina; Campus Universitário da UNEMAT. Estação Biológica, 18 May 1999, *N. Arenhart 9* (NX); Nova Xavantina, –14.67, –52.35, 26 March 2004, *F.M.F. Pires 3* (NX, UB!); Nova Xavantina; Campus Universitário da UNEMAT. Estação Biológica, 6 October 1999, *R.H.O. Viana 223* (NX); Paranatinga, 10 June 1999, *M. Macedo & A.R. Ferreira 7014* (UFMT!); Peixoto de Azevedo, BR-080. Cachoeirinha do Rio Peixoto, cerca de 63 km de Matupá em direção ao Rio Xingu. Gleba Leonislândia, –14.41, –56.45, 24 April 1997, *V.C. Souza 15634* (ESA!, UFMT!); Pontes e Lacerda, Estrada na Mineradora Santa Elina, –14.52, –59.78, 11 September 1997, *A.G. Nave et al. 2064* (ESA!, UFMT!); Porto Esperidião, 71 km de Porto Esperidião, direção Porto Velho, –15.85, –58.46, 1983, *P.C. Hutchison 8592* (UEC!); Porto Estrela, Est. Ecol. Serra dad Araras, 16 September 1987, *Ecol. Vegetal-Polo 1626* (UFMT!); Porto Estrela, –15.32, –57.23, 14 May 1995, *G. Hatschbach 62761* (MBM!); Ribeirão Cascalheira, Fazenda Marruá. P. 05 / Q. II, 5 October 2003, *C. Fernandes-Bulhão et al. CFB221* (NX); Ribeirão Cascalheira; Barreira Amarela. P. 01 / Q. IV, 12 October 2003, *C. Fernandes-Bulhão et al. 274* (NX); Salgadeira, Chapada dos Guimarães, 7 May 1983, A.T. de *Oliveira Filho 58* (UEC); São Félix do Araguaia, Estrada São Félix do Araguaia-Alto Boa Vista, ca. 13 km após o entroncamento para Luciara, –11.3602, –51.0456, 140 m, 15 March 1997, *V.C. Souza 14188* (ESA!, UFMT!); São José do Rio Claro, Fazenda Cachoeira de Pau, –13.52, –56.32, 14 June 1997, *V.C. Souza 18160* (ESA!, UFMT!); Sorriso—Próximo Teles Pires, 28 July 2002, *L. Regiane 39* (UFMT!); Tapurah, 75 km NE (em linha reta) de Tapurah. Estrada para Projeto Ipiranga, –12.14 –56.03, 9 June 1997, *V.C. Souza 17441* (ESA!, UFMT!); Tapurah, Estrada para Projeto Ipiranga. 47 km de Tapurah, –12.25, –56.13, 10 June 1997, *V.C. Souza 17633* (ESA!, UFMT!); Tapurah, Estrada MT-010, cerca de 5 km do entroncamento com MT-338, –12.82, –56.43, 12 June 1997, *V.C. Souza 17789* (ESA!, RB, UFMT!); Torixoréu, Próximo de Torixoréu, –16.28, –57.70, 25 October 1977, *J. de S. Costa 77* (RB!); Vila Bela da Santissima, Trinidade, Fazenda Bafa Funda, 9 September 1995, *M. Macedo et al. 4537* (UFMT!); Vila Bela da Sma.[Santissima] Trindade, MT-246, entre km 30–40, 10 November 1996, *G. Hatschbach & Silva 65488* (MBM!, UFMT!); Xavantina, 9 km E of the Base Camp of the Expedition (Base Camp –12.90, –51.87), ca. 270 km N of Xavantina, 19 April 1968, *J.A. Ratter et al. 1116* (UB!); Xavantina, 4 km N of the Base Camp (–12.90, –51.87), ca. 270 km N of Xavantina, 2 July 1968, *J.A. Ratter et al. 2051* (UB!); Xavantina, 24 November 1946, *H. Sick B165* (RB!); Base Camp, 2.5 km ao SE de Base Camp, –12.82, –51.77, *R.M. Harley et al. 10398* (UB!); Ilha do Bananal, na divisa com o Parque Nacional Araguaia; coletas no Parque Indígena, 11 October 1985, *J.R. Pirani et al. 1248* (NY!, SPF!); Base Camp, 2 km ao E de Base Camp, –12.82, –51.77, 22 December 1967, *D. Philcox 3700* (UB!); Base Camp, 8 km ao NE de Base Camp, –12.82, –51.77, April 1968, *J.A. Ratter 878* (UB!); Base Camp, 8 km ao NE de Base Camp, –12.82, –51.77, 9 April 1968, *J.A. Ratter 919* (UB!); Próximo ao Córrego do Surucucu, 10 October 1968, *Giulietti, A.M. 428* (IPA!); MT-270, Guiratinga-Poxoréu, 6 March 2000, *M. Macedo et al. 7221*(UFMT!); Serra da Chapada, 1894, *C.A.M. Lindman A2699* (S); **Mato Grosso do Sul:** Campo Grande, na estrada para Dourados, 50 km do Campo Grande, –20.44, –54.65, 8 September 2008, *H. Lorenzi 6516* (HPL!); Campo Grande, Cerrado do parque dos Poderes, –20.44, –54.65, 8 June 1992*, L.R. Noblick s.n.* (CGMS!); Inocência, em beira da estrada lado direito entre Água Clara e Inocência, –19.73, –51.93, 13 December 2007, *R. Tsuji 2391* (HPL!); Nova Alvorada do Sul, na BR-163 km 394 para Dourados, 20 January 2009, –21.47, –54.39, *H. Lorenzi 6581* (HPL!); Ribas do Rio Pardo; 36 km a L de Ribas do Rio Pardo, BR-262, 400 m, –20.417, –53.17, 3 September 1987, *E.L. Perez & J. B. Pereira 2407, 2409* (CEN!); Rio Pardo, na estrada para Água Clara (BR-262, km 189), 19 January 2002, *H. Lorenzi 6579* (HPL!); Rio Verde, 8 June 1974, *G. Martinelli 359* (RB!); Rio Verde, Faz. Anhumas do Rio Negrinho, 10 June 1974, *G. Martinelli 386* (RB!); **Minas Gerais:** Várzea da Palma, –17.60, –44.73, 13 March 1995, *G. Hatschbach 62860* (MBM!); **Pará:** Pará, perto do Rio Xingú, 27 June 1978, *J.M. Pires 16082* (NY!); Gorotire, 25 August 1985, A. Gély 493 (MG!); Itaituba, Serra do Cachimbo, estrada Santarém-Cuiabá, BR 163, km 771, –4.28, –55.98, 22 April 1983, *M.N.F. da Silva 64* (NY!); Portel, 10 km east of Portel, –1.94, –50.82, 12 September 1965, *G.T. Prance 1303* (NY!, U); Santarém, Cachoeira do Curua, Cierro de Cachimbo, Santarém-Cuiabá Highway BR 163, km 878 from Santarém, *M.J. Balick 912* (F!, MG!, NY!); Santa Cruz do Martírios, região do Araguáia, 13 June 1953, *R. de L. Fróes 30028* (IAN!); São Geraldo do Araguaia. Serra das Andorinhas, Alto Colina, próximo estrada para Santa Cruz do Araguaia, 5 August 2010, E. da S. Leal 289 (NY!); **Piauí:** 1839, *Gardner 2754* (K); Floriano, Entre Floriano e Jerumenha, –7.31, –43.04, 26 April 1984*, J.L.*

de S. Lima 81 (HTSA!); Jerumenha, road Jerumenha/Bertolínia ca. 44 km SW of Jerumenha, 400–500 m, –7.25, –43.75, 19 August 1994, *L.R. Noblick 4955* (FTG!, TEPB!); Landri Sales, Próximo a Marcos Parente, –7.20, –44.33, 21 November 1985*, J.L. de S. Lima 62* (HTSA); Teruminha, 21 November 1985*, J.L. de S. Lima s.n.* (HTSA); Uruçuí, E of road to Bertolínia/Uruçuí ca. 22 km NE of Bertolínia, 400–500 m, –7.42, –44.33, 19 August 1994, *L.R. Noblick 4957* (FTG!, TEPB!); **Tocantins:** Barreira da Cruz, A 10 km da Barreira da Cruz, que fica próximo a cidade de Pium, 12 June 1974, *J.A Rizzo 9869* (UFG!); Mateiros, APA do Jalapão-Saída para São Félix, 504 m, –10.54, –46.43, *Caxambu s.n.* (HCF); Mateiros; Cachoeira do Formiga, 463 m, –10.33, –46.47,16 June 2002, *A.O. Scariot 632* (CEN); Monte de Carmo, estrada para Ponte Alta do Tocantins, ca. 10 km de Monte de Carmo, –10.77, –48.04, 18 July 200, *V.C. Souza et al. 24149* (ESA!); Palmas, Serra do Lageado Córrego Brejão, –10.00, –48.22, 15 April 1994*, I.V. Lima 364* (HEPH); Recursolândia, Folha SC-23-V-A. Bacía Tocantins, Sub-bacía do Rio Manuel Alves Grande (T-14, area 1, pto 4), 368 m, –8.71, –47.09, 26 March 2010, *P.C.A. Oliveira et al. 1847* (IBGE, UB!); Ribeirão Grande, 5 km N of Tocantinópolis on road to Pará mun. Tocantinópolis, –6.33, –47.42, 21 Nov1993. *M.J. Balick et al. 3714* (UB!); Rio Sono, Folha SC-23-U-C, Bacia do Tocantins, sub-bacia do Rio Peridida (T-12, área 4, pto 5), 287 m, –9.40, –47.53, 28 March 2010, *F.C.R. Oliviera et al. 1885* (UB!).

14. *Syagrus coronata* (Mart.) Beccari (1916: 466). *Cocos coronata* Martius (1826: 115). *Calappa coronata* (Mart.) Kuntze (1891: 982). Lectotype (designated by Dahlgren 1959, plate 384):—BRAZIL. Bahia and Pernambuco: *Martius 1869* (M! [F neg. 18563, 18563a])

Cocos botryophora var. *ensifolia* Drude in Martius (1881: 409). *Arecastrum romanzoffianum* var. *ensifolium* (Drude) Beccari (1916: 459). Type:—cult. BRAZIL. Rio de Janeiro: Passeio Publ., 13 November 1875, *A.F.M. Glaziou 8058* (holotype P! [F neg. 21141], isotype RB!).

Cocos coronata var. *todari* Beccari (1887: 453). *Syagrus coronata* var. *todari* (Becc.) Beccari (1916: 466). Type:—cult. SICILY. Orto Bot., Palermo, *Todare s.n.* (holotype FI).

Cocos quinquefaria Barbosa Rodrigues (1900: 13). *Syagrus quinquefaria* (Barb.Rodr.) Beccari (1916: 467). Lectotype (designated by Glassman [1987: 74]):—BRAZIL. Rio de Janeiro: cult, Jardim Botânico do Rio de Janeiro: Barbosa Rodrigues (1903a) volume 1, t. 87A. 1903a.

Glaziova treubiana Beccari (1910: 791). *Syagrus treubiana* (Becc.) Beccari (1916: 468).

Lectotype (designated by Glassman [1987: 74]):—INDONESIA, Java: cult. Bogor Bot. Gard., *Hort. Bot. Bog. X.D. 48* (FI).

Figure 19 plate, Figure 20 map.

Moderate-sized, solitary, unarmed, palms. **Stem** (1.5–)3–12 m × (15–)20–25 cm, angular in appearance, light to dark gray, caulescent, erect, often concealed by persistent leaf bases, ultimately replaced by distinctive closely-spaced leaf scars, arranged in rows, internodes nearly absent. **Leaves** (10–)15–28(–30), arranged in five ranks or rows, usually spiraled to the left or to the right but rarely in five perfectly vertical rows, spreading; *sheathing leaf base* 102–160 cm long, usually persisting just beneath the crown, rarely persisting to the base, with wide woody flattened fibers; *pseudopetiole* 50–170 cm long mostly with wide woody flattened fibers from sheath remnants, *petiole* 3.5–7 × 2.5–3.5 cm, 1.0–1.5 cm thick; *rachis* (70–)120–280 cm long; *leaflets* green waxy adaxially, waxy glaucous especially on the abaxial surface, (80–)87–121(–131) along one side, irregularly distributed in clusters of 2–5, in divergent planes; no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 44–70 × 0.4–1.3 cm, middle leaflets (22–)24–70 × 1.5–4 cm, apical leaflets 11–27 × 0.1–0.8 cm with asymmetric, acuminate tips. **Inflorescence** pendulous, spirally branched; *prophyll* 35–55 cm long; *peduncular bract* ca. 59–112 cm long, expanded portion 30–75 × 6–21 cm, bearing a 3–5 cm beak, 12–21 cm perimeter, 1.5–3 mm thickness, woody, deeply sulcate, glabrous or with a thin waxy bloom, yellowish with a sweet odor when bract first opens, later turning tan to light brown or gray; *peduncle* ca. (20–)24–90 × 1–1.5 cm, mostly glabrous; *inflorescence axis* 30–88(–95) cm long; *rachis* 18–43 cm long; *rachillae* glabrous, 34–78, 18–44 cm long at its base, 8–25 cm long at its apex, rachillae bracts absent or to 1–1.5 mm long; *staminate flowers* 6–11 mm long at the apex, 10–14(–16) × (2–)4–7 mm at the base, cream to yellow, sepals 2–4 × 1.5–2.5 mm, glabrous, no veins visible, petals (4–)5–10 × 2–5(–7) mm, with acute tips, glabrous with indistinct nerves near the base, stamens 4–7.5 mm long, anthers 3–5.5 mm long, filaments 1.5–3 mm long, pistillode absent or to 0.5 mm long; *pistillate flowers* pyramidal, 7–12 × (5–)6–9 mm, green to light brown, sepals 7–12 × 4.5–9 mm, glabrous, obscurely veined, keeled, petals (5–)8–12 × (3–)4–6 mm, glabrous, with some raised veins especially near the base, valvate tips ½ the length of the petal, ca. 3–6 mm long, pistil (2–)4–6.5 × 2–3.6 mm, glabrous, stigmas 1.5–3 mm

long, staminodal ring ca. 1–1.5 mm high. **Fruit** ellipsoid, 2.5–3 × 1.7–2 cm, yellow-green, persistent perianth (cupule) beige to brown, 1.5–2 cm wide, 0.8–1 cm deep, ring 1.5–2 mm in height, epicarp yellow-green to orange, fairly smooth, fibrous, sometimes with a little brown tomentum, less than 0.5 mm thick, mesocarp fibrous, mucilaginous, sweet tasting, 1–2(–3) mm thick; *endocarp* 2.7–3.5 × 1.5–2.0 cm, 2–3.5 mm thick on the sides but 4–6(–8) mm thick at the tip, bony, cavity trivittate, smooth, slightly truncate at base, with no clusters of fibers; *seed* (13–)15–18(–23) × 9–12 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—licuri, licurizeiro, ouricuri, nicuri, alicuri, baba-de-boi, coqueiro-cabeçudo, coqueiro-decori, cabeçudo.

Etymology:—The specific epithet, *coronata,* means crown and refers to the distinctive phyllotaxy of the leaves: five rows forming a leafy crown.

Distribution and habitat:—Found in Brazil, mostly east of the Rio São Francisco, most of eastern and central Bahia, northern Minas Gerais to southern Pernambuco, including Sergipe and Alagoas. In northern Bahia, populations of this species are distributed to the coastline; but below Salvador, Bahia, the populations stop in the drier transitional areas and do not invade the wetter coastal rain forest to the east. In addition, none have been found west of the Rio São Francisco, nor south of the Rio Jequitinhonha. *Syagrus coronata* is one of the few palms that can survive the aridness of Bahia's caatinga vegetation. It does even better in areas of transition between the caatinga and the campo rupestre, caatinga and more mesic forests etc. It is a major component of some of the seasonal semideciduous forests east of the São Francisco. North of Salvador, *S. coronata* populations extend into the restinga (coastal) vegetation zone.

Conservation:—Because of its wide distribution, its ability to grow in areas that are not valuable for agriculture and its tenacity to persist in pastures, this species is not considered threatened. Truck-loads of them are cleared from fields each year to provide traditional annual Christmas decorations along the streets of Feira de Santana, Bahia. Other farmers are planting them to provide food for the native Lear's macaw (*Anodorhynchus leari*), and also for emergency forage for cattle in times of drought. It is classified as least concern, LC.

Phenology:—This palm will flower and fruit year around but has a peak of flowering and fruiting in the summer months from December to March.

Uses:—No one else championed the usefulness of *S. coronata* as much as Bondar (1938a, 1939a, 1939b, 1939c, 1939d, 1939f, 1942c, 1964). It is enough just to list a few of the uses that he reported. The heart of the palm, fruit and nut are edible, the leaves provide wax, the seeds are used for extracting oil for soap and other products, and the endocarp (nut) is used in regional handicrafts. During dry periods the leaves are ground up, mixed with other plants and fed to livestock. Even during the driest spells this palm has the capacity to continue to flower and produce fruits. The fruits produce an edible, mucilaginous, sweetish, fibrous mesocarp that is chewed then discarded. The seeds (endosperm) are often strung into long "rosaries" and eaten at leisure. The oily seeds are collected in large quantities for food. They can be made into a sugary sweet "cocada." They are also used for cooking and lighting oil and for the manufacture of other assorted products. At the turn of the century the oil was used in the perfume industry. Today, licuri oil is sought after to mix with oil from the African oil palm (*Elaeis guineensis*) to make soap (Sabão Gareira). Many seeds are gathered and sold as a source of income and enter in the national statistics together with that for babaçu oil. The crushed and broken seed is fed as a daily ration to domesticated fowl. In fact, in the interior of Bahia in some places it is customary to use crushed licuri seed rather than corn to feed fowl.

The leaves of licuri are used for covering rural shelters, and to fabricate doors and walls. Parts of the leaf are used for making hats, fans, baskets, dusters, sleeping mats etc. Because older leaves have accumulated large quantities of wax, they are used to make torches for night time illumination or to burn out ant nests. The wax is of very high quality similar to that collected from carnaúba palms, *Copernicia prunifera*, and used to be scraped off the leaves and sold into the wax export market until that market crashed.

In times of extreme emergency and hardship, this palm has saved the lives of many caatinga inhabitants. The palm heart is edible and sweet tasting and a substitute flour, "farinha," can be pounded and sifted from its trunk. It is not very healthful, but at least it filled the stomach and held off hunger and death for one more day.

Notes:—This is a slow growing palm distinguished by very visible leaf scars and a lack of visible internodes, angular trunk, leaf bases arranged in five rows, and thick flat woody sheath fibers. *Syagrus coronata* is easily distinguished by the unusual arrangement of its leaves on the stem in five distinct vertical rows, and by the persistent leaf remains on the stem, especially in moister areas. *Syagrus oleracea* with which it has been confused, usually has leaves spirally arranged on the stem, petiole margins that are more fibrous in nature, and larger fruits



FIGURE 19. *Syagrus coronata*. A. Palm from Bahia with Luciano Paganucci de Queiroz. B. Habit of species at MBC. C. Pentagonal stem with short compacted internodes. D. Crown with leaves in distinct rows. E. Pseudopetioles with flat, woody leaf sheath fibers. F. Inflorescence with pistillate flowers. G. Close up of receptive pistillate flowers. H. Open staminate flowers. I. Infructescence. J. Immature fruits approaching mature size.

and pistillate flowers. At a distance the two are may be difficult to determine, but up close, identification is easy. To date, the populations of these two palms have not been found to overlap in Bahia. *Syagrus coronata* is always found east of the Rio São Francisco, and *S. oleracea* is found only west of that river. *Syagrus coronata* forms hybrids with several other species of *Syagrus*, including *S. vagans, S. microphylla, S. schizophylla, S. botryophora* and *S. romanzoffiana*.

Representative specimens:—BRAZIL. **Alagoas**: Água Branca, Margem da AL-145, 13 November 1985, *R.P. de Lyra-Lemos & A.I.L. Pinheiro 1102* (MAC!, PEUFR!); Água Branca, –9.26, –37.94, 1 February 2009, *R.P. de Lyra-Lemos 11678* (MAC); Anadia, Fazenda Tanque Escuro, 22 February 1985, *R.P. de Lyra-Lemos & A.I.L. Pinheiro 1222, 1224* (PEUFR!); Arapiraca, Povoado Cangandu, –9.75, –36.66, 7 March 2009, *R. Fernandes 164* (MAC); Coruripe, Usina Coruripe, Fazenda Capiatã A-Bloco Poxinzinho, área de encosta, –10.13, –36.18, 24 July 2003, *M.A.B.L. Machado 306* (MAC); Junqueiro, Fazenda Ribeira, –9.84, –36.37, 20 November 2005, *A.L.S. Santos 206* (MAC); Maribondo, próximo a BR-316, 20 April 1982, *R.P. de Lyra-Lemos & M.N.R. Staviski 463* (MAC!); Rio Largo, próximo ao Aeroporto, 19 September 1985, *R.P. de Lyra-Lemos & A.I.L. Pinheiro 1048* (MAC!, PEUFR!); São Jose da Tapera, 33 July 1982, *R.P. de Lyra-Lemos & M.N.R. Staviski 659* (MAC!); São José da Laje, Usina Serra Grande-Flora dos Fragmentos: Frag. Jaqueira, –9.01, –36.06, 16 December 2003, *M. Oliveira 1523* (UFP); **Bahia:** Alagoinhas, ca. 12 km SW of Araçás and W of BA 093, Fazenda Conceição, 50–100 m, –12.17, –38.43, 23 November 1988*, L.R. Noblick & R. Soeiro 4688* (BAH!, BH!, CEPEC!, F!); Bahia, Alcobaça, –18.04, –39.37, 21 October 1985*, J.L. de S. Lima 67a* (HTSA!); Bom Fim [Senhor do Bonfim], "ouricuri" próximo à cidade do Bom Fim, 25 February 1968, *Pontual 68-750* (IPA!); Bom Fim, vicinity of Bom Fim, 8–9 June 1915, *J.N. Rose & Russell 19825* (NY!, US!); Cabadeiras do Paraguaçu, Recôncavo Sul, 100 m, –12.53, –39.08, 17–28 August 1980, *Grupo Pedra do Cavalo 657, 658, 714* (ALCB!); Cachoeira, Recôncavo Sul, 100 m, –39.08, –12.53, 26 September 1980, *Grupo Pedra do Cavalo s.n.* (ALCB!); Cachoeira, Recôncavo Sul, –12.62, –38.95, 21 September 1992*, M.L. Guedes s.n.* (ALCB!); Caetité, *E.R. Salviani et al. 1848*, (HPL!); Caldeirão Grande, Piemonte da Diamantina, –11.02, –40.30, 2 October 2009, *Ricl 01* (ALCB); Campo Formoso, Brejo do Tamanduá. Serra do Areião, 819 m, –10.43, –40.26, 17 February 2006, *Souza 1451* (HUEFS!); Cansanção, Fazenda Lagoa Grande, atrás, da Associação dos produtores rurais, 1 October 2010, *R. Silveira & A.P. Oliveira s.n.* (HUEFS!); Castro Alves, 30 June 1969*, S.F. Glassman & J.T. Medeiros-Costa 8714, 8715* (F!); Conde, Litoral Norte, 10 m, –11.95, –37.61, 26 January 2011, *F.S. Gomes 750* (ALCB); Coração de Maria, Retiro, –12.25, –38.83, 16 March 2002, *Ferraro 4* (HUEFS!); Entre Rios, 25 km W of the coastal village of Subaúma, 50–100 m, –11.93, –38.08, 29 November 1988*, L.R. Noblick & R. Soeiro 4694* (CEPEC!, F!, FTG!, HRB!, NY!); Entre Rios, Fazenda do Negro, ca. 15 km SE of Entre Rios, 153 m, –12.02, –38.05, 18 January 2012, *A.V. Popovkin & Mattos* (HUEFS!); Esplanada, 6 km W of Conde, 20–50 m elevation, –11.82, –37.62, 1 December 1988*, L.R. Noblick & R. Soeiro 4704* (CEPEC!, F!, FTG!, HRB!); Feira de Santana, Campos UEFS, –12.27, –38.97, 14 May 1998, *K.R.B. Leite 2* (HUEFS!); Feira de Santana, Campus da UEFS [Universidade Estadual de Feira de Santana], 9 October 1982*, L.R. Noblick 2071* (HUEFS!); Feira de Santana, Campus of the Universidade Estadual de Feira de Santana, ca. 3 km N on BR-116, 200–300 m, –12.25, –38.95, 18 February 1992*, L.R. Noblick & L.P. de Queiroz 4833* (FTG!, HUEFS!); Feira de Santana, Campus universitaire, 9 August 1993, *M.H. Pignal & F. Lechat 354* (P!); Feira de Santana, Fazenda Cruserio do Mocó, 211 m, –12.22, –39.05, 14 May 2013, *A.S. Querioz & F. França 42* (HUEFS!); Feira de Santana, Campus da UEFS, –12.20, –38.97, 4 October 2006, *E.M.B.G. Silva 34, 35, 36, 37, 38* (HUEFS!); Gloria, Nordeste, –9.33, –38.25, 18 January 1993, *Bandeira 159* (ALCB); Iaiú, –12.08, –40.22 [S of Baixa Grande], 13 December 1979, *A.P. de Araujo s.n.* (RB!); Iaçú, Lagedo Alto, 2–3 km norte do povoado, –12.72, –39.87, 16 January 1986*, L.R. Noblick & J. Lobo 4513* (F!, HUEFS!, MO!, US!); Ilhéus, Estrada do Bom Gosto a Olivença, –14.79, –39.05, 12 March 1943, *R. de L. Fróes 20094* (NY!); Ilhéus, km 7 estr. Ilhéus/Itabuna, Faz. Cordilheira. 5 km entr. CEPEC, –14.80, –39.20, 6 August 1985, *L.R. Noblick 4240* (CEPEC!); Indiaroba, Litoral Norte, 65 m, –11.56, –37.51, 25 January 2011, *F.S. Gomes 650* (ALCB); Ipirá, 30 km E of Ipirá along Highway BA-052 to Feira de Santana, 280 m, 2 April 1976, *G. Davidse 11827* (BH!, MO!, SP!); Ipuaçu, 30 November 1980, *Grupo Flora Pedra do Cavalo 937* (ALCB!, MBM!); Itaberaba, Parte da ARIE pertencente a Itaberaba. Fazenda Bom Jardim. Estância Baleeiro, 491 m, –12.34, –40.48, 14 November 2004, *L.P. de Queiroz 9846* (HUEFS!); Itatim, Morro das tocas, –12.72, –39.70, 14 October 1995, *F. França 1388* (HUEFS!); Itatim, Próximo ao Morro do Agenor, –12.72, –39.70, 21 April 1996, *F. França 1636* (HUEFS!); Itiruçú, Rod. Itiruçú/Maracás, ca. 10 km de Maracás. Ramal que dá acesso a formações rochosasa de granito, –13.53, –40.15, *L. Amorim 2745* (CEPEC); Itiúba, Povoado de Picos, serra entre o povoado e a Fazenda Lage da Cruz, 514 m, 5 April 2012, *D. Fernandes 5*

(HVASF); Itiúba, Próximo ao Povoado de Picos, Serra de Picos, 415 m, 6 April 2012, *R.R.V. Gonçalves 11* (HVASF); Itiúba, cerca de 5 km da estrada Itiúba-Filadélfia, Fazenda Carrapato, –10.73, –40.03, 16 August 2002, *L.P. de Queiroz 7330* (HUEFS!); Ituaçu, 2 km SE da cidade de Ituaçu, 600 m, –13.82, –41.27, 22 June 1987, *L.P. de Queiroz et al. 1633* (HUEFS!); Jaquarari, a 10 km a esquerda para Senhor do Bom Fim, 30 July 1984*, J.L. de S. Lima 23–27* (HTSA!); Jequié, 30 km N of Jequié para Milagres, 1965, *R.P. Belém & Mendes 241* (BH!, UB!); Jequié, mais ou menos 50 km de Jequié, ao norte, –13.86, –40.08, 29 November 2000, *E.R. Salviani & H. Lorenzi 1848* (HPL!); Road to Manoel Vitorino from Jequié, BR-116, 300 m, –14, –40.17, 9 February 1985, *A.H. Gentry & E.M. Zardini 49964* (CEPEC!, MO!, NY!); Jeremoabo, Povoado Casinhas, Roça de D. Lucinha, 411 m, –10.25, –38.40, 18 April 2009, *F.S. Gomes 14* (HUEFS!); Jeremoabo, Raso de Catarina próximo a Mata das Pororocas, 5 December 1983*, M.L. Guedes 853* (ALCB!); BR-110, km 36, no lado direito da estrada na direção de Jeremoabo, 13 April 1991, *R.P. de Lyra-Lemos & Esteves 1812* (MAC!); Reserva Ecológica do Raso da Catarina, Mata dos Pororocas, 7 December 1982, *446* (ALCB!); Livramento do Brumado, km 5 da Rodovia Liv. do Brumado/Rio de Contas, 600 m, –13.64, –41.84, 19–20 July 1979, *S.A. Mori et al. 12305* (BH!, CEPEC!, US!); Manuel Vitorino, Rod. Manoel Vitorino/Jequié, BR-116, 300 m, –14.00, –40.17, 9 February 1985, *A.H. Gentry s.n.* (CEPEC!); Maracás, ca. 6 km a SW de Maracás, 13 October 1983, *A.M. de Carvalho 2000* (CEPEC!, F!); Maracás, 1 July 1969*, S.F. Glassman & J.T. Medeiros-Costa 8720* (F!); Maracás, Rod. BA-026, a 26 km ao SW de Maracás. Folha SD-24 (14-41b), N.V. "licuri," 27 April 1978, *S.A. Mori et al. 10000* (CEPEC!, NY!); Maracás, Fazenda Corralinho, 999 m, –13.89, –40.75, 6 December 2011, *Oliveira 479* (HUESB); Marcionílio Souza, Vicinity of Machado Portello, –13.00, –40.53, 19 June 1915, *J.N. Rose 19939* (NY!, US!); Milagres, BA-046, 10 km W of Tartaruga, caatinga, 350 m, 18 July 1979, *G. Hatschbach 42462* (F!, MBM!, US!); Monte Santo, Fazenda Tapera, 400 m, 27 August 1985*, J.L. de S. Lima 95–98* (HTSA!); Monte Santo, Nordeste, –10.43, –39.32, 12 January 2006, *M.L. Guedes 12162* (ALCB); Morro do Chapéu, Buraco do Possidônio, 972 m, –11.65, –41.27, 7 November 2008, *E. Melo 6016* (HUEFS!); Morro do Chapéu, Burado da Duda, 995 m, –11.83, –41.31, 7 November 2008, *E. Melo 6041* (HUEFS!); Morro do Chapéu, 27.5 km SE of town of Morro do Chapéu on the BA 052 road to Mundo Novo, 800 m, –11.65, –41.02, 4 March 1977, *R.M. Harley 19411* (CEPEC!, K!); Mundo Novo, 4 November 1988*, J.L. de S. Lima & L.R. Noblick s.n.* (HTSA!); Paulo Afonso, 1973, *A.P. Duarte s.n.* (RB!); Paulo Afonso, Estação Ecológica do Raso da Catarina, 539 m, –9.68, –38.42, 30 November 2005, *F. França 5306, 5308* (HUEFS!); Paulo Afonso, Povoado Juá, –9.45, –38.43, 24 January 2009, *K.M.R. Rocha s.n.* (HST); Paulo Afonso, Estação Ecológica do Raso da Catarina, –9.41, –38.21, 31 March 2008, *M.S. Mendes 168* (UFP); Paulo Afonso, Estação Ecológica Raso da Catarina (Mata da Pororoca.), 715 m, –9.82, –38.49, 1 December 2005, *A.O. Moraes 118* (HUEFS!); Paulo Afonso, Nordeste, –9.40, –38.22, 7 December 1982, *L.P. de Queiroz s.n* (ALCB!); Pojuquinha, prés de Salvador, entre –12.00 á –12.33, –38.00 á –38.17, 0–50 m, 17 July 1993, *M.H. Pignal & F. Lechat 233* (BAH, P!); Rui Barbosa, estrada Norte de Rui Barbosa, Folha SD24-VB, ponto 08, –12.08, –40.22, 16 October 1978, *A.P. de Araujo 90* (HRB!, RB!); Salvador, Pituba, ca. 15 km N of Salvador, 1940, *G. Bondar s.n.* (F-619736); Salvador, Ondina, 11 September 1953, *D.R. Espinhosa s.n.* (BAH-600!); Salvador, Pituba, 3 July 1969*, S.F. Glassman & J.T. Medeiros-Costa 8723* (F!); Salvador, Região Metropolitana Salvador, –12.97, –38.50, 1 September 1997, *M.L. Guedes 5194* (ALCB!); Salvador, Região Metropolitana Salvador, –12.97, –38.50, 14 March 2010, *M.L. Guedes 18049* (ALCB!); Salvador, Região Metropolitana Salvador, –12.97, –38.50, 3 April 2012, *M.L. Guedes 19817* (ALCB); Salvador, Região Metropolitana Salvador, –12.81, –38.30, 18 March 2007, *M.L. Guedes s.n.* (ALCB); Salvador, Região Metropolitana Salvador, –12.97, –38.50, 14 October 1997, *M. Ramalho s.n.* (ALCB); Salvador, Ilha de Maré. Comunidade Quilombola de Praia Grande, –12.97, –38.51, 3 December 2012, *E.M.G.B. Silva 82* (HUEFS!); São João, *Luetzelburg s.n.* (B, destroyed?); Saúde, –11.62, –40.73, 4 September 1985*, J.L. de S. Lima 66* (HTSA); Senhor do Bonfim, Carrapichel, 538 m, –10.38, –40.16, 29 July 2005, *P.D. Carvalho 225* (HUEFS!); Senhor do Bonfim, Igara, Faz. Anaticun, 478 m, –10.39, –40.12, 6 October 2003, *K.R.B. Leite 411* (HUEFS!); Senhor do Bonfim, 20 km da cidade no sentido de Juazeiro, 25 December 1984, *G.P. Lewis et al. 7570* (SPF 36570!); Serra do Chuque, *Luetzelburg s.n.* (B, destroyed?); *Martius s.n.* (P! [P-00726050]); **Ceará:** Brejo Santo, Estrada da Serra, 763 m, 5 September 2012, *Socolowski 164* (HVASF); Brejo Santo, Povoado Timbauba, 849 m, 11 October 2012, *Oliveira 557* (HVASF); **Minas Gerais:** Jaíba, na estrada para Mocambirbinho, 470 m, –15.30, –43.70, 31 January 2010, *H. Lorenzi 6815* (HPL!); Mato Verde, Estrada para Rio Pardo de Minas, –15.40, –42.80, 12 May 1998, *A.C. Marcato 187* (SP); **Paraíba:** Monteiro, Vale do Boqueirão, 789 m, 1 August 2012, *Socolowski 130* (HVASF); São José de Piranhas, Serra do Vital, Restaurante nas Alturas, 708 m, 7 July 2010, *A.P. Fontana 6939* (HVASF); **Pernambuco:** Afrânio, Povoado de Caboclo, 587 m, 25 November 2007, *Pesqueira 30* (HVASF);

Afrânio, povoado de Caboclo, Fazenda Boqueirão, 560 m, 14 November 2005, *J.A. Siqueira Filho 1531* (HVASF); Afrânio, povoado de Caboclo, Fazenda Boqueirão, 560 m, 2 November 2007, *J.A. Siqueira Filho 1898* (HVASF); Arcoverde, Serra das Varas, –8.42, –37.05, 11 July 1966, *J.T. de Medeiros-Costa 66-0002.* (IPA!, UFP!); Buíque, Parque Nacional do Catimbau, próximo a 1 km da Pousada Vale do Catimbau sentido Cannyon, 844 m, 24 January 2012, *Oliveira 51* (HVASF); Garanhuns, estrada para Brejão, –8.89, –36.49, 24 June 1969*, S.F. Glassman 8702* (MO!); Garanhuns, BR-424 (Garanhuns/Arcoverde), ca. 15 km NW of the intersection of BR-424 near Garanhuns, 1000, –8.89, –36.50, 20 September 1994, *L.R. Noblick et al. 4975* (IPA!); Garanhuns, 1929, *D.B. Pickel 2178* (IPA!); Olinda, lugares secos do litoral, –8.01, –34.86, 27 January 1930, *D.B. Pickel, 2310* (IPA!); Ouricuri, Açude Tamboril (L156), –7.88, –40.08, 30 May 2003, *Rocha s.n.* (UFP); Tacaratu, Serra do Morcego, nos arredores da Torre da Telpe, –9.07, –38.13, 835 m, 15 March 2011, *J.A. Siqueira Filho 2471* (IPA); **Sergipe:** Aracaju, APA Morro do Urubu/Parque da Cidade, –10.89, –37.05, 28 October 2011, *D.S. Cardoso, 378* (ASE); Areia Branca, Parque Nacional da Serra de Itabaiana, –10.76, –37.32, March 2009, *E.C.A. Matos 251* (ASE); Barra dos Coqueiros, –10.91, –37.04, 20 March 1995, *M.F. Landim 195* (ASE); Estância, Rodovia para Abais, –11.28, –37.43, 23 October 2012, *D.A. Campos 172* (ASE); Indiaroba, –11.52, –37.51, 11 August 1995, *G. Hatschbach 63192* (MBM!); Lagarto, Mata de Doutor João, –10.92, –37.65, 12 March 2009, *D.S. Melo 19* (ASE); Neópolis, Fazenda Cadoz, –10.32, –36.58, 23 February 2006, *R.M.O. Rodrigues 24* (ASE, UFP); Pirambu, Assentamento Sao Sebastião, –10.74, –36.86, 13 May 2011, *D.M. Oliveira 73* (ASE); Pirambu, Margem Lagoa do Sangradouro, 51 m, –10.68, –36.80, 25 May 2012, *A.P. Prata 2961* (ASE); Poço Redondo, Serra da Guia, –9.81, –37.68, 30 May 2010, *W.J. Machado, 419* (ASE); Poço Redondo, Serra da Guia, –9.81, –37.68, 16 December 2010, *W.J. Machado 1077* (ASE); Poço Verde, –10.71, –38.18, 26 January 2011, *E.V.R. Ferreira 225* (ASE); São Cristóvão, Mata em frente ao Campus às margens do Rio Poxim, 47 m, –11.01, –37.21, 22 March 2010, *D.S. Melo 113* (ASE); São Cristóvão, Campus UFS, Rio Poxim, –10.91, –37.16, 9 April 1996, *M.F. Landim 903* (ASE); São Cristóvão, próximo ao Campus Universitário, 23 September 1986, *R.P. Lyra-Lemos 1230* (MAC!); Simão Dias, Assentamento Maria Bonita, –10.74, –37.81, 13 August 2010, *A.P. Prata 2479* (ASE).

15. *Syagrus deflexa* Noblick & Lorenzi (2010b: 19). Type:—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. 1,360 m, –14.07, –47.51, 19 June 2008, *R. Tsuji, H. Lorenzi, L.A. Ventura, L.R. Noblick 2691* (holotype HPL!, isotypes ESA!, FTG!, K!, NY!, RB!, SP!, UFG!, UB!)

Figures 21–22 plates, Figure 20 map.

Small to moderately-sized, clustering palm, rarely solitary, 0.5–4 m. **Stem** 2–3 m × 6–10 cm, caulescent, generally arched, ringed but often covered with leaf base remains. **Leaves** 5–7 in the crown, 1–1.25 m long; *sheath* with fibrous margin 25–39 cm long; *pseudopetiole* 14–33 cm long; *petiole* ca. (4–)12–22 × 0.6–0.9 cm; *rachis* 52–85 cm long; *leaflets*, coriaceous, 39–50(–100) along each side, irregularly spaced, the majority in clusters of 2–5(–8), inserted in different planes, all strongly bent or deflexed downward, glaucous on the lower surface when young later becoming green; no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets (6.5–)21–34 × 0.1–0.4(–1.2) cm, middle leaflets 16–37 × 0.85–2 cm, apical leaflets (5–)14–29 × 0.2–0.5(–1.1) cm. **Inflorescence** erect or pendulous, spirally branched, rarely unilaterally branched in younger inflorescences; *prophyll* 12–24 × 1.4–3 cm; *peduncular bract* 34–90 cm long, expanded portion 22–30 × 4–7 cm, including a beak 0.5–1.5 cm, glaucous to short tomentose near the base; *peduncle* 12–18(–48?) cm × 5–9 mm, 4–6 mm thick, slightly flattened, ellipsoid in cross-section, covered with a silver lepidote to ferruginous indument; *inflorescence axis* 22–33 cm long; *rachis* 9–28 cm; *rachillae* 5–19, the apical ones are spiraled around the rachis (smaller inflorescences with rachillae sometimes arranged unilaterally similar to *S. flexuosa*), 7–13 cm long at the apex, 15–29 cm at the base, lepidote to glabrous; *staminate flowers* ca. 7–10 mm long at the apex, 11–15 × ca. 3–4 mm at the base, sepals ca. 2–3 × 1–1.5 mm, glabrous, petals 6–11 × 2–3 mm with acute to acuminate tips, glabrous to scattered lepidote pubescence, nerves indistinct to slightly raised, but usually obscure at the base, stamens (3.2–)4.5–6.5 mm long, anthers 2.5–4.8 mm long, filaments ca. 1.0–2.5 mm long; *pistillate flowers* elongate pyramidal, 9–12 × 5–7 mm at the apex, 12–20 × 8–10 mm at the base, yellow, lepidote especially near the base, sepals 14–19 × 7–7.5 mm with scattered lepidote scales especially at the base, visibly nerved, strongly keeled, petals 14–17 × 6.0–8.5 mm slightly to distinctly nerved, sparsely lepidote, but more so at the base, valvate tips ca. ½–3/5 of the length of the petal, 5–9 mm long, pistil 6–14 × 3.5–6 mm, glabrous or

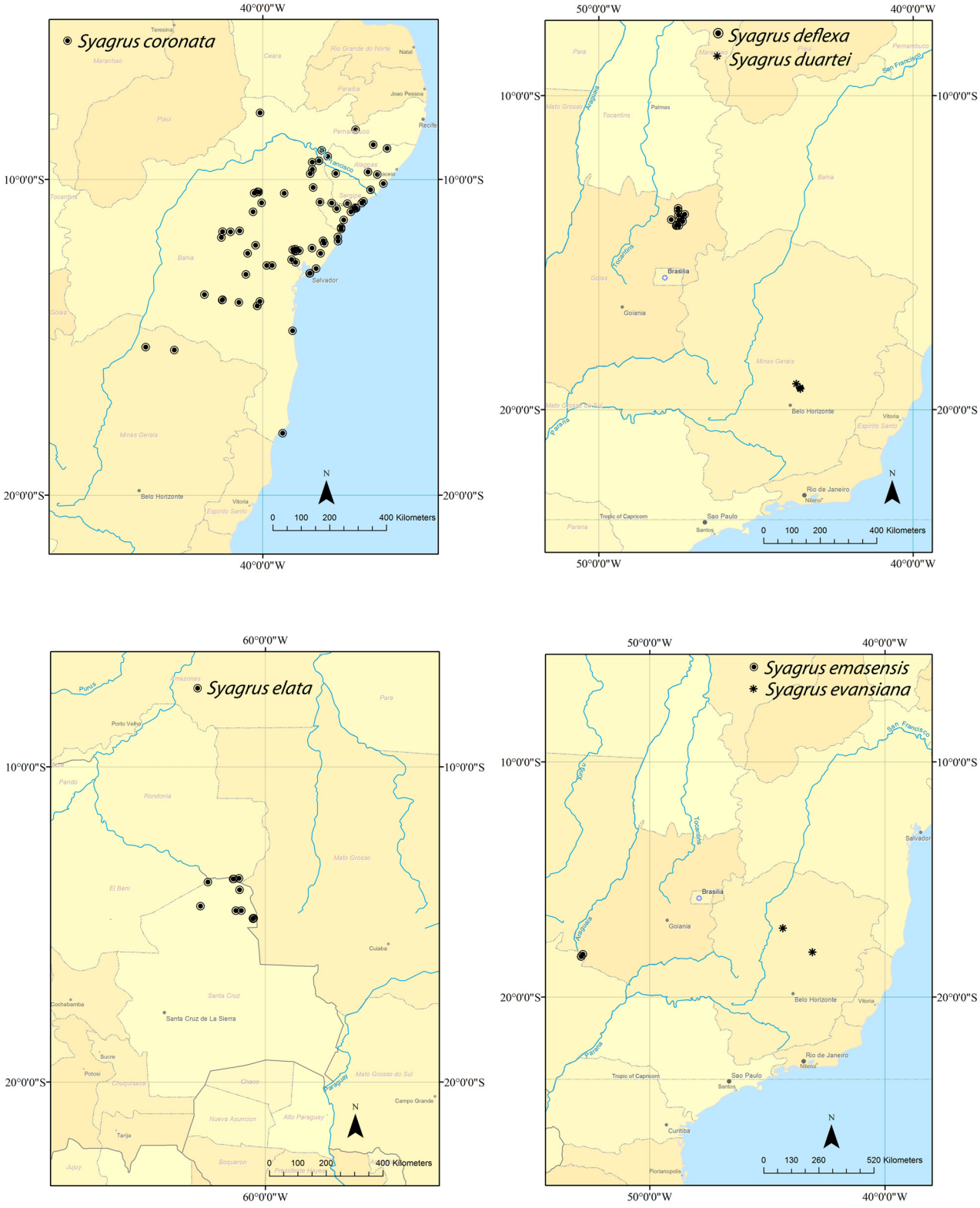

FIGURE 20. Distribution maps of *Syagrus coronata, S. deflexa, S. duartei, S. elata, S. emasensis* and *S. evansiana*.

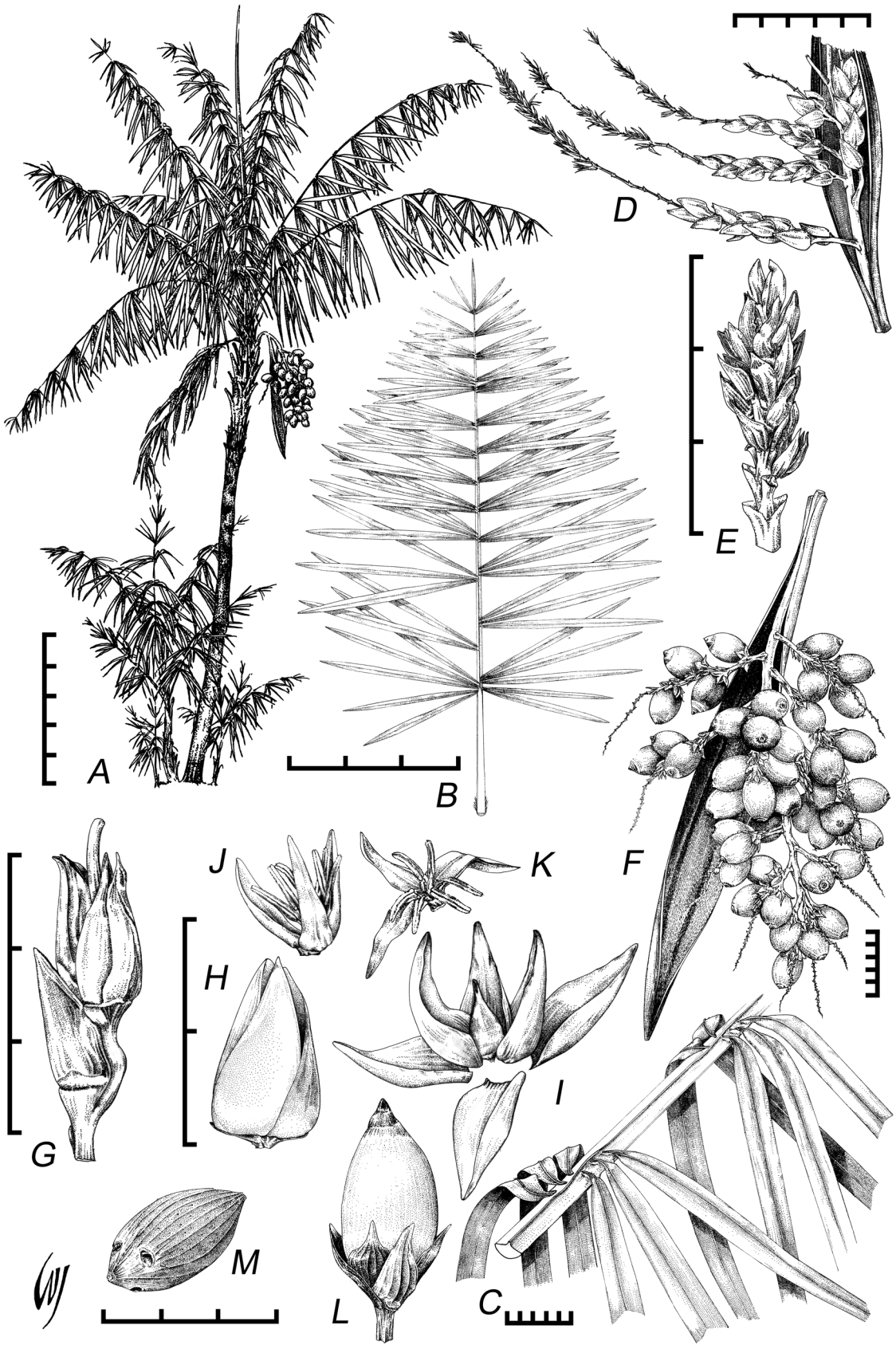

FIGURE 21. *Syagrus deflexa*. A. Habit. B. Leaf. C. Deflexed leaflets. D. Inflorescence. E. Portion of a primary branch with staminate flowers. F. Infructescence. G–I. Pistillate flowers. J–K. Staminate flowers. L. Fruit. M. Endocarp. A–D drawn from images taken by L. Noblick, E–L drawn from *R. Tsuji et al. 2691*. All scales are in centimeters except A and B which are in decimeters. Drawn by Wes Jurgens.

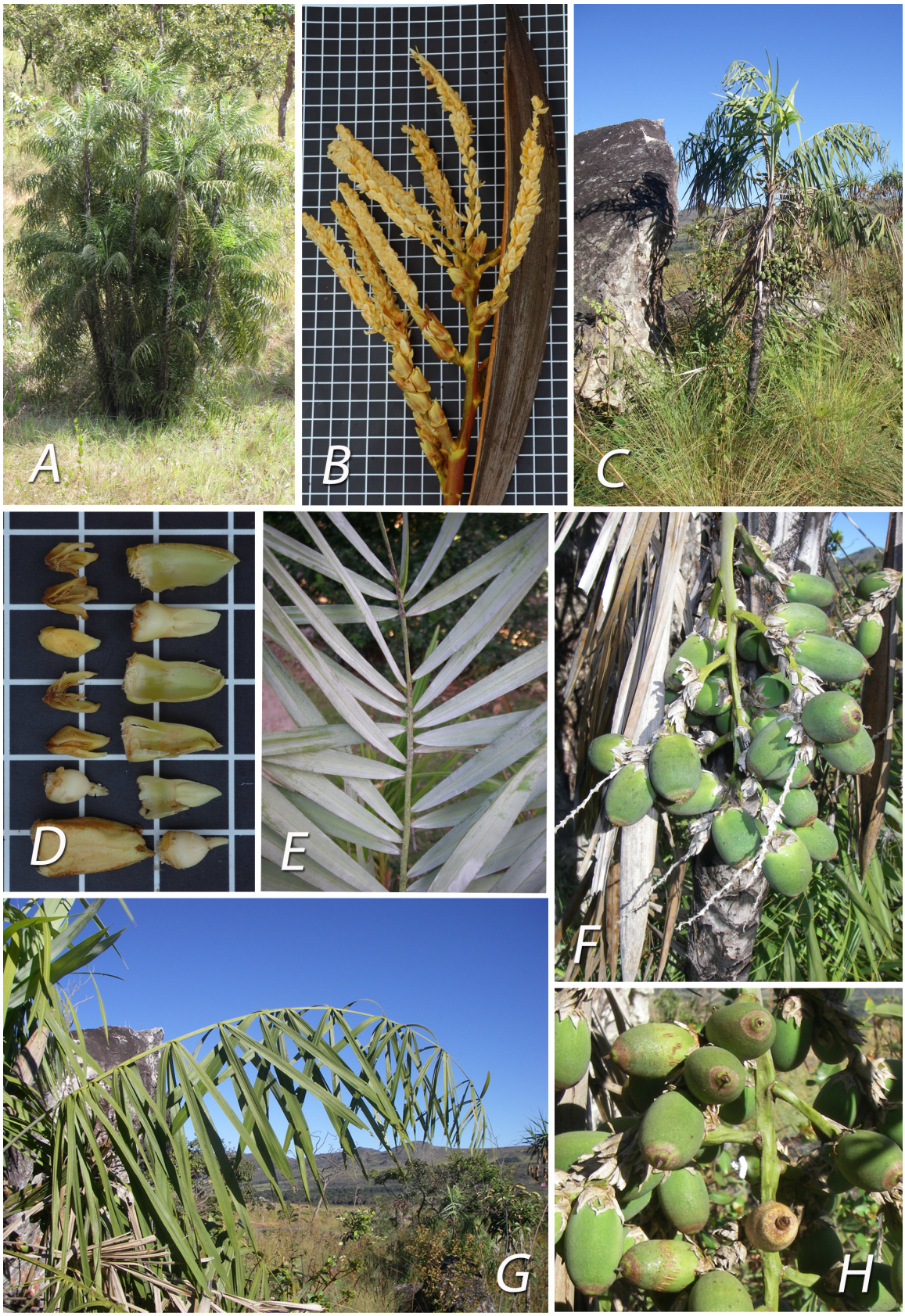

FIGURE 22. *Syagrus deflexa*. A. Clustering habit. B. Inflorescence. C. Solitary habit. D. Flowers. First 5 on left are staminate followed by a pistil and an unopen pistillate flower. Flowers on the right are pistillate flower or pistillate flower parts terminating at the bottom with another pistil. E. Whitish waxy bloom on the underside of the leaflets. F. Infructescence spirally branched. G. Leaf with characteristic deflexed leaflets. H. Close of immature fruit. All grids are in centimeters.

with lepidote indument from the base of the pistil to nearly the base of the stigmas, stigmas 3–4 mm long, staminodal ring ca. 1–3.5 mm high, 6-dentate. **Fruit** ellipsoid, (1.3–)3.0–4.5 × 1.5–2.0 cm (still immature, probably a bit larger), lepidote or somewhat tomentose at the tip, but otherwise glabrous, with an apical beak, yellowish-green, epicarp less than 0.5 mm thick, mesocarp ca. 2 mm thick, sweet, succulent and fibrous; *endocarp* ca. 3.2 × 1.6–1.7 cm, 3–4 mm thick; *seed* ellipsoid ca.1.2–1.5 × 1.0 cm with endosperm homogeneous. Germination remote-tubular.

Common name:—acumã-branco, licuri-da-serra (Kalunga).

Etymology:—The specific epithet, *deflexa,* is derived from the fact that all of the leaflets are bent downwards; deflexed.

Distribution and habitat:—This palm is endemic to northern Goiás, Brazil, in the Chapada dos Veadeiros region, in campo rupestre and cerrado vegetation in the sandy, rocky soils between Alto Paraíso de Goiás and Teresina de Goiás.

Conservation:—This species is protected within the boundaries of a national park (Chapada dos Veadeiros) and grows in very rocky soils in inaccessible areas that are not agriculturally valuable. Therefore, it is classified as least concern, LC.

Phenology:—Flowering January to June and maturing fruits April through November. There were flowers and immature fruits in June.

Uses:—The mesocarp of the fruit is edible, in spite of being mucilaginous, as are the seeds. The dry leaves are used as kindling for fires. The plant is ornamentally attractive because of its clustering habit and deflexed leaflets and maybe a candidate for cultivation.

Notes:—This attractive clustering palm is easily identified by its unique strongly deflexed leaflets. The rachillae are spirally arranged around the rachis, but in younger plants the rachillae are often unilaterally arranged, which may cause some confusion between this species and the dried material of *S. flexuosa* and *S. campestris.*

Harri Lorenzi discovered this palm in the Chapada dos Veadeiros region, in the Municipio of Alto Paraíso de Goiás and brought it to the author's attention in 2005. However he was not the first to collect it. It has probably been collected and misidentified in most herbaria as *Syagrus flexuosa*. In a pressed specimen, the deflexed leaflets that so easily separate this species from *S. flexuosa*, which may be a close relative, are not apparent. Finding this species has forced the author to re-examine the *S. flexuosa* complex, which includes palms with unilateral inflorescences, with caulescent, procumbent or acaulescent stems, with pendulous or stiff leaflets varying in texture from membranaceous to coriaceous, including *S. campestris,* the former *S. urbaniana* and others that have yet to be distinguished. *Syagrus campestris* appears to be a distinct species, even though Glassman (1969) synonymized it. Although Glassman examined over 50 herbarium specimens, he never saw the important differences in the habit and in the texture of the leaves that are obvious in living plants. *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 that 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.

Representative specimens:—BRAZIL. **Goiás**: Alto Paraíso de Goiás, Chapada dos Veadeiros, 30 May 1994, *S. Bridgewater* S210 (UB!); Alto Paraíso de Goiás, Chapada dos Veadeiros, 1500–1700, –14.12, –47.52, 16 February 1979, *F. Cardosa 70* (UB!); Alto Paraíso de Goiás; Estradinha de terra a 3 km N de Alto Paraíso de Goiás, 1380 m, –14.13, –47.45, 14 March 1995, *T.B. Cavalcanti et al. 1312, 1313* (CEN); Alto Paraíso de Goiás, –14.13, –47.51, 1 December 1992, *G. Hatschbach 58346* (MBM!); Alto Paraíso de Goiás, Chapada dos Veadeiros, ca. 15 km W of Veadeiros, 1000 m, –14.13, –47.51, 13 February 1966, *H.S. Irwin et al. 12766* (BH, F!, MO, NY, UB!, US); Alto Paraíso de Goiás, Chapada dos Veadeiros, ca. 19 km N of Alto do Paraíso, 1250 m, –14.13, –47.51, 20 March 1971, *H.S. Irwin et al. 32828, 32833* (MO, NY, UB!); Alto Paraíso de Goiás, RPPN Mata Funda, 5 July 1998, *R.C. Mendona 3568* (UB!); Alto Paraíso de Goiás, Estrada para a estação de tratamento de água, ca. 1,5 km da entrada lateral ao posto na margem da GO-118, 1150 m, –14.14, –47.53, 22 January 2005, *J. Paula-Souza et al. 4441* (ESA!); Alto Paraíso de Goiás, Fazenda São Bento, 1200 m, –14.16, –47.61, 21 October 2005, *Pinto & E.O. Lenza 356* (UB!); Alto Paraíso de Goiás, Chapada dos Veadeiros, ca. 21 km N de Alto Paraíso de Goiás na Rodovia

GO 118, –13.97, –47.45, 8 February 1987, *J.R. Pirani et al. 1892* (K, SPF!); Alto Paraíso de Goiás, Chapada dos Veadeiros, GO-118 ca. 5 km de Alto Paraíso na estrada para Travessa se Goiás, 1553 m, –14.12, –47.52, 31 October 2010, *L.P. de Queiroz et al. 15177* (HUEFS!); Alto Paraíso de Goiás, Chapada dos Veadeiros, 30 November 1971, *J.A. Rizzo 7256* (UFG!); Alto Paraíso [de Goiás], Chapada dos Veadeiros, 4 January 1972, *J.A. Rizzo 7379* (UFG!); Alto Paraíso de Goias, Chapada dos Veadeiros-Cerrado. 4 February 1972, *J.A. Rizzo 7575* (UFG!); Alto Paraíso de Goias, Chapada dos Veadeiros-Cerrado. 2 March 1972, *J.A. Rizzo 7804* (UFG!); Alto Paraíso de Goiás; Margem da rodovia GO -118, 2,8 km após Alto Paraíso, 1410 m, –14.00, –47.33, 9 March 1988, *A.O. Scariot & J.N. da Silveira. 23* (CEN); Alto Paraíso de Goias, ca. 5 km da cidade na estrada de terra para acesso ao Hotel Fazenda Água Clara, 4 February 2008, *R. Tsuji & R. Pimenta 2726* (HPL!); Alto Paraíso de Goiás, em beira da estrada sentido TO, ca. 3 km da cidade, 7 May 2008, *R. Tsuji & E. Franco 2620* (HPL!); Alto Paraíso de Goiás, próximo ao Hotel Carmelot, saindo de Atlo Paraiso (sentido TO), lado direito, 1280 m, –14.13, –47.52, 19 June 2008, *R. Tsuji et al. 2690* (paratype HPL!); Cavalcante, caminho para Vão do Moleque, 15–16 km da cidade a partu do asfalto, –13.66, –47.48, 21 May 2011, *J.B. Bringel & J.F.B. Pastore 785* (UB!); Cavalcante, –13.80, –47.46, 26 May 1975, *G. Hatschbach 36872* (F!, MBM!); Cavalcante, Parque Nacional da Chapada dos Veadeiros. Alto do Cruzeiro, –13.94, –47.70, 15 April 2009, *G. Martinelli 16447* (RB); Cavalcante, comunidade Kalunga, Engeho II, –13.58, –47.47, 20 September 2009, *R.C. Martins et al. 1042* (UB!); Cavalcante, Próximo ao Córrego Quebra-coco, 16 January 2010, *R.C. Martins 1062* (UB!); Cavalcante, Beira da estrada entre o Engenho II e o Brocotó, 17 January 2010, *R.C. Martins 1067* (UB!); Cavalcante, Estrada para Minaçu, cabeceira das Covas, 27 February 2010, *R.C. Martins 1074* (UB!); Teresina de Goiás, 31 km by road S of Terezina; ca. 40 km N of Alto Paraíso. Chapada dos Veadeiros, 1500 m, –13.78, –47.26, 16 March 1973, *W.R. Anderson 7175* (NY!, UB!); Teresina de Goiás, na Rodovia GO 118 p/Alto Paraíso, km 215 (ca. 35 km da cidade de Alto Paraíso), 1140 m, –13.87, –47.34, 7 March 2009, *H. Lorenzi et al. 6648* (HPL!).

16. *Syagrus duartei* Glassman (1968a: 289). Type:—BRAZIL. Minas Gerais: Serra do Cipó, 24 August 1961, *A.P. Duarte 5706* (holotype RB!)

Figure 23 plate, Figure 20 map.

Small to moderate-sized, solitary palm. **Stem** 0–2 m × 8–12 cm, usually short prostrate to subterranean, occasionally erect, columnar, angular in appearance with closely spaced leaf-scars arranged in rows. **Leaves** 6–12 arranged in almost vertical or slightly spiraled vertical rows; *sheathing leaf base* ca. 20 cm long; *pseudopetiole* 24–27 cm long; *petiole* 3.2–14 × 1.3–1.8 cm, 0.8–1.3 cm thick; *rachis* 50–90 cm long; *leaflets* slightly lighter on the abaxial surface, 44–64 along one side, in clusters of 2 or 3 (or 4), inserted at various angles, giving the leaf a plumose appearance, ramenta scales not or rarely present near where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 24–30 × 0.2–0.8 cm, middle leaflets 13–34 × 1.3–2.5 cm, apical leaflets 6–9 × 0.2–0.8 cm with an asymmetric tip. **Inflorescence** erect or pendulous, spirally branched; prophyll 18–22 ×2.5–3 cm; *peduncular bract* 33–73 cm long, expanded portion 30–45 × 3–6 cm, including a 0.5–2.0 cm beak, 4.5–7.0 cm perimeter, 2–3 mm thickness, narrow, woody, sulcate, exterior with thin indument; *peduncle* ca. 25–50 cm × 8–9 mm, 4–5 mm, elliptical in cross-section, glabrous; *inflorescence axis* 15–36 cm long; *rachis* 7–23 cm long; *rachillae* 5–8, glabrous, 6.5–18 cm long at the apex, 11–22 cm long at the base; *staminate flowers* 10–15 mm long at the apex, 16–28 × 4–5 mm at the base, green to yellow, sepals 2–4 × 2.5–3.5 mm, glabrous, with no raised nerves, petals ca. 13 mm long at the apex, 19–20 × 4–5 mm at the base with acute tips, nerves indistinct, stamens 8–10.5 mm long, anthers 6–9.5 mm long, filaments ca. 2 mm long, pistillode less 0.5 mm long; *pistillate flowers* pyramidal, 17–25 × 6–10 mm, yellow, glabrous, sepals 20–24 × 6.5–9.5 mm, glabrous, no visible veins, strongly keeled, petals 20–22 × 4.5–6 mm, glabrous, with visible veins especially at the base, valvate tips ca. ½ the length of the petal, ca. 2–3 mm long, pistil ca. 10 × ca. 4.5 mm, glabrous or fine waxy indument, stigmas ca. 6 mm long, glabrous, staminodal ring ca. 0.8 mm high, 6-dentate. **Fruit** 3–3.8 × 2.5–3.2 cm, brown when mature, mostly glabrous, nearly globose, epicarp less than 0.5 mm thick, mesocarp 2–4 mm thick, succulent and fibrous; *endocarp* 3–3.5 × 2.8–3.0 cm, ca. 5–8 mm thick on the sides, up to 9 mm thick at the ends; *seed* nearly globose ca. 1.5 cm in diameter, endosperm homogeneous. Germination remote-tubular.

Common name:—coqueirinho, coco-de-lapa, coquinho-da-serra.



FIGURE 23. *Syagrus duartei*. A. Habitat with a few palms. B. Habit with reclined or procumbent stem. C. Habit with a more upright stem. D. Inflorescence with Lester Cline for scale. E. Close up of inflorescence with hand for scale. F. Infructescence. G. Older grayish-brown staminate flowers with green pistillate flowers. H. Large characteristically rounded endocarps. Grid is 0.5 centimeters.

Etymology:—The specific epithet, *duartei,* honors the original collector Apparicio Pereira Duarte (1910–1984), a Brazilian botanist.

Distribution and habitat:—This species grows in the Serra do Cipó in Minas Gerais, Brazil, and appears to be endemic to this region. It grows in very rocky areas at higher elevations.

Conservation:—This palm species is protected mostly within the boundaries of a national park (Serra do Cipó), and it grows in soils that are not agriculturally valuable. Therefore, this palm is not considered to be threatened and is classified as least concern, LC.

Phenology:—Perhaps flowering and fruiting year around. It has been seen flowering in March/August and it fruits sparsely in spring and summer. The seeds have a low rate of germination and are also slow to germinate.

Uses:—Its rustic appearance makes this a nice ornamental plant for full sun areas. It can tolerate cold, dryness and fire giving this species tremendous landscape potential.

Notes:—*Syagrus duartei* is similar to *S. glaucescens* and is surely related to it. *Syagrus duartei* is usually a smaller or shorter plant often with a reclined or prostrate trunk, and has a fruit that is larger (3–4 vs. 2.5 cm) and more globose in shape (not ellipsoid). The larger peduncular bracts, larger inflorescences and larger globose fruit appear to be good characters, but the number of rachillae (5–8 for *S. duartei* vs. 5–17 for *S. glaucescens*), which has been used in keys, is probably not reliable. Although most individuals of this species are short with reclined or prostrate stems, a few have tall, above-ground stems.

Representative specimens:—Minas Gerais: 1816–1821, *A. de Saint-Hilaire 389* (P!); Serra do Cipo, 24 August 1961, *A.P. Duarte 5706* (RB); Serra do Cipó-107 km N of Belo Horizonte, 1300 m, 10 July 1965, *S.F. Glassman 8033–8036* (F!, FTG!, RB!, SP!); Serra do Cipó, 1940, *Freitas & Pedersoli s.n.* (BHCB 1280!, 13298!); Almeida, beira da estrada para Serra do Cipó, na descida (lado esquerdo), 1200 m, –19.29, –43.60, 21 June 2008, *Tsuji et al. 2712* (HPL!); Conceição do Mato Dentro, estrada Santana do Riacho-Serro, km 155, próximo á ponte do rio Santo Antonio, 5 July 1996, *V.C. Souza et al. 11758* (ESA!); Santana do Riacho, Usina Coronel Américo Teixeira (UCAT), –19.17, –43.71, 15 April 1985, *Andrade s.n.* (BHCB-8883!, 8885!); Santana do Riacho, Serra do Cipó, 10–20 km E de Cardeal Mota, camino a Conceição de Mato Dentro, –19.33, –43.58, 16 May 1990, *M.M. Arbo et al. 4235* (CTES!, MBM!, SPF!); Santana do Riacho, –19.17, –43.71, 25 October 1974, *G. Hatschbach 35324* (F!, MBM!); Santana do Riacho, Serra do Cipó, Estrada da USINA, 9 January 1981, *M.C. Henrique et al. 6895* (SPF); Santana do Riacho, Usina Coronel Américo Teixeira (UCAT), –19.17, –43.71, without date, *Lopes s.n.* (BHCB); Santana do Riacho, 3 km N of the Fazenda & Restaurant Chapéu do Sol and 58 km S. of Conceiçao do Mato Dentro, 1200–1300 m, –19.17, –43.71, 23 March 1992*, L.R. Noblick 4854* (BHCB!, FTG!, MO!, NY!); Santana do Riacho, ao longo da rodovia Belo Horizonte-Conceição do Mato Dentro, Santana do Riacho, km 116 ao longo da rodovia Belo Horizonte-Conceição do Mato Dentro. Beira do Rio Santo Antonio, –19.17, –43.71, 19 April 1981, *L. Rossi, & M.C.E. Amaral 7267* (SP!, SPF!); Serra do Cipó, –19.35, –43.62, June 1990, *K.I. Horst 74* (MBML!).

17. *Syagrus elata* (L.R. Moreno & O.I. Moreno) Noblick, *comb. & stat. nov. Syagrus petraea* var. *elata* L.R. Moreno & O.I. Moreno (2009: 204). Type:—BOLIVIA. Santa Cruz: PNNK [Parque Nacional "Noel Kempff Mercado"], Los Fierros en Pampa de Huanchaca, 300 m, –14.56, –60.93, 6 April 1990, *L.R. Moreno & O. Moreno 29* (holotype JBSC, isotypes LPB, NY!, USZ)

Figure 24 plate, Figure 20 map.

Small to moderate, solitary palm. **Stem** ca. 0.5–5 m × 8–12 cm, thicker at the base of the stem where the roots are exposed, internodes ca. 4–5 cm long. **Leaves** 6–14; *sheathing* leaf base ca. 20 × ca. 10 cm at the very base; *pseudopetiole* not measured, *petiole* 15 × 1.5 cm, thickness not measured, glabrous; *rachis* ca. 1 m long; *leaflets* linear acuminate, slightly lighter on the abaxial surface, 40–75 along one side, in clusters of 2–4, inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets not measured, middle leaflets ca. 40 × ca. 1.5 cm, apical leaflets not measured with an asymmetric tip. **Inflorescence** frequently spicate or bifid, *prophyll* 8–12 × ca. 4 cm; *peduncular bract* 60–80 cm long, expanded portion ca. 20 × ca. 4 cm, including a short conical beak, 2–3 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument or tomentum; *peduncle* ca. 50 cm × 6 mm, elliptical in cross-section, glabrous; *inflorescence axis* 15–18 cm long; *rachis* normally absent; *rachillae* 1 or 2(–4), glabrous, 15–18 cm long; *staminate flowers* pyramidal, ca. 20 × 6 mm, green to yellow, small triangular sepals not



FIGURE 24. *Syagrus elata*. A. Habit with Luiz and Oscar Moreno for scale. B. Leaf bases and sheath fibers near the crown. C. Abaxial side of leaflets. D. Inflorescence with pistillate flowers E. Infructescence. F. Close of large immature fruits showing grooved epicarps.

measured, glabrous, with raised nerves, rhomboidal petals not measured, separate with acute tips, nerves indistinct to slightly raised, stamens not measured, anthers 9 mm long, filaments not measured, pistillode not measured; basal *pistillate flowers* pyramidal, ca. 20 × 10 mm, yellow, sessile, glabrous, sepals ca. 18 mm long, petals ca. 17 × 10 mm, light yellow-green, glabrous, hard, thick, triangular, with long acuminate tips, pistil globose, glabrous, 5 mm in diameter, stigmas not measured, glabrous, staminodal ring ca. 2 mm high, undulate or slightly 6-dentate. **Fruit** ovoid, ca. 3.7 × 2.3 cm, light brown to yellow orange when mature, glabrous, with fine longitudinal striations or grooves, a swollen base, rounded apex, epicarp thin, fibrous, less than 0.5 mm thick, longitudinally striate, mesocarp thickness not measured, succulent and fibrous; *endocarp* oval, ca. 3.3 × 1.9 cm, 2 mm thick, light brown, with three small ridges from the apex to the base, 3 visible pores on the basal end, often hidden by many adherent fibers, apex trilobed; *seed* ovoid ca. 1.7 × 1.5 mm with a central cavity, endosperm homogeneous. Germination remote-tubular.

Common name:—None recorded.

Etymology:—The specific epithet, *elata,* means tall, which is a misnomer, since the palm is not tall at all (to 5 m). It is tall in relation to the acaulescent *S. petraea* to which it was originally thought to be related.

Distribution and habitat:—This species is found mainly within the Bolivian Parque Nacional Noel Kempff Mercado. Localities within the park include: near Velasco-Santa Cruz in the campground of Flor de Oro; in the tall grass prairies of Los Fierros; near Bella Vista lake, at about 200 m above sea-level; on the little plateau of Caparuch in the campground of Las Gramas, at 800–850 m above sea level, where there were some specimens that appeared to be natural hybrids with *S. comosa* (Moreno & Moreno, 2006). It may be distributed across the border into Brazil, but there are no collections as of yet. There is also a collection from Beni. It grows in colonies in cerrados and campo rupestres, in well drained soils that are more or less dry. In seasonally flooded areas of open plains or pastures, it grows on ant or termite hills and is thus above the flood zone.

Conservation:—The greater part of this species' range is protected within the Parque Nacional Noel Kempff Mercado." *Syagrus elata* is apparently not rare within the national park, as it has been collected numerous times and by various collectors. Therefore, it is classified as least concern, LC.

Phenology:—Flowering in cultivation in March in Bolivia.

Uses:—An attractive small to medium palm that would be ideal for landscaping.

Notes:—This small solitary, columnar palm is easily identified by its long inflorescences, which are nearly equal to the length of the leaves. It has a long-peduncled, spicate inflorescence (sometimes bifid), which is unusual in a *Syagrus* with an above ground stem. Its fruits have a grooved or striate epicarp. Grooved epicarps are rare in *Syagrus*. The only other species with a grooved epicarp is *S. stratincola* from the Guyanas. The authors of this taxon were reluctant to elevate the status of their variety to species because they found the flowers to be similar in size on both *S. petraea* and *S. elata* (L. Moreno pers. comm.). However, *Syagrus elata* does have larger flowers and larger fruits than *S. petraea*; their own measurements contradict their argument (Moreno & Moreno 2006). *Syagrus elata* has larger staminate flowers (20 × 10 mm vs. 12–14 × 4 mm), larger pistillate flowers (20 × 10 mm vs. 15 × 6 mm), larger anthers (9 vs. 5 mm), larger pistils (5 vs. 2.5 mm diameter), larger staminodes (2 vs. 1 mm) and larger fruits (3.7 × 2.3 vs. 2 × 1.6 cm). This variety is elevated to species rank based on its columnar stem, larger flowers, larger, grooved to striate fruits, larger inflorescence, larger flowers and different leaflet anatomy. It is unfortunate that the epithet, *elata,* means tall, as this is not a tall palm when compared to other species in the genus.

Representative specimens:—BOLIVIA, **Beni:** Iténez, Cerro San Simón, 200 m, –14.42, –62.05, 16 July 1993, *A. Jardim et al. 907* (USZ); **Santa Cruz**: Velasco, Bajo Paraguá, Meseta Caparú, 450 m, 4 November 1995, *G. Coimbra 4305* (JBSC); Velasco, *R. Gillén & T. Centurión 1035* (USZ); Velasco, Parque Nacional Noel Kempff Mercado Las Gamas, 850 m, –14.80, –60.39, 17 February 1997, *C. Guardia, et al.* 192 (MO, USZ); Velasco, Parque Nacional Noel Kempff Mercado, 180 m, –14.56, –60.76, 26 August 1995, *P. Solíz Gullén & J. Surubi 4152* (NY, USZ)*;* Velasco, Parque Nacional Noel Kempff Mercado, Campamento Las Gamas, 900 m, –14.82, –60.38, 28 March 1993, *T.J. Killeen 4861* (MO, USZ); Velasco, Parque Nacional Noel Kempff Mercado, Huanchaca, Las Gamas, 850 m, –14.80, –60.38, 14 April 1993, *T.J. Killeen et al. 5242* (NY, USZ); Velasco, *T.J. Killeen et al. 6015, 6495* (USZ)*;* Velasco, Parque Nacional Noel Kempff Mercado, 210 m, –13.55, –61.01, 15 November 1993, *T.J. Killeen et al. 6075* (MO, USZ); Velasco, Estancia Flor de Oro, Río Iténez, 160 m, –13.53, –60.83, 18 November 1993, *T.J. Killeen 6145* (LPB, NY, USZ); Velasco, *L.R. Moreno & O. Moreno 33* (JBSC); Velasco, Parque Nat. Noel Kempff M., Campamento Flor de Oro, Rio Iténez, 210 m, –13.55, –61.00, 6 June 1993, *L.R. Moreno & H. Justiniano 133* (JBSC); Velasco, Cantón: Florida; Loc.: Campamento Las Gamas, 850 m, –14.80, –60.37, 13 June

1994, *L.R. Moreno et al. 142* (JBSC, NY); Velasco, Parque National Noel Kempff M. Serrania N y NE de la pista Noel Kempff M., 400 m, –13.90, –60.81, 12 May 1994, *B. Mostacedo et al. 1813* (MO, NY!, USZ); Velasco, cerca a la pista de aterrizaje, 360 m, –13.90, –60.80, 8 June 1994, *B. Mostacedo et al. 2120* (LPB, NY, USZ); Velasco, Estancia Flor de Oro, W side of the Rio Guapore (=Rio Iténez), 190 m, –13.55, –61.02, 21 June 1991, *M.H. Nee 41168* (LPB, NY); Velasco, without date, *M. Peña-Chocarro 100* (USZ); Velasco, without date, *M. Peña et al. 138* (USZ); *L. Quevedo et al. 907, 2180* (USZ); Velasco, Parque Noel Kempff M., Campamento La Torre, 200 m, –13.65, –61.82, 15 June 1994, *L. Quevedo et al. 2583* (NY, USZ); Velasco, Parque Nacional Noel Kempff Mercado, camino a la meseta, 260 m, 7 November 1995, *A. Rodriguez Olmos & P.F. Foster 751* (MO, USZ); Velasco, *W.W. Thomas et al. 5700* (USZ); Velasco Province, Parque National Noel Kempff Mercado, Meseta de Huanchaca, cima de las colina de Huanchaca, 15 km al W de la Estación Los Fierros, 650–700 m, –14.56, –60.76, 29 September 1995, *I.G. Vargas et al. 3961* (LPB, NY!, USZ).

18. *Syagrus emasensis* Noblick & Lorenzi (2014: 6). Type:—BRAZIL. Goiás: Chapadão do Céu: Parque Nacional das Emas, Not far from the Park Office, elevation ca. 818 m, –18.27, –52.91, 9 Jan 2014, *L. Noblick & H. Lorenzi 5632* (holotype ESA!, isotypes HPL!, UB!, RB!, SP!, K!, FTG!, NY!, MO!, US!)

Figure 25 plate, Figure 20 map.

Small solitary palm at times appearing clustered, due to the proximity of individuals, to 20–50 cm tall. **Stem** short, subterranean. **Leaves** 3 or 4, usually slightly twisted; *sheathing leaf base* ca. 3–6(–11) cm long; *pseudopetiole* 2–3.5(–8) cm long; *petiole* 1.5–3(–6) × 0.3–0.5 cm, 0.2–0.3 cm thick; *rachis* 12–22 cm long; *leaflets* slightly lighter on the abaxial surface, 6–10 along one side, in clusters of 2–5 or singly, ramenta scales or tomentum absent where the leaflets are inserted on the rachis, only occasional ramenta or tomentum along the abaxial midvein; basal leaflets 11–16 × 0.2–0.3 cm, middle leaflets 14–22(–30) × 0.5–0.7 cm, apical leaflets 11–13(–25) × 0.1–0.4 cm with an asymmetric tip. **Inflorescence** erect, spicate or branched; *prophyll* 3–5 × 0.9–1.0 cm; *peduncular bract* 9–12 cm, expanded portion 5–9 × 1–2 cm, 1.5–3 cm perimeter, 1 mm thickness or less, narrow, woody, sulcate, exterior with scattered scales; *peduncle* ca. 2.5–6.0 cm × 3 mm, tomentose; *inflorescence axis* 3–8 cm long; *rachis* absent; *rachilla* 1 (rarely 2 or 3), glabrous, 3–5(–8) cm long; *staminate flowers* 4.5–4.8 × 2.5–2.7 mm at the apex, 7.9–8.0 × 3.0–3.1 mm at the base, green to yellow, sepals 1 × 1 mm, glabrous, no visible nerves, petals 3.9–4.1 × 1.7–2.1 mm at the apex, 6.0–6.7 × 2.0–2.8 mm at the base with acute tips, nerves indistinct, stamens 2.7–3.7 mm long, anthers 2.2–2.7 mm long, filaments 1.0–1.7 mm long, pistillode ca. 0.3 mm long; *pistillate flowers* conical, 8.0–8.2 × 3.5–3.8 mm at the apex, 9.5–10.2 × 3.7–3.8 mm at the base, yellow, glabrous, sepals 6–10.2 × 3.0–5.5 mm, glabrous, no visible venation, petals 6.0–8.8 × 4.0–6.6 mm, glabrous, obscurely nerved, valvate tips 1/3 to ½ the length of the petals, ca. 2–4 mm long, pistil 6.5–6.6 × 2.8–3.0 mm, glabrous on the upper half, short tomentose on the lower half of the ovary, stigmas ca. 3 mm long, glabrous, staminodal ring ca. 0.7–0.8 mm high, 6-dentate. **Fruit** ellipsoid, 2.3–2.5 × 1.3–1.5 cm, green when mature, covered with a squamous tomentum, epicarp less than 0.5 mm thick, mesocarp not measured, succulent and fibrous; *endocarp* 1.8–1.9 × 1.2 cm, thickness not measured; *seed* ellipsoid not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—None recorded.

Etymology:—The specific epithet, *emasensis,* refers to the Parque Nacional das Emas located in the southwestern corner of the state of Goiás, where this palm grows.

Distribution and habitat:—This species is distributed between the municipality of Mineiros and Chapadão do Céu in the Brazilian state of Goiás. Currently it is known only within the Parque Nacional das Emas growing in open cerrado grasslands, in rocky to sandy soils, in highly exposed conditions with few trees or bushes.

Conservation:—This species has not yet been found outside of the Parque Nacional das Emas. It is well protected within the 30,000 hectare park, where it appears to be fairly common, but outside the park it would be threatened by soybean agriculture. Since the park is so large and the population is substantial, this species is considered LC, least concern.

Phenology:—Mostly flowering in January and February and with mostly immature fruits in January.

Uses:—This is a potential landscape plant. This species has a pleasing and curious curliness about the leaf, which the author has not found in other acaulescent *Syagrus*.

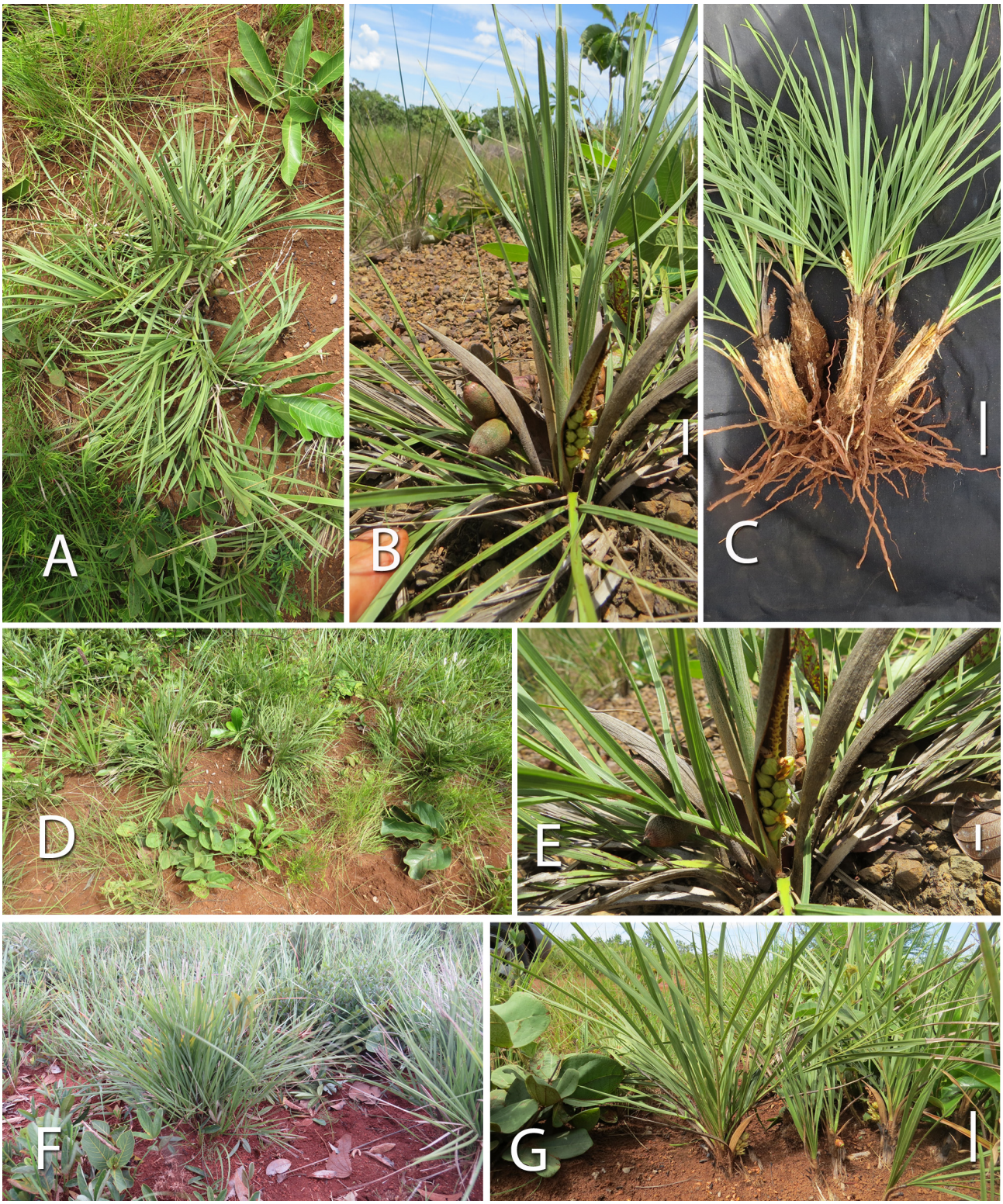

FIGURE 25. *Syagrus emasensis*. A. Habit. B. Palm with infructescence to the left and inflorescence with pistillate flowers to the right, scale = ca. 2 cm. C. Cluster of plants showing that they are individuals and not a single plant, scale = ca. 5 cm. D. Top view showing several individuals and grassy habit. E. Inflorescence with pistillate flowers, scale = ca. 1 cm. F. More elongated plants as a result of being buried by additional soils and growing up through them, *Noblick & Lorenzi 5633.* G. Palms with inflorescences. Scale = ca. 5 cm. *Noblick & Lorenzi 5632* (A–E, G),

Notes:—Normally the leaves of this palm are somewhat twisted, curved or curled, but when sandy soil is piled on top of already established plants as we found along one roadside, they emerge with straighter leaves (*Noblick 5633*) and narrower elongated inflorescences.

Syagrus emasensis grows in the same national park and habitat as *S. procumbens*. Both are small acaulescent palms with spicate inflorescences. *Syagrus emasensis* differs from it in having the longitudinally twisted leaves (vs. straight leaves), which are slightly less procumbent to the ground than those found in *S. procumbens*. *Syagrus emasensis* also differs by having a longer leaf rachis (12–22 vs. 2.4–13 cm), but shorter leaflets (12–30 vs. 31–78 cm).

Representative specimens:—BRAZIL. **Goiás**: Chapadão do Céu, no Parque Nacional das Emas, 800 m, –18.26, –52.90, *H. Lorenzi & A. Campos-Rocha 7121* (HPL!); Chapadão do Céu: Parque Nacional das Emas, ca. 838 m, –18.17, –52.83, *L.R. Noblick & H. Lorenzi 5633* (ESA!, HPL!, FTG!, NY!).

19. *Syagrus evansiana* Noblick (2010: 113). Type:—BRAZIL. Minas Gerais, Montes Claros, N side of BR 365 (Pirapora\Montes Claros) at km 70.5, 960 m, –17.07, –44.34, 20 June 2008, *R. Tsuji, H. Lorenzi, L.A. Ventura, L.R. Noblick 2703* (holotype HPL!, isotypes ESA!, FTG!, K!, RB!, NY!, UB!)

Figures 26–27 plates, Figure 20 map.

Small, solitary palm, usually less than 60–100 cm tall. **Stem** very short to subterranean, nearly acaulescent. **Leaves** 3–11; *sheathing leaf base* ca. 10–20 cm long, fibrous with papery membrane between the fine principal fibers that tend to disintegrate along the margins*; pseudopetiole* to 10–40 cm long; *petiole* absent to nearly 18(–26.5) × 0.6–1.5 cm, 0.3–0.8 cm thick; *rachis* 21–92 cm long; *leaflets* medium to dark gray green, concolorous, adaxial surface waxy, but abaxial surface with a thicker white waxy coating, linear, rigid-coriaceous with apex usually rounded, emarginated, more or less symmetrical, with a glaucous lower surface, leaflets 18–48 along one side, irregularly distributed in clusters of 2–4(–5), inserted in divergent planes over the rachis, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein of the leaflet; basal leaflets 4–27 × 0.2–0.8 cm, middle leaflets 12–30 × 1.5–3 cm, apical leaflets 3–12 × 0.1–0.9 cm, both lobes of the asymmetric tip are rounded. **Inflorescence** erect, commonly spicate, 4.5–17 cm long; *prophyll* 6–16 × 1.5–2.5 cm; *peduncular bract* ca. 12–48 cm long, expanded portion 7–22 × 1.5–7 cm, including a beak of 0–1.5 cm, 3–11 cm perimeter, 1–2 mm thickness, woody, sulcate, exterior with a thin indument becoming increasingly dense near the base; *peduncle* ca. 8–27 cm × 3–7 mm, 3–5 mm thick, elliptical in cross-section, glabrous; *inflorescence axis* 4.5–17 cm long; *rachis* 0–6 cm long; *rachillae* 1–9, 4.5–10 cm long at the base, (2–)5–8 cm at the apex, glabrous; *staminate flowers* 8–10 × 4–5 mm, yellow, sepals 1.5–2.0 × 1.5–2.0 mm, petals 7 × 4–5 mm with acute tips, nerves indistinct, stamens 4–5 mm long, 3.5–4.0 mm long, filaments 1 mm long, pistillode less than 1 mm long; *pistillate flowers* elongate pyramidal, 8–10 × 4–7 mm at the apex, 11–19 × 5–10 mm at the base, glabrous, sepals 11–19 × 4–5 mm, petals 10–11 × 3.5–4.0 mm, valvate tips 2/5–1/2 the length of the petals, 4–5 mm long, unnerved, pistil 10–11 × 3.5–4.0 mm, with lepidote indument from base to nearly the base of the stigmas, stigmas 3–5, 3 mm long, glabrous, staminodal ring ca. 1–3 mm high, 6-dentate. **Fruit** globose, about as long as wide 1.5–2.3 cm in diameter, yellowish brown when mature, obscured by a thick brown indument or lepidote tomentum, epicarp less than 0.5 mm thick, mesocarp 1–2 mm thick, succulent and fibrous (pulpy); *endocarp* ca. 1.4–1.6 × 1.1–1.3 cm, ca. 1 mm thick, with 3–5 pores on the basal end; *seed* nearly globose, ca. 0.8 cm in diameter, endosperm homogeneous. Germination remote-tubular.

Common name:—palmeirinha.

Etymology:—The specific epithet, *evansiana,* honors Don Evans, retired Director of Grounds Management at Fairchild Tropical Botanic Garden, Florida, USA, who first brought this plant to the author's attention after returning from a field trip with Roberto Burle Marx to Minas Gerais.

Distribution and habitat:—This palm species is endemic to the state of Minas Gerais, Brazil, in the Cadeia do Espinhaço region, in high elevation campo rupestre or cerrado, generally in well-drained rocky terrain. It is locally common in the well-drained, rocky soils and high grassy plains (900–1300 m) of the campo rupestre regions north of Diamantina, Minas Gerais, east of Pirapora and west to Itacambira including the Serra Cabral State Park near Joaquim Felício, Minas Gerais. There are areas where it is a dominant plant, i.e. the high flat grassy plateaus near Itacambira, Minas Gerais.

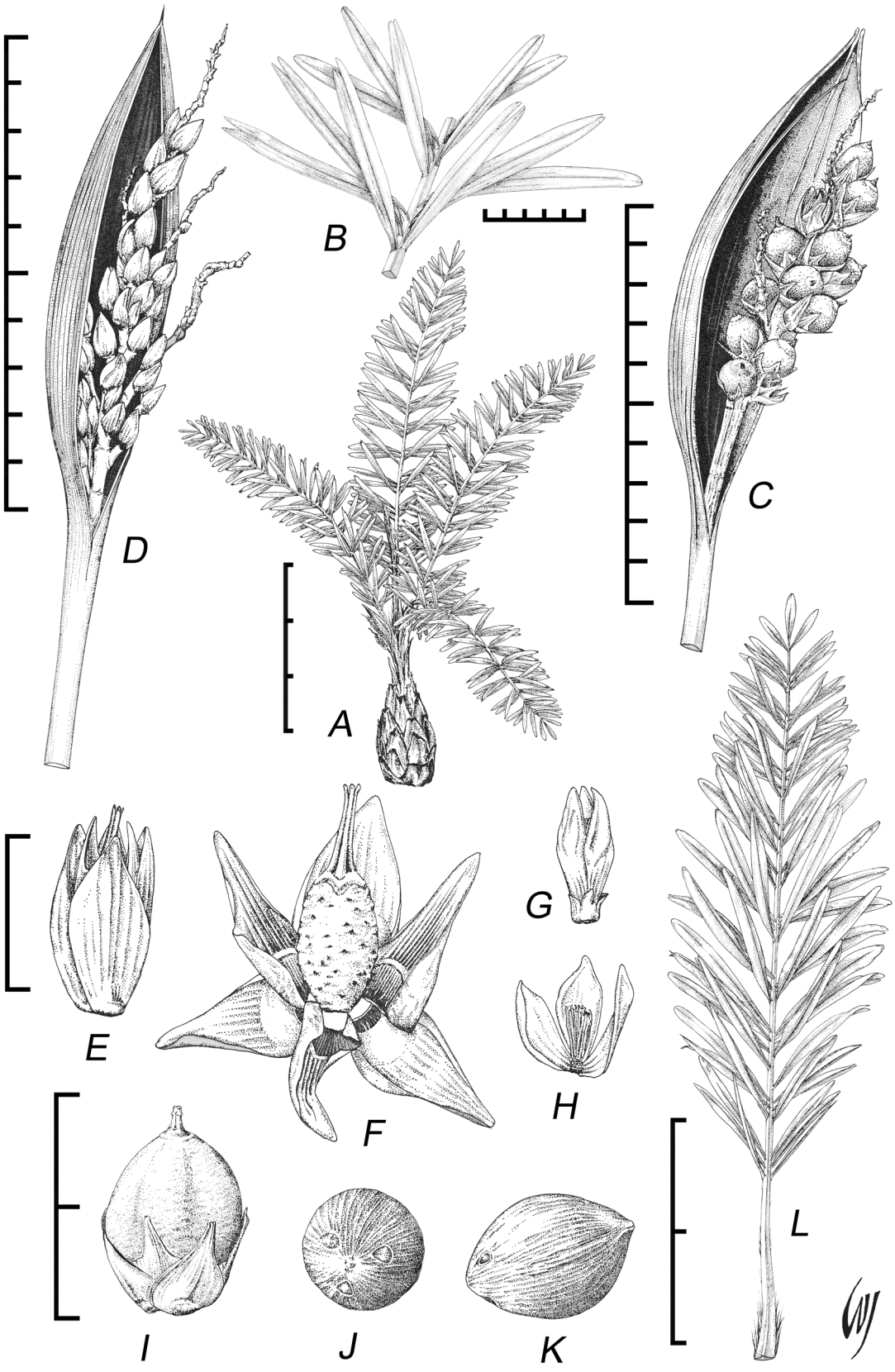

FIGURE 26. *Syagrus evansiana*. A. Habit. B. Leaflets with emarginated tips. C. Infructescence. D. Inflorescence. E. Receptive pistillate flower. F. Pistillate flower opened to see the pistil. G. Staminate flower. H. Staminate flower opened to see stamens. I. Fruit. J. Endocarp end view showing pores. K. Endocarp side view. L. Leaf. Habit, leaf and leaflets drawn from images supplied by Harri Lorenzi. Reproductive parts drawn from *Lorenzi 4276*. All scales are in 1 cm units except A and L which are in 1 dm units. Drawn by Wes Jurgens.

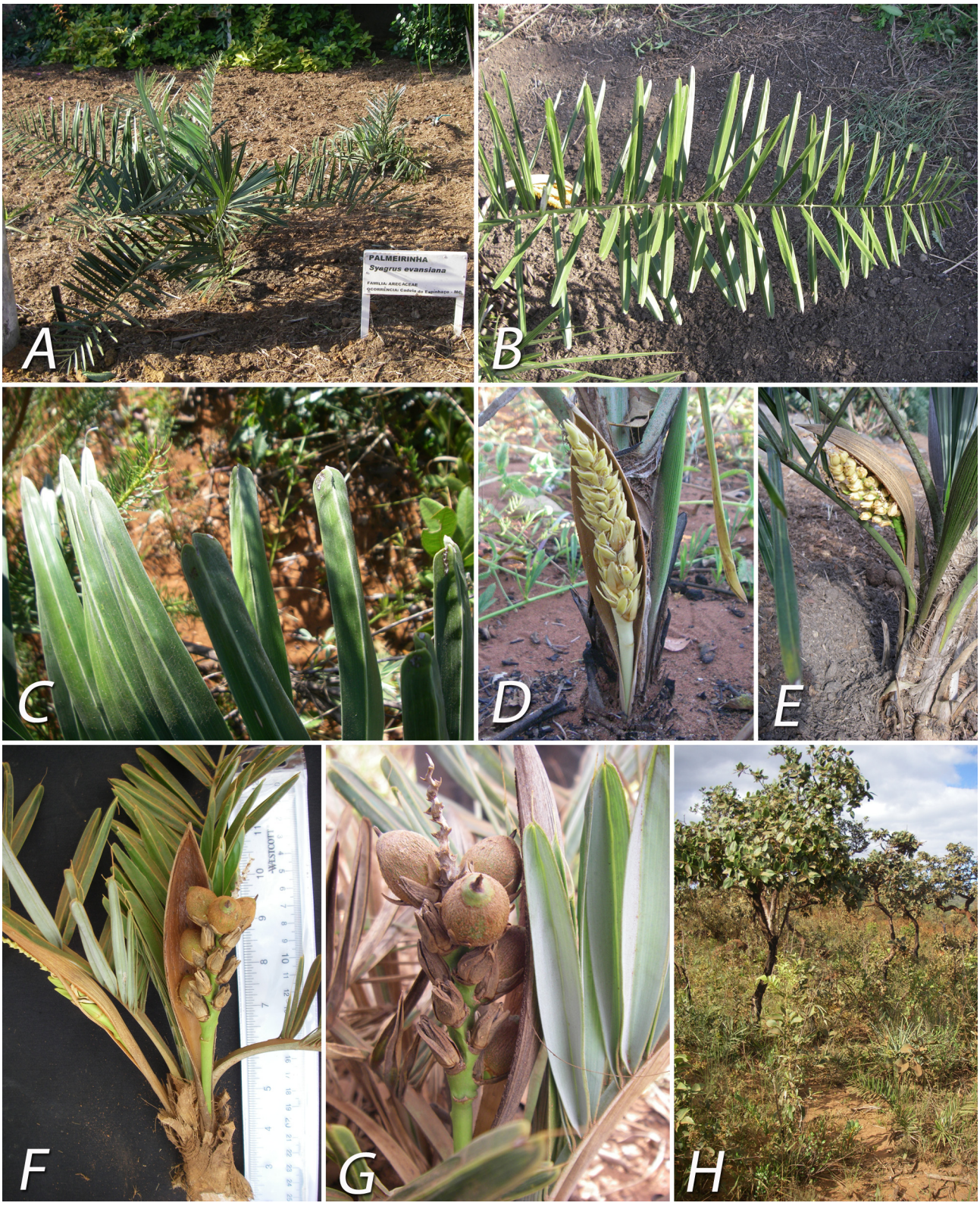

FIGURE 27. *Syagrus evansiana*. A. Cultivated specimen at Jardim Botânico Plantarum. B. Leaf. C. Ends of leaflets showing emarginate tips. D. Newly opened inflorescence with staminate flowers. E. Older inflorescence with pistillate flowers. F. Infructescence. Ruler is in inches and centimeters. G. Infructescence with fruit and old pistillate flowers. Note waxy bloom on abaxial surface of leaflets. H. Habitat with palms.

Conservation:—This species has an ample distribution within the northeastern portion of Minas Gerais. Where it grows in better soils, it is threatened by agriculture including *Eucalyptus* plantations. Fortunately, it also grows well in rocky areas, campo rupestre vegetation, which is not valuable for agriculture, and therefore is

somewhat protected. For this reason it is not considered to be threatened. Some have been even sighted just outside the boundaries of a state park (Serra Cabral near Joaquim Felício) and probably occur within the protection of the park itself. Therefore, it is classified as least concern, LC.

Phenology:—Flowering in June–August and also December and with mature fruits in December.

Uses:—This petite palm is attractive due to its ornamental gray-green foliage, and could be cultivated with success in the landscaping of full-sun gardens, as much in tropical regions as subtropical tolerating weak freezes and fires.

Notes:—This species has leaves that resemble miniature *Syagrus duartei* or *S. glaucescens*, differing principally in its much smaller size, shorter leaves, shorter and often spicate inflorescences, shorter stamens, shorter fruits and smaller endocarps. Leaflet tips are frequently asymmetric, with both halves rounded. The expanded portion of the peduncular bract is smaller in *S. evansiana* than in *S. duartei* (7–22 vs. 20–40 cm). It has a smaller inflorescence, often spicate (4.5–17 cm vs. 15–36 cm long), and smaller rachis (0–8 cm vs. 5–23 cm). *Syagrus evansiana* fruits are less than 2.5 cm long (2.3 cm), while *S. duartei* have the largest fruits at nearly 4 cm (3.8 cm) in length. One unusual character of this species is the variable number of pores in its endocarp, with most having three, but several having as many as four and five pores. The overall size of the plants increase (from less than 40 cm to more than a meter) from the western side of its distribution (west of Montes Claros) to the eastern side of its distribution (north of Diamantina), from rocky soils to deep clay soils.

Representative specimens:—BRAZIL. **Minas Gerais:** Itacambira, na estrada de terra para Caçaratiba, 17 December 2003, *H. Lorenzi 4276* (FTG!, HPL!); Itacambira, estrada para Montes Claros, 9 January 1986, *R. Mello-Silva et al. 9158* (K, SPF 41319!); Juramento, SE of the city of Juramento on Rd. to Itacambira (Itacambira\Montes Claros), Serra Catuni, border bt. Juramento and Itacambira, –17.00, –43.50, August 1992. *Don Evans s.n* (FTG!); Juramento, nas proximidades do municipio de Juramento, a 6 km de Pau-de-Óleo, na subida da serra, sentido a Itacambira, 17 December 2003, *H. Lorenzi 4269* (HPL!); Montes Claros, 52 km de Montes Claros para Pirapora, 30 January 1965, *R.P. Belém & J.M. Mendes* 413 (HBR!, UB!); Penha de França, ca. 100 km ao nordeste de Diamantina, ca. 1000 m, –18.08, –43.08, 11 March 1995, *Splett 875* (UB!); São Gonçalvo do Rio Preto, nas proximidades da BR 367, 30 July 2004, *H. Lorenzi 4913* (HPL!).

20. *Syagrus flexuosa* (Mart.) Beccari (1916: 466). *Cocos flexuosa* Martius (1826: 120). *Calappa flexuosa* (Mart.) Kuntze (1891: 982). Lectotype (designated by Dahlgren 1959, plate 382:—BRAZIL. without locality, without date, *Martius s.n.* (M! [F neg. 18567])

Figure 28 plate, Figure 29 map.

Small to moderate, usually clustered, but sometimes solitary, unarmed, palms. **Stem** 1–5 m × (2–)6–15(–20) cm, erect to arching, dark gray, with leaf scar intervals ca. 2–3 cm long, usually obscured by persistent petiole bases. **Leaves** 7–15(–20), spirally arranged, spreading; *sheathing leaf base* (15–)28–35 cm long, fibrous; *pseudopetiole,* 60–100 cm long with fibrous margins; *petiole* 3.5–21(–34) × 0.8–1.5 cm; *rachis* (48–)60–106(–113) cm long; *leaflets* green above, paler green beneath, (38–)77–182 along one side, irregularly distributed in clusters of 2–4(–10) in divergent planes; no ramenta scales or tomentum present where the leaflets are inserted on the rachis but a few brownish ramenta along the proximal portion of the abaxial midvein; basal leaflets 16–45 × 0.2–1.1 cm, middle leaflets (15–)18–47 × 0.5–2.0 cm, apical leaflets 6.0–28 × 0.2–1.4 cm mostly with acuminate, asymmetric tips. **Inflorescence** erect or pendulous, unilaterally branched; *prophyll* 15–34 × 2–3.5 cm; *peduncular bract* ca. 40–83 cm long, expanded portion 15–48 × (1.2–)2–8.5 cm, bearing a 0.5–3.5(–5) cm beak, perimeter not measured, woody, sulcate, glaucous, with patches of light brown tomentum, becoming green and glabrous with age; *peduncle* ca. (11–)15–35(–46) × 0.4–1.4 cm, somewhat elliptical in cross-section; *inflorescence axis* (10–)15–44 cm long; *rachis* (6–)10–26 cm long; *rachillae* (5–)8–31, (8–)13–27(–39) cm long at the base, (4–)7–19 cm long at the apex, each rachilla, especially lower ones, subtended by a bract 0–7 mm long; *staminate flowers* (5–)7–9 mm long at the apex, 9–18 × 3–5 mm at the base, yellow, sepals 1–2 × (<1–)2–3.5 mm, glabrous, nerves none to obscurely visible, petals 8.5–16 × 2.5–4.5 mm at the base, 5–10 mm long at the apex, with acute to acuminate tips, glabrous, nerves indistinct to obscurely visible at the base, stamens 3.2–6.5 mm long, anthers 2.5–4.8 mm long, filaments dorsifixed 1–5 mm long, pistillode 1–1.5 mm or less; *pistillate flowers* elongate pyramidal, dark yellow, 13–22 × 5–10 mm, sepals 13–21 × 5–8(–9) mm, glabrous to scaly lepidote on the lower

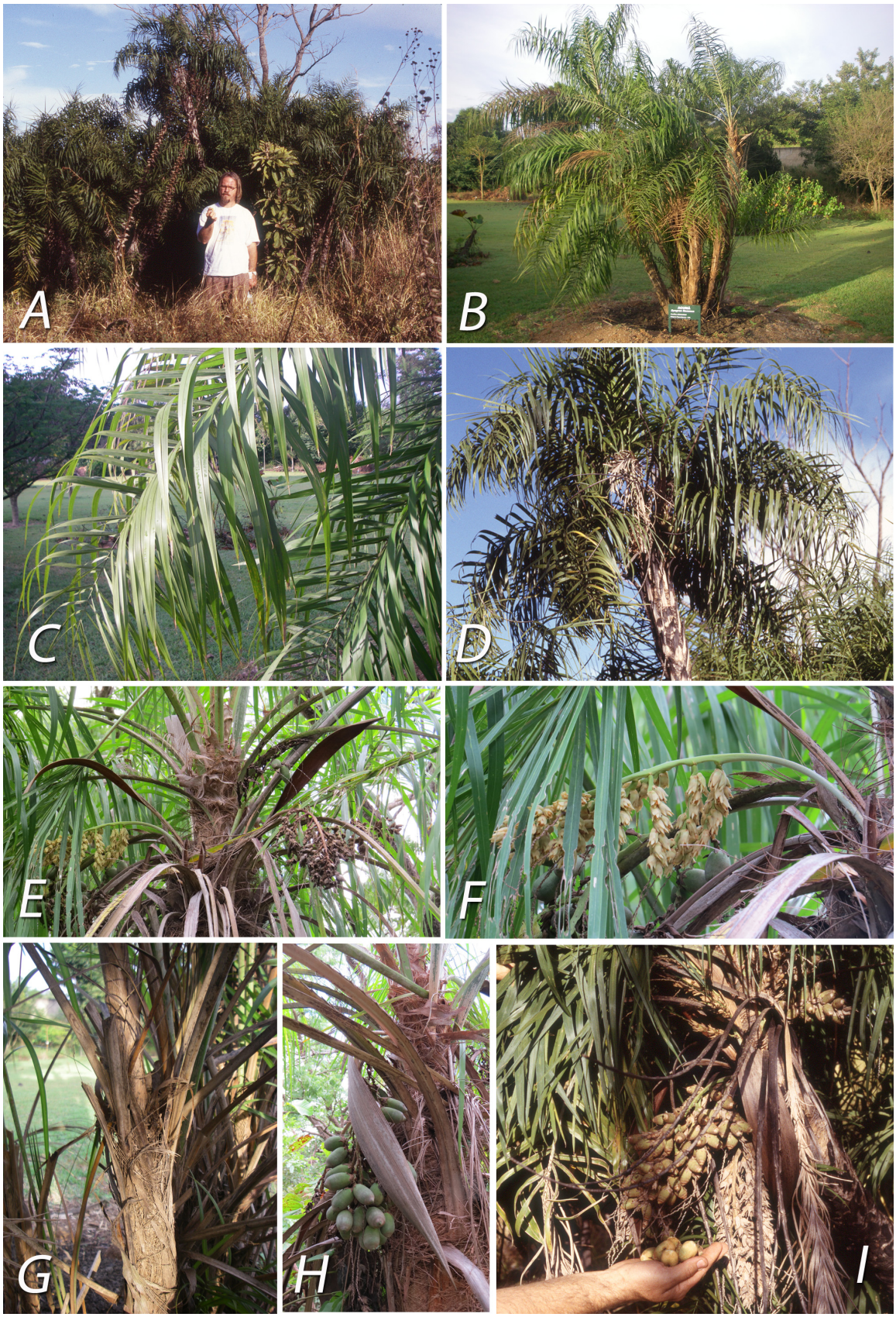

FIGURE 28. *Syagrus flexuosa*. A. Habitat near Brasília with Nikolaus von Behr. B. Clustering stem habit at Jardim Botânico Plantarum near Nova Odessa, São Paulo. C. Leaves with pendulous leaflets. D. Crown. E. Crown with fibrous leaf sheaths and inflorescences. F. Unilateral inflorescence with pistillate flowers. G. Leaf sheaths with fibers. H. Infructescence with narrow ellipsoid fruit. I. Infructescences and hand with mature fruits.

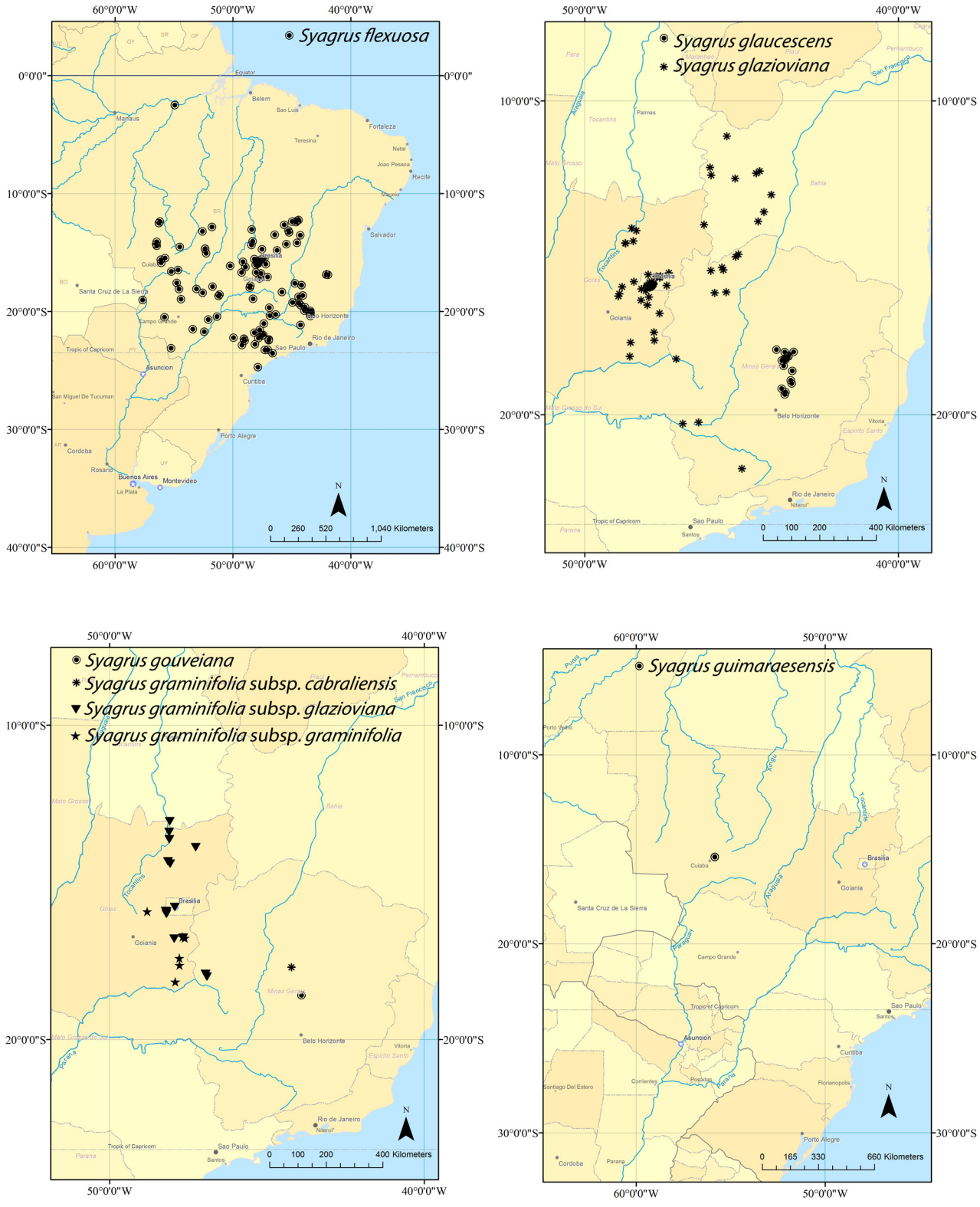

FIGURE 29. Distribution maps of *Syagrus flexuosa*, *S. glaucescens*, *S. glazioviana*, *S. gouveiana*, *S. graminifolia* subsp. *cabraliensis*, *S. graminifolia* subsp. *glazioviana*, *S. graminifolia* subsp. *graminifolia* and *S. guimaraesensis*.

portion at least, no visible veins to slightly raised veins, petals 11–19 × (3–)4–7.5 mm, short tomentose, with slightly raised veins, valvate tips ¼–1/3 the length of the petal, ca. 3–8 mm long, pistil 7.5–16 × 3–4.5(–6) mm, light brown tomentose, stigmas 5 mm long, staminodal ring 0.5–1.5 mm high. **Fruit** ellipsoid, 3.0–5.5 × 1.5–3.0 cm, persistent perianth (cupule) light tan, 15 mm wide, 13–15 mm deep, ring 2 mm in height, epicarp smooth, glabrous or with patchy brown tomentum, green to yellowish-green when mature, less than 0.5 mm thick, mesocarp 2–9 mm thick, whitish, sweet, succulent and fibrous; *endocarp* bony, brown, trivittate, 2.6–4.0 × 1.1–1.6 cm, 3–4 mm thick on the sides, 5–7 mm thick at the ends, with fibers present, scattered; *seeds* ellipsoid, 2.0 × 0.8 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—acumão, acumã, acunã, ariri, côco-ariri, côco-de-ariri, côco-babão, côco-de-campo, coqueiro-do-campo, côco-de-raposa, côco-da-serra, côco-de-vaqueiro, côco-da-vassoura, palmito-do-campo, palmito-amargoso.

Etymology:—The specific epithet, *flexuosa,* refers to the flexible nature of the tips of the rachillae.

Distribution and habitat:—Brazil and Bolivia. In Brazil, occurs in western Bahia, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, São Paulo and Tocantins (Lorenzi *et al.* 2010) and the Distrito Federal. In Bolivia it grows in the eastern part. It grows in cerrados including high elevation disjunct cerrados, woodlands and disturbed habitats in fine sandy to rocky soils.

Conservation:—This species has a broad distribution and grows in both agriculturally valuable and invaluable sites. It is found within several national parks throughout its range. Therefore it is not threatened and is classified as least concern, LC.

Phenology:—Flowers and fruits year around, but flowering appears to peak between November and April with fruiting in July to October.

Uses:—This palm is used as an ornamental in landscaping, especially in Brasília and throughout the Distrito Federal. The fruits are edible.

Notes:—*Syagrus flexuosa* is a small- to medium-sized, clustering species and is easily distinguished from other *Syagrus* species by its large 2 cm long pistillate flowers, large ellipsoid fruit, unilaterally arranged rachillae, dark green leaves with narrow clustered leaflets or pinnae that are more or less membranaceous in texture with pendulous tips. It is one of the few *Syagrus* species that has clustering, above-ground stems. Other clustering *Syagrus* with above-ground stems include *S. campestris, S. cataphracta, S. deflexa, S. ruschiana* and *S. cearensis*. For a time, *S. campestris* was erroneously synonymized with *S. flexuosa* (Glassman 1969, 1987), but *S. campestris* is a smaller palm with wider, thicker and more rigid leaflets, and its leaflet anatomical cross-sections show that it contains many more adaxial fiber strands than *S. flexuosa*. In fact, adaxial fiber strands may be lacking altogether in many specimens of *S. flexuosa.*

At least two other species of *Syagrus* have been mistakenly identified as *S. flexuosa*. One is *Syagrus deflexa*, easily distinguished by its strongly, deflexed leaflets. Its inflorescences have branched rachillae that are spirally arranged and not unilaterally arranged as in *S. flexuosa* (except in younger plants). One other species that is commonly misidentified as *S. flexuosa* grows in the Chapada Diamantina region of central Bahia from Caetité northward to Palmeiras. It is both morphologically and anatomically different has been renamed *Syagrus cataphracta*. It is a distinct species with bluish-green leaflets that are neither pendulous nor deflexed, with a white waxy bloom on the abaxial surface of the leaves. It is a smaller palm with thinner stems, and its leaflet anatomy is very distinct from *S. flexuosa* with large clustering fiber bundles in the adaxial surface of the leaflet and a large vascular bundle with an exaggerated sheath of fibers in the margin of the leaflets.

Representative specimens:—BRAZIL. **Bahia:** Baianópolis, 14 km S of the village of Cocos on the road to Inhumas, cerrado vegetation, 705 m, –12.30, –44.53, 15 October 1988*, L.R. Noblick & J.L. de S. Lima 4626* (CEPEC!, HTSA!, F!); Cocos, A mais ou menos 10 km de Coribe/Cocos, –44.81, –14.42, 22 March 1986*, J.L. de S. Lima 68a* (HTSA!); Côcos, 31 km W of Côcos on road to Serra da Suçuarana, Riacho do Meio, place called Samambaia, 600 m, –14.17, –44.55, 20 October 1988*, L.R. Noblick & J.L. de S. Lima 4653* (F!, HTSA!, MO!); Correntina, Após a 7 km de Inhumas p/ Correntina, –13.14, –45.29, 15 Oct1988*, J.L. de S. Lima 105* (HTSA!); Correntina, A 16 km de Correntina na estrada p/ Inhumas, –13.29, –45.23, 15 October 1988*, J.L. de S. Lima 109a* (HTSA!); Correntina, 16 km N of Correntina on road to Inhumas, 650 m, –13.29, –45.23, 15 October 1988*, L.R. Noblick & J.L. de S. Lima 4630* (HTSA!, F!); Cristópolis, Cantinho, –12.42, –44.64, 20 March 1986*, J.L. de S. Lima 70* (HTSA!, IPA!); Cristópolis, Riacho do Sal, 9 km E of Cristópolis on BR 242, 680 m, –12.23, –44.42, 13 October 1988*, L.R. Noblick & J.L. de S. Lima 4619* (BAH!, HTSA!, F!); Jaborandi, 12 km S of the Rio Arrojado on

road, Correntina/Jaborandi, 600 m, –13.53, –44.28, 17 October 1988*, L.R. Noblick & J.L. de S. Lima 4632* (BAH!, CEPEC!, F!, FTG!, HTSA!, NY!, RB!), *4633* (CEPEC!, HTSA!, F!, FTG!); São Desidério, 8 km W of São Desidério on road to Sítio Grande, 660 m, –12.37, –44.97, 24 October 1988*, L.R. Noblick & J.L. de S. Lima 4661* (CEPEC!, F!, FTG!, HTSA!, NY!); São Desidério, A mais ou menos 8 km na estrada p/ Sítio Grande, –12.64, –45.64, 24 October 1988*, J.L. de S. Lima 134a* (HTSA!); Suçuarana, 31 km de Cocos Oeste na estrada para, Suçuarana. Riacho do Meio-Samambaia, –14.29, –45.45*, J.L. de S. Lima 130a* (HTSA!); **Distrito Federal:** Brasília, Parque Nacional de Brasília, –15.78, –47.93, January 2000, *T.L.S. Abreu 74* (UB!); Brasília, Centro Olímpico da Universidade de Brasília, –15.77, –47.86, 25 January 2006, *Andrade et al. 12* (UB!); Brasília, Campus da Universidade de Brasília, –15.78, –47.93, 23 February 1965, *R. P. Belém 466, 467* (BH, CEPEC!, UB!); Brasília; Parque Nacional de Brasília, 1109 m, –15.72, –47.97, 2 July 2006, *C.A. Faria et al. 167* (CEN, UB!); Brasília, Sobradinho, –15.78, –47.93, 26 February 1965, *R. P. Belém 493* (CEPEC!, UB!); Brasília, 10 km SE of Brasília, 1976*, S.F. Glassman & G. Eiten 13051, 13053* (F!); Brasília, 10 km from lake bridge, near IBGE, 200 m along power-line, 800–1200 m, –15.48, –47.32, 17 May 1970, *R. Goodland 4332* (UB!); Brasília, Parque Nacional de Brasiliia, SD 23-YC, –15.67, –47.97, 27 September 1979, *J.G. Guimaraes 686* (HBR!); Brasília, Fazenda Água Limpa, –15.78, –47.93, 3 August 1981, *M. Haridasan 31* (UB!); Brasília, Planaltina, CPAC, August 1982, *M. Haridasan 340* (UB!); Brasília, Fazenda Água Limpa, –15.78, –47.91, 12 December 1983, *M. Haridasa 425* (UB!); Brasília, Fazenda Água Limpa, –15.78, –47.91, 7 May 1984, *M. Haridasa MH 497* (UB!); Brasília, Reserva Ecológica do IBGE-Picada R-5, cerrado, –15.78, –47.93, 20 September 1977, *E.P. Heringer et al. 77* (NY, UEC!, US); Brasília, Reserva Ecológica do IBGE. Picada R-4, –15.78, –47.93, 20 February 1978, *E.P. Heringer 344* (NY); Brasília, Bacia do Rio São Bartolomeu, –15.78, –47.93, 18 January 1980, *E.P. Heringer 3132* (MG!, NY); Brasília, margem direita do Rio São Bartolomeu, 15 January 1980, *Heringer et al. 3155* (MG!); Brasília, Bacia do Rio S. Bartolomeu, –15.78, –47.93, 26 February 1980, *E.P. Heringer 3554* (NY, US); Brasília, –15.78, –47.93, 2 May 1965, *E.P. Heringer 10408* (NY!, UB!); Brasília, Rio São Bartolomeu, 22 April 1965, *E.P. Heringer 10356* (UB!); Brasília, Plano Piloto, –15.78, –47.93, 15 February 1966, *E.P. Heringer 11006* (UB!); Brasília, Reserva Ecologica do I.B.G.E., 11 February 1982, *E.P. Heringer 18329* (MO!, US!); Brasília, Chapada da Contagem, ca. 20 km E of Brasília, 700–1000 m, –15.78, –47.93, 19 August 1964, *H.S. Irwin 5296* (NY!, UB, US); Brasília, Corrego Covanças, near Chapada da Contagem, ca. 22 km N.E. of Brasília, 1000 m, –15.78, –47.93, 11 January 1966, *H.S. Irwin 11578* (BH, NY!, U); Brasília, 3 km ao S de Sobradinho, 1000 m, –15.78, –47.93, 1 May 1966, *H.S. Irwin 15458* (BH, NY!, UB, US); Brasília, ca. 2 km E of Lago Paranoá, DF-6, 1000 m, –15.78, –47.93, 26, 26 February 1970, *H.S. Irwin et al. 26637* (MO, NY!, RB, UB, US); Brasília, Centro Olímpico da Universidade de Brasília, –15.77, –47.86, 18 September 2007, *M.P. Kuhlmann 4* (UB!); Brasília, Reserva Ecológica do IBGE, 1100 m, –15.95, –47.88, 30 September 2004, *C. Lima* (HCF); Brasília, Fazenda Palmas. Próximo ao Rio das Palmas. APA de Cafuringa, –15.78, –47.93, 23 December 1998, *R.C. Martins 221* (UB!); Brasilia, Sobradinho, 29 October 1986, *J.P.F. Melo s.n.* (UB!); Brasília, Fazenda Água Limpa, –15.92, –47.91, 2 September 2002, *R.C. Mendonça 4911* (UB!); Brasília, 411 e 412, L2 Norte, –15.78, –47.93, 21 June 2004, *J.M.S. Monteiro s.n.* (UB!); Brasília, Universidade de Brasília, –15.77, –47.87, 3 August 1981, *E.A. Nascimento 17* (UB!); Brasília, near CENARGEN just N of town. 1100 m, –15.78, –47.92, 1 May 1992, *L.R. Noblick 4858* (FTG!, UB!, UFG!); Brasília, Fazendinha Agua Limpa; study area of the University of Brasília, 1140 m, –15.78, –47.93, 7 February 1996, *L.R. Noblick 5108* (NY!, UB!); Brasília, Estação Ecológica de Aguas Emendadas, 1 October 1982, *P.E.A.M. de Oliveira 116* (HEPH); Brasília, Reserva Biológica do Jardim Botânico, –15.87, –47.85, 1 January 1993, *C.E.B. Proença 878* (UB!); Brasília, Fazenda Água Limpa (Campo Experimental da UnB); –15.97, –47.92, 1 October 1993, *C.E.B. Proença 963* (UB!); Brasília, Fazenda Água Limpa (Univ. of Brasília field station), near Vargem Bonita, c. 18 km SSW of Brasília TV tower, –15.78, –47.93, *J.A. Ratter 3642* (UB!); Brasília, Reserva Ecologica do IBGE, –15.95, –47.87, 1 January 2001, *M.A. Silva 5071* (UB!); Brasília, –15.74, –47.89, November 2000, *A.P. Silva 133* (UB!); Brasília, ARIE do Cerradão, ARIE do Cerradão, –15.85, –47.82, 6 November 2007, *J.S. Silva & P.S. Carvalho 191* (UB!); Brasília, ARIE do Cerradão, ARIE do Cerradão, –15.85, –47.82, 27 February 2008, *J.S. Silva et al. 383* (UB!); Brasília, BR-020 Planaltina, –15.78, –47.93, 30 March 1995, *J.C.S. Silva 819* (UB!); Brasília, Universidade de Brasília, –15.78, –47.93, *Taxonomy Class of Universidade de Brasília 1342* (UB!); Brasília, Centro Olímpico, Campus da Universidade de Brasília. Reserva de Cerrado do Centro Olímpico, 1050 m, –15.75, –47.90, 17 June 2008, *Zanella, et al. 22* (UB!); Catetinho, 6 January 1982, *B. Pereira 160* (US); Gama, Parque Recreativo e Reserva Ecológica do Gama, 850 m, –16.05, –48.05, 25 January 2001, *B.M. Gomes et al. 210* (UB!); Distrito Federal, Águas Emendadas, 40 km NE of Brasília, divide between drainages of Rio La Plata and Rio Amazonas, 21

January 1978, *A.H. Gentry 21431* (MO!, UB!); Distrito Federal, Estação Ecológica de Águas Emendadas, –15.58, –47.58, without date, *G. Gottsberger 11-170998* (UB!); Distrito Federal, Córrego Capão da Onça. 9 July 1979, *E.P. Heringer et al. 1780* (MO!, US); Distrito Federal, N of Corrego do Cupim, –15.55, –48.17, 4 November 1982, *J.H. Kirkbride 4954* (US); Distrito Federal, near Cabeça de Veado, Escola Fazendária, –15.87, –47.82, 29 September 1980, *M.D. Rivera 80-442* (UB!); Distrito Federal, near Cabeça de Veado, Escola Fazendária, 1150 m, –15.87, –47.82, 23 September 1980, *M.D. Rivera 80-536* (UB!); Distrito Federal, Próximo à Escola Fazendária, 1150 m, without date, *M. Haridasan 203* (UB!); **Goiás:** Anápolis, BR 414, saída de Anápolis para Pirenópolis, –16.22, –48.92, 18 December 2010, *R.C. Martins et al. 1108* (UB!); Caçu, UHE Salto, –18.68, –51.20, 19 April 2009, *F.A.G. Guilherme et al. 1689* (HJ); Caçu, nas proximidades da Rodovia GO-260 (km 6), –18.56, –51.13, 11 April 2007, *R. Tsujiet al. 1913* (HPL!); Campo Alegre, –17.20, –47.73, 850 m, 6 August 1981, *E. de F. Almeida 145* (HBR!); Campo Alegre de Goiás, 6 km S of the trunoff to Pires do Rio on the BR-050, 2500 ft, –17.26, –47.77, 31 July 1997, *L.R. Noblick & N. von Behr* 5165 (FTG!, UB!); Chapadão do Céu, Parque Nacional das Emas-Mineiros (–17.82 to –18.47 and –52.65 to –53.17), –18.41, –52.55, 1 November 1998, *M.A. Batalha 2029* (SP); Corumbá de Goiás, 26 March 1978, *E.P. Heringer et al. 17931* (CEN!) [mixed collection, leaf and older flowers are *S. flexuosa*]; Corumbaíba; Margem esquerda do Rio Corumbá; capoeira à beira do rio Gameleira, 540 m, –17.80, –48.52, 18 November 1993, *G.P. Silva et al. 2024* (CEN); Corumbaíba; Margem esquerda do Rio Corumbá, –17.97, –48.57, 14 December 1993, *G.P. Silva et al. 2119* (CEN); Cristalina, Serra dos Cristais. 5 km by road E of Cristalina, 1200 m, –16.77, –47.61, 5 April 1973, *W.R. Anderson 8178* (BH!, FTG!, MO!, NY!, U, UB, US); Cristalina, Fda. Bela Vista, –16.77, –47.61, 14 August 1980, *G. Hatschbach 43124* (MBM!, NY); Formosa; Margem esquerda da lagoa do Perta Pé, –15.98, –47.20, 26 March 2002, *G.P. Silva et al. 6251* (CEN); Goiânia, Na GO M-9, para Nerópolis. 2 km da Escola Agronomia e Veterinária. Ocorre o córrego Samambaia, –16.68, –49.25, 23 May 1968, *J.A. Rizzo 1038* (UFG!); Ipameri, margem esquerda do rio Corumbá, próximo à foz do rio, 600 m, 25 March 1993, *G.P. Silva et al. 1292* (CEN); Jataí, Bálsamo. Margens do Rio Corrente. Capões, –17.88, –51.71, 19 July 1951, *A. Macedo 3324* (SP!); Luziânia, Hidrelétrica de Corumbá III, área a ser desmatada para enchimento do reservatório, 770 m, –16.68, –48.02, 26 September 2007, *C.H.G. Cezare et al. 100* (UB!); Mineiros, Parque Nacional das Emas, Jatobá, park entrance ca. 85 km SW of Mineiros on GO-341, 800–1000 m, –18.08, –53.08, 10 May 1992, *L.R. Noblick & H. Ferreira 4869* (FTG!, MO!, UFG!); Mossâmedes, Reserva Biológica da Serra Dourada-Estrada para a Reserva com início no córrego Piçarrão à 300 m da estrada; 2º transecto, –16.13, –50.22, 19 July 1994, *J.A. Rizzo 11543* (UFG); Niquelândia; Companhia de Níquel Tocantins-CNT. Morro na entrada, –14.36, –48.42, 16 April 1996, *F.C.A. Oliveira et al. 560* (IBGE); Niquelândia; Base (quarto inferior) da Serra Negra; área dentro, 470 m, –14.03, –48.32, 15 April 1992, *B.M.T. Walter et al. 1403* (CEN); Pirenópolis, 870 m, –15.78, –49.13, 15 August 2002, *M. Brito et al. 42* (UB!); São João da Aliança, Serra Geral do Paraná, 7 km ao Norte da estrada de São João da Aliança, 1070 m, –14.71, –47.52, 25 March 1973, *W.R. Anderson 7939* (BH!, FTG!, MO!, NY!, RB, UB!); Sitio d'Abadia, ca. 5 km from town on road to Formoso-MG, 900 m, –14.81, –46.25, 3 February 1996, *L.R. Noblick 5094* (CEN!, NY!); Goiás, Cabeceira do Rio Gama, 1894, *A.F.M. Glaziou 22264* (C, K, P!); Goiás, Rio Costa & Pichoa, Oct–Nov 1894, *A.F.M. Glaziou 22259* (P!); Goiás, Margem da Serra Velha, 1 August 1965, *E.P. Heringer 10475* (NY!); Goiás, 1 January 2008, *N.P. Massarotto 132* (UB!); **Mato Grosso:** 1 km S. of km 246, Xavantina-Cachimbo road, 12 March 1968, *D. Philcox 4519* (NY!, UB!); Rio dos Baynes, *S. Moore 427* (BM); Barão de Melgaço, RPPN SESC Pantanal, –16.19, –55.97, 19 April 2002, *S.R. Zaniolo 264* (MBM, UPCB); Barra do Carças, 25 km from Xavantina, 13 June 1955, 600–1000 m, *D.R. Hunt 5981* (K); Barra do Garças, Fazenda Brasil, 780 m, –15.05, –52.26, 26 March 1997, *N.M Ivanauskas et al. 1676* (ESA!); Base Camp, 9 km E of the Base Camp, 270 km N of Xavantina, –12.82, –51.77, 19 April 1968, *J.A. Ratter et al. 1123* (UB!); Chapada dos Guimarães, –15.46, –55.75, 19 February 1997, *A.G. Nave et al. 1073* (ESA!); Cuiabá, –15.60, –56.10, 13 November 1975, *G. Hatschbach 34477* (F!, MBM!); Cuiabá, km 10 entre Cuiabá e Chapada dos Guimarães, margem esquerda, –15.60, –56.10, 17 September 1998, *E. Ferreira & A. Silva 515* (EAC, NY, UFMT!); Diamantino, Estrada Diamantino-Sumidouro (BR 364), cerca de 26 km após o trevo para São José do Rio Claro. Fazenda Nova Era, –14.09, –56.45, 18 May 1997, *V.C. Souza et al. 16314* (ESA!); Diamantino, Fazenda Caeté (Parte da Fazenda Baronesa), 15 km ESE (em linha reta) de Diamantino, –14.41, –56.45, 23 May 1997, *V.C. Souza et.al. 16971* (ESA!); Jaciara, Fazenda Furnas, 10 February 2000, *M. Macedo et al. 7185* (UFMT!); Jangada, estrada entre cuiabá e STNOP, 4 km após a cidade de Jangada, na margem esquerda da estrada, 19 September 1998, *E. Ferreira & A. Silva 523* (UFMT!); Limpo Grande, próximo Limpo Grande-Várzea Grande, 23 June 1995, *M. Macedo & R. Godinho 4228* (UFMT!); Nobres, Arredores da Fazenda Quebó, cerca de 37 km ENE (em linha reta)

de Nobres, –14.37, –56.00, 24 May 1997, *V.C. Souza et al. 17055* (ESA!); Nova Brasilândia, Estrada Nova Brasilândia-Planalto da Serra, ca. 20 km NE (em linha reta) de Nova Brasilândia, –14.52, –54.49, 10 October 1997, *V.C. Souza et al. 20705* (ESA!, UFMT!); Nova Xavantina, Nova Xavantina, 6 km ao S de Nova Xavantina (R & A transect), 1500–1700 m, –14.67, –52.35, 11 October 1967, *G.C.G. Argent 6694* (UB!); Nova Xavantina, –14.67, –52.35, 10 August 1994, *B.S. Marimon 86* (UEC); Nova Xavantina; Campus Universitário da UNEMAT. Estação Biológica, 10 May 1999, *E. Ribeiro El1* (HPL!); Ribeirão Cascalheira; Barreira Amarela. P. 03 / Q. I, 12 October 2003, *C. Fernandes-Bulhão et al. 277* (NX); Rio dos Peixes, Cuiabá, 17 July 1998, *S. Cruz & T. Lopes 97* (UFMT!); Rondonópolis, –16.47, –54.64, 3 May 1995, *G. Hatschbach 62210* (MBM!); Rondonópolis, Bororo Indian Village, "Córrego Grande", and vicinity, on north shore of Rio São Lorenço, 64 km due WSW of Rondonópolis, 180 m, –16.60, –55.22, 4 December 1976, *G. Eiten 103* (UB!); Rondonópolis, MT-130 Rondonopolis/Poxoréo road, between km 29–30 on the W side of MT-130, elevation ca. 469 m, –16.21, –54.49, 11 January 2014, *L.R. Noblick & H. Lorenzi 5636* (ESA!, FTG!, HPL!, NY!); Santo Antônio do Leverger, –15.87, –56.08, 18 January 1989, *A. Krapovickas 43038* (MBM!); Santo Antonio de Leverger, Fazenda Matão, 9 March 1996, *M. Macedo & R. Godinho 4553* (UFMT!); Sao Lourenco de Fatima, Terras, 15 September 1995, *S.M. Salis 823* (CPAP); Tapurah, MT-010. 37 km após o trevo com a Serra dos Caiabis, –12.36, –56.18, 8 June 1997, *V.C. Souza et al. 17368* (ESA! UFMT!); Tapurah, estrada MT-010, cerca de 5 km do entroncamento com MT-338, –12.49, –56.26, 12 June 1997, *V.C. Souza et al. 17780* (ESA!, UFMT!); Xavantina, Base Camp, 8 km E of the Base Camp, 270 km N of Xavantina on the Xavantina—São Felix road, –12.82, –51.77, 21 June 1968, *J.A. Ratter 1873* (UB!); Xavantina, Plot 4, P/C transect, Xavantina, 14 July 1968, *P.W. Richards 6407* (UB!); Xavantina, Vicinity of Xavantina, ca. 2 km S of Xavantina, 300–400 m, 25 September 1964, *H.S. Irwin & T.R. Soderstrom 6313* (BH, NY!); Xavantina, 24 November 1946, *H. Sick B166* (RB!); Xavantina, Rio das Mortes, February 1947, *H. Sick B232* (RB!); **Mato Grosso do Sul:** Amambaí, Arredores da tribo Caiuá, –23.10, –55.23, 1979, *W.B.G. Garcia 13758* (UEC!); Aquidauana, Pantanal, –20.47, –55.79, 18 May 1900, *S.M. Salis 1131* (CPAP); Bataguassu, Várzea aluvionar do rio Paraná, –21.71, –52.42, 21 November 1992, *I. Cordeiro 995* (SP); Corumba, Pantanal, –19.01, –57.65, 18 May 1900, *S.M. Salis 1124* (CPAP); Corumba, Pantanal, Fazenda Ipanema (Pantanal subregion of Nhecolândia), ca. 100 km SE of Corumbá, 90 m, –19.23, –57.02, 4 October 1985, *J.A. Ratter 5082* (CPAP, K!); Cuiabá, S. Jose de Serra, 1975, *G. Hatschbach 37477* (F!); Nova Ponte, na rodovia entre Nova Ponte e Água Clara, próximo as torres da força, 382 m, –20.68, –52.081, 16 June 2008, *R. Tsuji et al. 2676* (HPL!); Pedro Gomes, Rio Pequire, 150 km S of Rondopolis, –18.10, –54.55, 1 September 1976, *S.F. Glassman 13088* (F!, SP!); Ribas do Rio Pardo, prox. Foz do Rib. Londrinha, –21.50, –53.39, 7 November 1981, *L.A. Dambrós 239* (HBR!); São Gabriel do Oeste, Fazenda Bonito próximo ao córrego Bonito, cerca de 3 km da MS-430, –18.96, –54.39, 15 June 2002, *V.J. Pott 5565* (CGMS); Sonora, Reserva Legal da Usina (CASE), –17.58, –54.76, 5 August 2001, *U.M. Resende 2662* (CGMS); **Minas Gerais:** Araçuaí, SE 24-V-A, –16.88, –41.93, 6 July 1981, *S.J. Filho 146* (HBR!); Araçuaí, Chapada de Lagoão, –16.85, –42.07, 21 March 1992, *L.R. Noblick 4852* (BHCB!, F!, FTG!, K!, MBML!, NY! [sic *4892*], US!); Araxá, Arboreto CBMM, 1111 m, –19.67, –46.91, 19 November 2010, *J.R. Stehmann & M. Augsten 6151* (BHCB); Belo Horizonte, 1900, *Teixeira 24156* (SP); Belo Horizonte, Ex Hervário Esc. Farm. de Ouro Preto, –19.92, –43.94, 5 February 1900, *A.S. Teixeira s.n.* (SP!); Biribiry, dans le campos, 19 March 1892, *A. F.M. Glaziou 20025* (NY!); Biribiry, prés Diamantina, 19 March 1892, *A.F.M. Glaziou 20026* (A, C, FI, K, NY!, P! P02147202, P02147205); Campos do Curvelo, 1839, *P. Claussen s.n.* (G); Campos do Curvelo, 1840, *Gardner 428* (K); Capão, Inter Capão et Corrego secco, March 1892, *P. Schwacke 8470* (RB!); Catas Altas, Serra do Caraça, –20.07, –43.41, 18 June 2002, *T.M.A. Alves & M. Sobral, 55* (BHCB); Catas Altas, Serra do Caraça, Cascatinha, –20.07, –43.41, 3 May 1980, *T. Viana & T.S.M. Grandi 171* (BHCB!); Catas Altas, Serra do Caraça, Caminho da cascatinha, –20.07, –43.41, 6 June 1980, *T. Viana 207* (BHCB!); Catas Altas, Serra do Caraça, Caminho da Cascatinha, –20.07, –43.41, 4 October 1997, *A. Salino 3537* (BHCB); Catas Altas, Serra do Caraça, 1300 m, –20.07, –43.41, 22 December 1997, *M.F. de Vasconcelos s.n.* (BHCB); Congonhas, Entre Congonhas do Campo [Congonhas] and Queluz, 1 July 1884, *A.F.M. Glaziou 15559* (C, MO!, NY, P!. US); Curvelo, –18.76, –44.43, *E. Tameirão Neto 3099* (BHCB); Delfinópolis, Estrada para Casinha Branca-Antes da Sete Cidades, –20.34, –46.85, 8 October 2002, *R.L. Volpi 265* (HUFU); Delfinópolis, Estrada para Casinha Branca, –20.34, –46.85, 7 December 2002, *R.L. Volpi 439* (HUFU, UB!); Delfinópolis, Fazenda Água da Serra-Trilha "Escada de Pedras," –20.34, –46.8539, 10 March 2003, *R.A. Pacheco 498* (HUFU); Delfinópolis, Fazenda Zé Antunes-Trilha para Cachoeira Triângulo, –20.34, –46.85, 6 December 2002, *J.N. Nakajima 3422* (HUFU); Delfinópolis, Estrada para Casa Branca-Fazenda Paraíso, –20.34, –46.85, 10 April 2002, *R. Romero 6339* (HUFU, UB!); Felixlândia, BR 040, km

384, 18 December 1986, *R. Cytryn 03* (RB!); [Divisa de Alegre], km 19 da rodovia Rio/Bahia, proximo a fronteria com a Bahia, –15.75, –41.33, October 1989, *G.F.E. Abrahão s.n* (MBML!); Furnas, área em torno das eclusas da represa. Próximo ao hotel, 1 July 1994, *J.A. Lombardi 564* (BHCB, NY); Haut de la Serra de S. José del Rei, 26 June 1887, *A.F.M. Glaziou 17337* (C, F, FI, K, P! P02147200! is mixed, leaves of *S. flexuosa* and inflorescence piece of an *Attalea* sp., P02147197, P02147198, P02147199); Ituiutaba, –18.97, –49.47, 13 August 1944, *A. Macedo 496* (SP!); [João Pinheiro], 300 km de Brasília para Belo Horizonte, 20 June 1964, *J.M. Pires 58041* (NY!, U, UB!); Joaquim Felício, Serra do Cabral. Immediately E of Joaquim Felício, 1000 m, –17.76, –44.17, 6 March 1970, *H.S. Irwin 27003* (NY!, UB!); Joaquim Felício, –17.76, –44.17, 16 April 1996, *G. Hatschbach 64914* (MBM!); Lagoa Santa, near Quartel Aeronautica, above the Lake. –19.63, –43.89, 11 July 1965, *S.F. Glassman & J.C. Gomes jr. 8044–8054* (F!, MO, RB, SP!); Lagoa Santa, Shamel, without date, *W. Popenoe & Dorseit 234b* (US); Lagoa Santa, January 1914, *W. Popenoe 345b* (US!); Lagoa Santa, *Warming 1846* (C); Mariana, Mina da Samitri, –20.38, –43.42, 29 January 2001, *R.C. da Mota & L. Viana 605* (BHCB); Mariana, Mina de Fábrica Nova, Ampliação da mina de Fábrica Nova, –20.20, –43.44, 28 June 2011, *R.C. da Mota s.n.* (BHCB); Paracatu, BR 040 depois do Ranchão, 962 m, –17.07, –47.057, 20 May 2009, *R.C. Martins et al. 1011* (UB!); Paraopeba, Reserva do Horto Florestal, –19.27, –44.40, 5 April 1965, *J.E. de Paula 70* (SP!, UB!); Patos de Minas, Cidade de Patos de Minas, 1 September 1950, *A. Duarte 3236* (RB!); Pompéu, –19.22, –44.94, 28 July 2011, *C. Valle s.n.* (BHCB); Presidente Juscelino, 5 km W of the Rio Parauna along BR-259 and 2 km S on na unpaved road, 700–800 m, –18.64, –44.06, 20 March 1992, *L.R. Noblick 4850* (BHCB!, FTG!, K!); Santa Bárbara, Serra do Caraça, –19.96, –43.42, 7 October 1988, *M.M.N.Braga et al. 246* (BHCB); Santa Bárbara, Serra do Caraça, Parque Natural do Caraça, Cascatona, –20.12, –43.49, 19 April 1997, *J.A. Lombardi et al. 1620* (BHCB); Santa Bárbara, Serra do Caraça, 1300 m, 25 March 1991, *R. Pardini & D. Novaes 3* (NY, SPF!); Santa Bárbara, Serra do Caraça, caminho para Capelinha e Gruta de Lourdes, 27 May 1983, *J.R. Pirani & O. Yano 699* (SPF!); Santa Bárbara, Serra do Caraça, –20.10, –43.48, 30 August 1997, *J.R. Stehmann et al. 2273* (BHCB); Santa Bárbara, Cascatinha, Serra do Caraca, SW de Catas Altas, ca. 1270–1350 m, –20.08, –43.45, 14 May 1990, *M.M. Arbo et al. 4028* (CTES!, K, MBM!); Santa Bárbara, Serra do Caraça, –19.96, –43.42, 20 April 1933, *H.L.M. Barreto 4824* (BHCB!); Santa Bárbara, Serra do Caraça, –19.96, –43.42, 13 December 1978, *H.F. Leitão Filho 9630* (UEC!); Santa Bárbara, Serra do Caraça, –19.96, –43.42, 10 September 1990, *J.R. Stehmann et al. s.n.* (NY); São Gonçalo do Abaeté, –18.34, –45.83, 26 January 2001, *R.C. Mota da 383* (BHCB); Sao Gonzalo do Abaete, Rod. BR-365, km 235, 700 m, –18.34, –45.83, 20 March 1980, *G. Hatschbach 42817* (MBM!, MO, NY, US); São João del Rei, –21.14, –44.26, 15 September 1948, *E.P. Heringer 2580* (SP!); São Roque de Minas, Parque Nacional da Serra da Canastra-Mata próxima a cachoeira dos Rolinhos, –20.2453, –46.3658, 23 February 1997, *R. Romero 4020* (HUFU); Serra do Cabral, Jun1990, *K.I. Horst 68* (MBML!); Serra do Caraça, Em direção à Carapuça, 1500 m, 18 November 1978, *N.D. Cruz 6441* (UEC!); Serra do Lenheiro, 28 June 1893, *A.F.M. Glaziou 20536* (P!, U); Sete Lagoas, área da EMBRAPA, –19.47, –44.25, 26 September 1996, *J.A. Lombardi 1401* (BHCB, NY); [Uberaba], between Uberava [sic] and Bada, 1848, *Regnell 1288* (S); Uberlândia, BR 365-Estrada perto do km 20, –18.92, –48.28, 28 July 1982, *R.C. Vieira 178* (HUFU!); Uberlândia, BR 365-Na altura do km 634. Sítio do Capim Branco, –18.92, –48.28, 17 July 1984, *R.C. Vieira 262* (HUFU!); Várzea da Palma, –17.60, –44.73, 12 March 1995, *G. Hatschbach 61777* (MBM!); without a locality in Minas Gerais, 1838, *P. Claussen 171* (P!); without a locality in Minas Gerais, 1816–1821, *A. de Saint-Hilaire 1245* (P!); without locality in Minas Gerais, 1 July 1884, *Simard s.n.* (US, US 1112500); without a locality in Minas Gerais, November 1843, *M. Weddell 1678* (P!); **Pará:** 7–8 km from Alter do Chão on the Santerme road, –2.48, –54.92, 1 January 1993, *J.A. Ratter et al. s.n.* (INPA); **Paraná:** Nova Adradina, Rod. BR-267, 11 July 1969, *G. Hatschbach* 21763 (MBM!); **Rio Grande do Norte:** Natal, Rio Jaguaribe, –5.80, –35.21, 3 May 2006, *R.S. Melo 96* (UFRN); **São Paulo:** Aguas de Santa Bárbara, Estação Ecológica Águas de Sta.Bárbara, –22.84, –49.23, 24 September 2008, *N. Guerin et al. 236* (SPSF); Agudos, Fazenda Cia Cervejaria Brahma, –22.47, –48.99, 6 July 1995, *Bertoncini 623* (MBML); Altinópolis, Estrada Altinápolis-Cajuru, 4 km da Rodovia Altino Arantes, Morro do Forno, Fazenda Morro do Forno, –21.02, –47.37, 19 June 2003, *J. Lovo 2* (NY, SPF, SP); Anhembí, Fazenda Barreiro Rico, –22.78, –48.12, 2 May 1959, *M.P. Kuhlmann 4541* (UFP); Araraquara, Estrada Araraquara a Bauru 286 km, –21.79, –48.17, 3 July 1965, *S.F. Glassman & J.C. Gomes 8002* (F!, RB, SP!); Bauru, Jardim Botânico –22.31, –49.06, *M.H.O. Pinheiro 183, 222, 466* (HRCB); Bauru, Jardim Botânico Municipal, –22.31, –49.06, 6 December 1996, *M.H.O. Pinheiro 494* (IAC); Bauru, Entre Santo Antônio e Floresta, –22.3147, –49.0606, 27 September 1938, *J.E. Rombouts s.n.* (IAC!); Cabreúva, Jacaré, –23.237111, –47.042806, 2 March 1994, *K.D. Barreto et al. 2075* (ESA!); Campinas, –47.06, –22.90, 08, April 2004, *S.R. Morbiolo & R.L.*

Fonseca 2 (ESA!); Corumbatai, Mata da UNESP, 9 November 1993, *K.D. Barreto et al. 1562* (ESA!); Icém, Fazenda Velho—Usina Moema, 12 October 1994, *S.A. Barraca et al. 29SAB* (ESA!); Ilha Solteira, –20.43, –51.34, July 1979, *S. Bianco 10269* (UEC); Itaqui, without date, *G. Arbocz 1528*, (HPL!); Itú, Área de proteção, –23.26, –47.29, 8 January 1987, *S.M. Silva 25264* (UEC); Luís Antônio, Reserva de Jataí, –21.56, –47.70, 30 January 2003, *L.C. Bernacci & L. Bonjorne 3349* (IAC); Marília, Estrada perto de Marília, –22.21, –49.95, 20 June 1940, *E.S. Normanha & O. Zagatto 5621* (F!, IAC!, MBML!, SP-44403!, SP!); Mogi Guaçu, Estação experimental da Campininha, –22.37, –46.94, 12 April 1988, *L.C. Bernacci 20199* (UEC); Mogi Guaçu, Fazenda Campininha, 600 m, –22.37, –46.94, 19 November 1980, *A. Custodio Filho 493* (SP!); Mogi Guaçu, Fazenda Campininha-"Campos das Sete Lagoas". 3.6 km, northwest of Rio Mogi-Guaçu & village of Pádua Sales (or 23 km WNW of city of Mogi-Guaçu), 600 m, –22.37, –46.94, 12 November 1959, *G. Eiten 1478* (SP!); Mogi Guaçu, *G. Eiten & L.T. Eiten 2220* (SP); Mogi Guaçu, Fazenda Campininha-Cerrado, –22.37, –46.94, 22 June 1977, *M. Kirizawa 116* (SP!); Mogi Guaçu, Fazenda Campininha-Pádua Sales, Reserva Biológica, –22.37, –46.94, 6 May 1980, *W. Mantovani 741* (SP!); Mogi Guaçu, Fazenda Campininha-Pádua Sales, Reserva Biológica, –22.37, –46.94, 6 May 1980, *W. Mantovani 793* (SP!); Mogi Guaçu, Fazenda Campininha-Pádua Sales, Reserva Biológica, –22.37, –46.94, 23 June 1980, *W. Mantovani 779* (SP!); Mogi Guaçu, Fazenda Campininha-Martinho Prado, Reserva Biológica, –22.37, –46.94, 23 December 1980, *W. Mantovani 1518* (SP!); Mogi Guaçu, Fazenda Campininha-Martinho Prado, Reserva Biológica, –22.37, –46.94, 17 March 1981, *W. Mantovani 1727* (SP!); Mogi Guaçu, Fazenda Campininha-Perto de Pádua Sales, –22.37, –46.94, 24 May 1965, *J.R. Mattos 12239* (HAS!), *12304* (SP!); Mogi Guaçu, Fazenda Campininha-Perto de Paduá Sales. Reserva Florestal. No cerrado denso, –22.37, –46.94, 24 May 1965, *J.R. Mattos 12291* (SP!); Mogi Guaçú, Estação Ecológica de Mogi Guaçú, Reserva de Cerrado do Instituto de Botância, –22.37, –46.94, *M.R.P. Noronha 318* (HRCB); Moji Mirim, Horto Florestal, –22.43, –46.95, 3 May 1989, *R.L. Baldini 21935* (UEC); Moji Mirim, –22.43, –46.95, 16 October 1942, *M.P. Kuhlmann & P. Goncalves 47390* (F!, SP!); Moji Mirim, Horto Florestal de Mogi Mirim, –22.43, –46.95, March 1978, *D.V. Toledo Filho 9874* (UEC); Pariquera-Açu, –24.71, –47.88, 20 April 1998, *M.G.C. Gondim Jr. 29* (ESA!); Pirassununga, Cerrado de Emas, –22.03, –47.50, 24 November 1994, *S. Aragaki 256* (SP); Pirassununga, Cerrado de Emas, –22.03, –47.50, 19 July 1994, *M.A. Batalha 169* (SP); Pirassununga, 11 km north of Pirassununca, 1 km south of Emas, –21.99, –47.42, 14 July 1969, *S.F. Glassman 8749, 8750* (FTG!, MBM!, NY); São Paulo, Parque Estadual das Fontes do Ipiranga-Instituto de Botânica, Jardim Botânico, –23.54, –46.63, 1 December 1976, *Câmara s.n.* (SP!); São Paulo, Parque Estadual das Fontes do Ipiranga-Instituto de Botânica, Jardim Botânico, –23.54, –46.63, 15 December 1976, *F.S. Cavalcanti 12* (SP!); Sao Paulo, Tiete, 1936, W. *Hoehne & Gehrt s.n.* (F, SP-37053!); São Paulo, Parque Estadual das Fontes do Ipiranga, –23.54, –46.63, 21 September 1949, *W. Hoehne 3248* (NY, SP!); São Paulo, Parque Estadual das Fontes do Ipiranga-Instituto de Botânica, Jardim Botânico, –23.54, –46.63, 25 May 1977, *M. Kirizawa 263* (SP!); São Paulo, Parque Estadual das Fontes do Ipiranga-Jardim Botânico, cerca de 2,0 m de distância, –23.54, –46.63, 1 June 1977, *M. Kirizawa s.n.* (SP-204268!); São Paulo, Jardim Botânico, –23.54, –46.63, 15 May 1997, *M. Kirizawa 3351* (SP); São Paulo, Parque Estadual das Fontes do Ipiranga-Instituto de Botânica, Jardim Botânico, –23.54, –46.63, 1 June 1977, *M.G.L. Wanderley 109* (SP!); São Pedro, Rod. Ulisses Guimarães, –22.54, –47.91, 5 March 1997, *A. Jr. Amaral & J.O. Mendonça 265397* (BOTU); São Paulo, Rio Feio. Paccas. Expedição do Rio Feio, October 1905, *G. Edwall ERF144* (SP!); **Tocantins:** Palmeirópolis, –13.04, –48.40, 23 January 1992, *G. Hatschbach 56344* (MBM!); **Without locality**: *Sello s.n.* (LE, P!); *Gardner 4028* (K); *A.F.M. Glaziou s.n.* (A).

21. *Syagrus glaucescens* Glaz. ex Beccari (1916: 470). Type:—BRAZIL. Minas Gerais: Biribiry, Prés Diamantina, 28 March 1892, *A.F.M. Glaziou 20024* (holotype FI, isotype C, F!, K!, MO, P!)

Figure 30 plate, Figure 29 map.

Moderately-sized, solitary palm. **Stem** ca. 0.5–4 m × (8–)10–12 cm angular in appearance, with persistent leaf bases or leaf scars arranged in rows with no or indistinct internodes. **Leaves** 5–15; *sheathing leaf base* ca. 42–52 × 6–8 cm; *pseudopetiole* 28–55 cm long; *petiole* 6–36 × 1.4–2.0 cm, 0.7–1.0 cm thick; *rachis* (55–)62–118 cm long; *leaflets* slightly lighter on the abaxial surface, (38–)59–79 along one side, in clusters of 3–5, inserted at various angles, giving the leaf a plumose appearance, no ramenta scales present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 11–34 × 0.1–1.0 cm, middle leaflets 16–29(–35) × 1.5–

3.0 cm, apical leaflets 1.5–6 × 0.2–1.0 cm with an asymmetric tip. **Inflorescence** erect or pendulous, spirally branched; *prophyll* ca. 18 × 2.5 cm; *peduncular bract* (35–)39–85 cm, expanded portion 25–40 × 4–9 cm, including a 0.5–3.0 cm beak, 5.5–12 cm perimeter, 2–4 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 21–64 cm × 7–9 mm, 3–6 mm thick, elliptical in cross-section, glabrous; *inflorescence axis* 16–30 cm long; *rachis* 5–16 cm long; *rachillae* 5–17, glabrous, 6–15 cm long at the apex, 8–19 cm long at the base; *staminate flowers* 8–12 mm long at the apex, 14–17 × 3–4 mm at the base, green to yellow, sepals 1.5–2.5 × (0.5–)2–2.5 mm, glabrous, with no visible nerves, petals 8–11 mm long at the apex, 9–14 × 2–4 mm at the base, with acute tips, glabrous, nerves slightly raised, stamens 6–8.5 mm long, anthers 5–7.5 mm long, filaments 1–2 mm long, pistillode less than 1 mm long, ca. 0.6 mm long; basal *pistillate flowers* elongate pyramidal, 10–17 × 6.0–7.5 mm, yellow, sepals 10–15 × 6–7 mm, glabrous with no visible nerves, keeled, petals 8–12 × 4–6 mm, glabrous, with slightly raised nerves, valvate tips 1/3 to nearly 4/5 the length of the petal, ca. 3–8 mm long, pistil 6–9 × 4–6 mm, glabrous, stigmas less than 3–4 mm long, glabrous, staminodal ring ca. 0.7–2 mm high, 6-dentate. **Fruit** ellipsoid, 2–3 × 1.6–2.5 cm, brownish when mature, covered with a short lepidote, epicarp less than 0.5 mm thick, mesocarp 1–2 mm thick, succulent and fibrous; *endocarp* ellipsoid to ovoid, ca. 2–2.8 × 1.7–2.1 cm, (2–)3–4 mm thick on the sides, 4–9 mm thick at the tips; *seed* more or less ellipsoid ca. 1.2–1.4 × 1.1–1.2 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—coco-da-pedra, palmeirinha-azul, blue-rock-coconut

Etymology:—The specific epithet, *glaucescens,* means glaucous and refers to the grayish or bluish green of the leaves due to the waxy bloom present on both sides of the leaflets.

Distribution and habitat:—Endemic to the Brazilian state of Minas Gerais in the Cadeia do Espinhaço in cerrado and high elevation campo rupestre over rocky terrain and in very rocky soils. This species has the greatest distribution of the entire *S. glaucescens* complex, which also includes *S. duartei* to the south and the acaulescent *S. evansiana* to the north along with some confusing intermediates. This species is most abundant in the region near Diamantina, but specimens have been seen as far south as the northern edge of the Serra do Cipó Nacional Park and as far north as Mendanha.

Conservation:—Because this palm grows so slowly and it is sought after by plant collectors, it is threatened in its natural habitat. Nevertheless, its rocky habitat makes it very difficult for the poachers to dig it up successfully or for fire to reach it. This species is protected within the boundaries of a national park (Diamantina) and also in other areas that are environmentally protected; however that does not stop poachers. It also does not grow in agriculturally valuable soils. However outside of these protected areas its habitat continues to decline and the total extent of its occurrence (EOO) is probably under 20,000 km^2 and for that reason it is classified as vulnerable, VU B1ab(iii).

Phenology:—Flowering and fruiting in September. This species fruits moderately during the months of spring and summer (September–March). Propagation is only by seed, but the germination rate is low, and it germinates slowly, taking as long as 6 months.

Uses:—Palms with notable ornamental characteristics like bluish-green foliage are sought by landscapers. For its rustic beauty, it possesses the potential for cultivation in general landscaping in both tropical and subtropical regions.

Notes:—This species is **s**imilar to *S. duartei*, but *S. glaucescens* has smaller fruits (2.5 vs. 3.0–4.0 cm) and unlike *S. duartei*, this species always has an upright stem. The smaller fruits and endocarps are more ellipsoid in *S. glaucescens*, but globose or even broader than long in *S. duartei*. The number of rachillae (ca. 5–8 for *S. duartei* vs. 5–17 for *S. glaucescens*) is not a reliable character, although it has been used previously (Lorenzi *et al.* 2010) to distinguish these two species.

Representative specimens:—BRAZIL. **Minas Gerais:** Biribiry, 26 March 1892, *Herb. Schwake 8471* (RB!); Conceição do Mato Dentro, Cava do Sapo, 950 m, –18.91, –43.43, February 2012, *L.B. Carvalho s.n.* (BHCB); Conceição do Mato Dentro, Parque Natural Municipal do Ribeirão do Campo, 9 November 2002, *R.C. da Mota & P.L. Viana 1693* (BHCB); Conceição do Mato Dentro, –19.00, –43.40,14 August 2012, *E. Tameirão Neto & C.V. Vidal 5086* (BHCB); Conselheiro Matar, Próximo à Rodovia Diamantina-Belo Horizonte, entrando em estrada de terra 1 km antes da Saída para Conselheiro Matar. Aflorações rochosas a 2 km da rodovia, 500 m antes da Porteira da Fazenda Rio Pardo, 4 November 1993, *A.M. Benko-Isepon s.n.* (UFP); Datas, –18.45, –43.66, 20 August 1987, *R.A. Cytryn 09* (RB!); Datas, Estrada Curvelo-Diamantina, KM110, –18.45, –43.66, 5 April 1983, *G. Martinelli 9168* (RB!); Datas, Datas & Morro do Coco (1 km do entroncamento para Diamantina), 1200–1300 m, 24 March 1986,

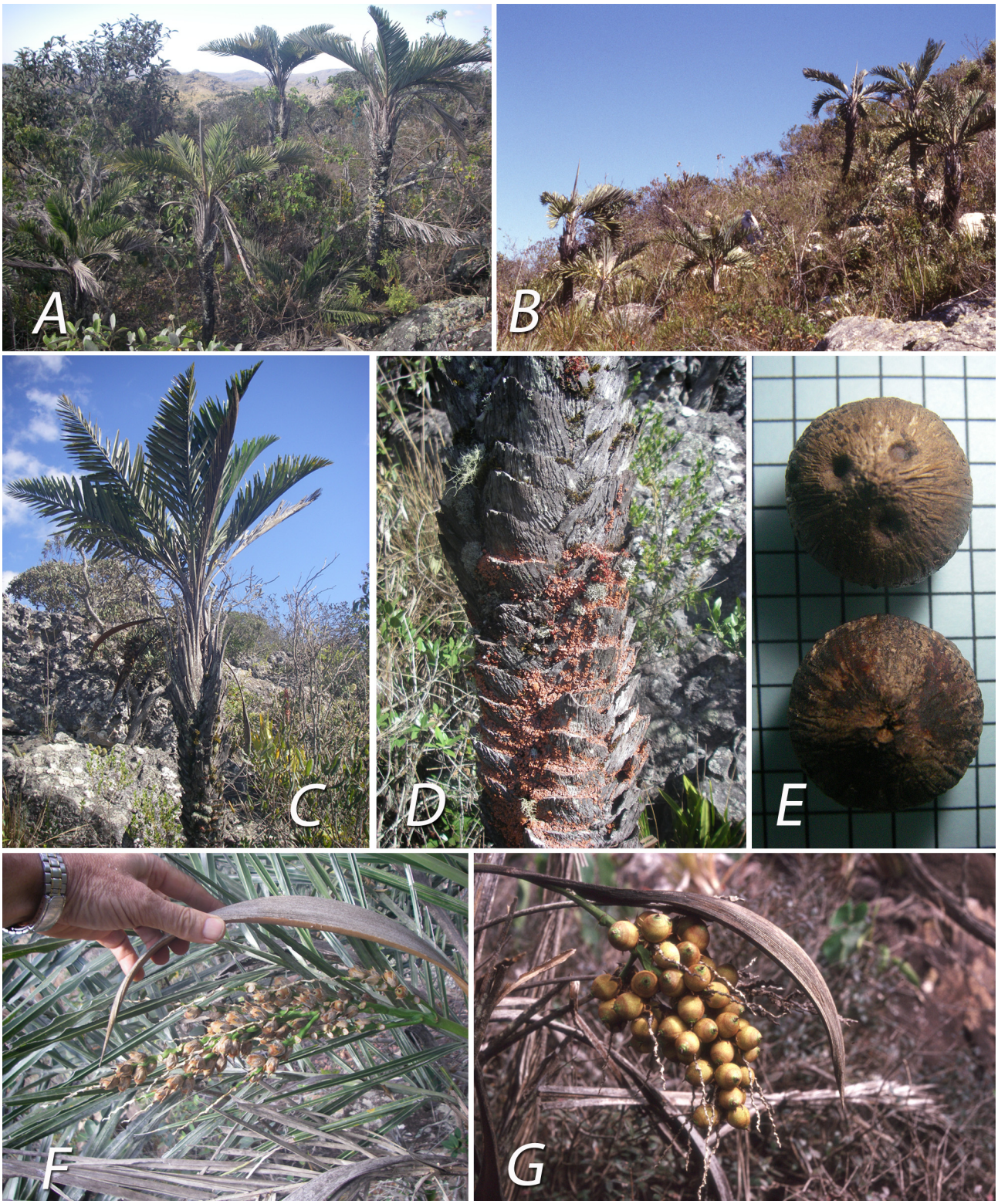

FIGURE 30. *Syagrus glaucescens*. A. Habitat and habit of palms. B. Palms on very rocky terrain. C. Habit. D. Stem with closely spaced internodes and sheath remains arranged in rows. E. Endocarps F. Inflorescence with young developing fruits. G. Infructescence. Grid is in 0.5 centimeters.

R. Mello-Silva et al. 9768 (K, SPF 43013!); Diamantina, ca. 15 km de Diamantina, na rod. Mendanha-Diamantina, 1119 m, –18.19, –43.52, 9 November 2002, *Araújo, A.O. et al. 158* (ESA!); Diamantina, –18.25, –43.60, 20 August 1987, *R.A. Cytryn 05* (RB!); Diamantina, Serra do Biribiry. 7 km W of Diamantina. In cerrado, rocky soil, –18.25, –43.60, 15 July 1965, *S.F. Glassman 8111, 8112, 8114, 8116* (F!, RB, SP!); Diamantina, Serra do Gombo. 18 km NW

of Diamantina, Cerrado, rocky soil, –18.25, –43.60, 15 July 1965, *S.F. Glassman 8159* (SP!); Diamantina, Rio Pardo-Rodovia Linha Verde-Conselheiro Mata, –18.25, –43.60, 25 July 1998, *G. Hatschbach 68248* (HUFU, MBM!); Diamantina, –18.25 –43.60, 23 October 1999, *G. Hatschbach 69594* (MBM!); Diamantina, Campo Rupestre, –18.25, –43.60, June 1990, *K.I. Horst 61* (MBML!); Diamantina, Norte de Diamantina, Direção de Araçuai, July 1990, *K.I. Horst 76* (MBML!); Diamantina, Serra do Espinhaço, ca. 23 km E of Diamantina, 900 m, 15 March 1970, *H.S. Irwin 27605* (NY!); Diamantina, APA Pau-de-Fruta-COPASA, –18.25, –43.60, 13 February 2001, *J.A. Lombardi 4240* (BHCB); Diamantina, na estrada para Monjolos a ca. de 3 km da rodovia, 1400 m, –18.27, –43.71, 19 January 2010, *H. Lorenzi 6799* (HPL!); Diamantina, Estrada Turmalina/Diamantina, MG-2, 33 km de Diamantina, –18.25, –43.60, 13 May 1979, *G. Martinelli 5918* (RB!); Diamantina, Fazenda do "Seu Geraldão," acesso por Inhaí, 1154 m, –17.93, –43.89, 2 May 2010, *C.B.R. Munhoz et al. 7172* (UB!); Diamantina, ca. 10 km N of the city on BR-367, the road to Mendanha, 1000–1100 m, –18.25, –43.60, 19 March 1992, *L.R. Noblick 4843* (BHCB!, F!, FTG!, K!, NY!, US!); Diamantina, near Mendanha, 1 km S of the Rio Jequitinonha on BR-367, 400–500 m, –18.12, –43.50, 19 February 1992*, L.R. Noblick 4845* (BHCB!, FTG!); Diamantina, Cachoeira da Sentinela, –18.01, –43.62, 21 September 2000, *J.R. Stehmann et al. 2671* (BHCB); Diamantina, estrada Diamantina-Conselheiro Mata, km 185, 28 January 1986, *D.C. Zappi et al. 9371* (SPF 42629!); Diamantina, estrada Diamantina-Biribiri, ca. 6 km de Diamantina, 1200 m, –18.22, –43.62, 19 July 1987, *D.C. Zappi et al. 11090* (SPF!); Lagoa Santa, Serra do Cipó, Trilha para Poço Azul, –19.35, –43.62, 4 November 2009, *R.C. Oliveira & Chacon, R.G. 2489* (UB!); Mendanha, Vicinity of Mendanha, –18.25, –43.60, 24 September 1936, *W.A. Archer 4078* (BH!, RB!, US!); Mendanha, 5 km SE of Mendanha, 13 August 1976*, S. Glassman 13002* (F!, FTG!); Mendanha, estrada para Diamantina, ca. 5 km de Mendanha, 800 m, –18.14, –43.50, 24 February 2002, *V.C. Souza et al. 28323, 28324* (ESA!); Rio Vermelho, Pedra Menina, Serra do Ambrósio, Morro da Virada do Mato Virgem, 31 July 1985, *R. Mello-Silva et al. 7833* (SPF 38799!); Santana do Riacho, Parque Nacional da Serra do Cipó, 1122 m, –19.28, –43.59, 1 October 2010, *S.B. Reis & V.S. Azevedo 2* (BHCB); Santana do Riacho, Serra do Cipó, km 135, –19.17, –43.71, 27 April 1978, *G. Martinelli 4419* (RB); São Gonçalo do Rio Preto, Parque Estadual do Rio Preto, –18.00, –43.33, 17 November 1999, *J.A. Lombardi s.n.* (BHCB); Serro, Milho Verde, –18.60, –43.38, 24 July 2002, *R.C. Mota da 1610* (BHCB); Serro, Grota Seca. São Gonçalo do Rio das Pedras, –18.60, –43.38, without date, no collector (BHCB); **Without specific locality**: Minas Gerais, *A.F.M. Glaziou 20024* (K!, MO); Minas Gerais, June 1990, *K.I. Horst 64* (MBML!); Minas Gerais, 1816–1821, *A. Saint-Hilaire de 1232* (P!).

22. *Syagrus glazioviana* (Dammer) Beccari (1916: 466). *Cocos glazioviana* Dammer (1902: 21). Lectotype (designated by Glassman [1968b: 370]):—BRAZIL. Goiás: Morro do Frota, near Meia Ponte, 5 September 1894, *A.F.M. Glaziou 22254* (lectotype, C! [F neg. 21138], isolectotypes FI, G, K, P!)

Cocos petraea var. *alpina* Drude *in* Martius (1881: 426). *Syagrus petraea* var. *alpina* (Drude) Beccari (1916: 467). *Syagrus glazioviana* var. *alpina* (Drude) Glassman (1968b: 370).Type:—BRAZIL. Goiás: Sertão d'Armoleite, September–October 1844, *H.A. Weddell 2775* (holotype P!).

Figure 31 plate, Figure 29 map.

Small, solitary palm, usually less than 1.2 m tall, but can vary from 40–120 cm tall. **Stem** a short underground stem, appearing acaulescent. **Leaves** 4–8; *sheathing leaf base* ca. 3–35 cm long; *pseudopetiole* 6–45(–62) cm long; *petiole* 4–29 × 0.4–1.1 cm, 0.2–0.7 cm thick; *rachis* 24–120(–129) cm long; *leaflets* slightly lighter on the abaxial surface, 10–30(–40) along one side, nearly regular, single near the apex, or in loose clusters of 2–3 near the base, inserted at various but only slightly divergent angles, leaves lie more or less in the same plane, flat, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 13–40 × 0.1–0.5 cm, middle leaflets 17–60(–69) × 0.6–1.3 cm, apical leaflets 8–40 × 0.1–0.7 cm with an asymmetric tip. **Inflorescence** erect, usually spicate or less commonly branched; *prophyll* 6–20 × 0.7–2.2 cm; *peduncular bract* 12–69 cm long, expanded portion 9.5–29 × 1.2–3.8 cm, including a 0–3(–4) cm beak, 2–6.5 cm perimeter, 1–4 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. (3–)5–38(–50) cm long × 3–7 mm thick, elliptical in cross-section, glabrous; *inflorescence axis* 5–26 cm long; *rachis* absent but rarely to 5 cm long; *rachillae* 1–3(–6), glabrous, 4–13(–17) cm long at the apex, 1.5–11 cm long at the base; *staminate flowers* 7.8 mm long at the apex, 8.0 × 2.6–4.8 mm at the base, green to yellow, sepals 1.5–2.0 × 1

mm, glabrous, petals 6.9 mm long at the apex, 8.0 × 2.2–2.6 mm at the base with acute tips, nerves indistinct, stamens 4.4–5.1 mm long [original description says 10 mm], anthers 3.7–4.8 mm long, filaments 0.7–1.1 mm long, pistillode less than 0.5 mm long; *pistillate flowers* pyramidal to conical, ca. 9 × 6 mm at the apex, 7–10(–16) × 4–7 mm at the base, yellow, glabrous, sepals 10 × 6–7 mm, petals 9.5–10 × 5–6 mm, glabrous, tips only slightly valvate, not measured, pistil not measured, glabrous, stigmas not measured, glabrous, staminodal ring not measured. **Fruit** globose, 2.0–3.0 × (1.4–)1.9–2.0 cm, yellowish green when mature, glabrous to tomentose, epicarp less than 1 mm thick, mesocarp thickness not measured, succulent and fibrous: *endocarp* ca. 2.2–2.5 × 1.6–2.5 cm, thickness not measured; *seed* ellipsoid not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—ariri, côco-de-raposa, coquinho-da-serra, côco-de-vassoura; acumã, guriri.

Etymology:—The specific epithet, *glazioviana,* is in honor of the collector Auguste François Marie Glaziou (1828 –1906). He was a French landscape designer and botanist, who was born in Lannion, Brittany. In Paris, he earned a degree in civil engineering and took classes at the Muséum National d'Histoire Naturelle. In 1858, Emperor Dom Pedro II asked him to relocate to Rio de Janeiro as director of parks and gardens.

Distribution and habitat:—Found in Mato Grosso, Goiás, Tocantins, Minas Gerais, Piauí(?), and Bahia, Brazil. In Bahia, it is found in the cerrado areas west of the Rio São Francisco in the planalto region of Brazil. This species grows well in variable habitat and soil types within the cerrado, from forested environments to open, semi-open, and very exposed "campo limpo" cerrado environments, from deep fine sandy soils to very rocky soils.

Conservation:—This species appears to be a widely distributed complex spread throughout several Brazilian states. Some are protected within the borders of national parks (i.e. Grande Sertão Veredas) and in relatively untouched low-elevation cerrados that are unsuitable for soybean production. The complex is not completely understood, but until we know more, it can only be classified as least concern, LC.

Phenology:—This palm appears to flower and fruit year around, most specimens collected in flower in September and October but few with mature fruits. The species fruits rarely during the spring months.

Uses:—Leaves are gathered and bound together to make brooms (côco de vassoura). The plant is ornamental, could be used in gardens in tropical or subtropical regions (tolerates weak freezes).

Notes:—This palm has been misidentified as *S. petraea*, but *S. petraea* of Bolivia has a different leaflet anatomy. *Syagrus petraea* has adaxial fiber bundles that are short and narrow and most reach only 1/5 to ¼ the distance across the mesophyll, whereas *S. glazioviana* has thicker leaflets and longer, thicker fiber bundles, most of which reach 1/3 to ½ the distance across its mesophyll (Noblick 2013a). This is an acaulescent palm with usually spicate inflorescence, long narrow, often dark bluish green, coriaceous leaflets that are arranged either regularly or in loose clusters.

Syagrus glazioviana is an extremely variable palm. Inflorescences and leaves vary in size and even somewhat in shape, partly as a response to soil composition, available light, and soil moisture. Most keys are inadequate in distinguishing this palm species, because its characters are so inconsistent. It forms a confusing complex, and perhaps there is some introgressive hybridization with other cerrado palms. More field and laboratory research is needed to make any sense out of this. The large series of collections certainly testifies to the struggle to understand and document the variation in this species.

In Bahia, plants with shorter (ca. 10–12 cm in length) and more depauperate peduncular bracts and smaller leaves with more tightly clustered leaflets belong to *S. allagopteroides*. The longer or larger peduncular bracts (to 61 cm) probably belong to *S. glazioviana*. Occasionally on the same plant, or different plants in the same population, *S. glazioviana* will display branched inflorescences with up to 6 rachillae. The leaves are long with loosely spaced leaflets, often regularly arranged near the leaf tip, but in irregular loose groups of ca. 2 or 3 leaflets near the base. The larger leaves of *S. glazioviana* are more apt to have regularly spaced to lose groupings of leaflets. The fruits seem to be consistent in size.

Most recently this species was studied in the northern portion of Minas Gerais and Goiás, and most of the measurements for this palm come from the Minas Gerais collections.

Representative specimens:—BRAZIL. **Bahia:** Baianópolis, 2 km E of the village of Mandacaru, 770 m, –12.30, –44.53, 14 October 1988*, L.R. Noblick & J.L. de S. Lima 4624* (CEPEC!, F!, HTSA!, UC!, US!); Barreiras, 28 km W of Barreiras, cerrado, associated with *Bactris* [*Astrocaryum campestre*] and *Attalea*, 23 August 1976*, S.F. Glassman 13043–13046* (F!, MO!, SP!); Barreiras, 10 km L. da divisa Goiás-Bahia, 9 October 1981, *G. Hatschbach 44102* (MBM!, NY!); Barreiras, 18 km N of the BR 020 at Posto Cerradão (66 km W of Barreiras). Cerrado vegetation with fine light brown sandy soils, 740 m elevation, –12.13, –45.00, 26 October 1988*, L.R. Noblick & J.L.*

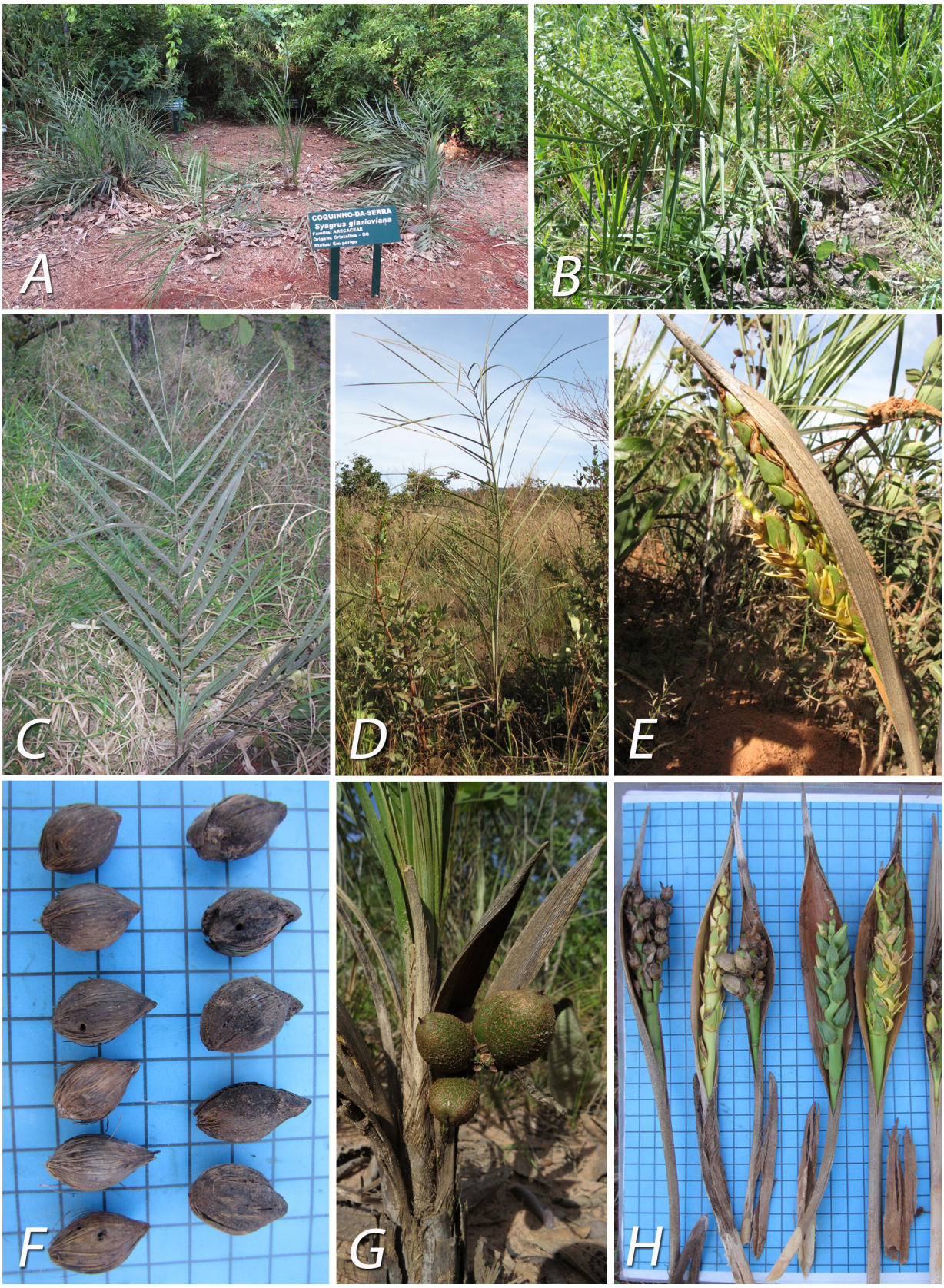

FIGURE 31. *Syagrus glazioviana*. A. Variable habit of plants from Goiás displayed at Jardim Botânico Plantarum. B. Habit at its type locality on Morro de Frota (Pirenópolis, Goiás). C. Leaf near Coromandel, Minas Gerais. D. Leaf with narrower leaflets near Chapada Gaúcha, Minas Gerais. E. Inflorescence. F. Endocarps. G. Fruits. H. Inflorescences and infructescences with prophylls. Grid is in centimeters. Photo B by Renata Martins.

de S. Lima 4670 (HTSA!, F!, IPA!); Coribe, 13 km nordeste da cidade na BA 172, 600–700 m, –13.83, –44.47, 31 January 1986*, L.R. Noblick & J. Lobo 4521* (F!, HUEFS!); Coribe, 12 km S of the city on the road to Côcos, 660 m, –13.83, –44.47, 18 October 1988*, L.R. Noblick & J.L. de S. Lima 4643* (CEN!, CEPEC!, F!, HTSA!, NY!); Cristópolis, Agua Doce, 11 km E of Cristópolis on BR 242, 720 m, –12.23, –44.42, 13 October 1988*, L.R. Noblick & J.L. de S. Lima 4616* (HTSA!, F!), *4617* (BAH!, CEN!, CEPEC!, F!, HTSA!, K!, MICH!, MO!); Correntina, na estrada para Brasília (local Rosário), 980 m, –13.94, –46.19, 5 March 2009, *H. Lorenzi 6643* (HPL!); Jaborandi, 12 km S of the Rio Arrojado on road, Correntina/Jaborandi, 600 m, –13.53, –44.28, 17 October 1988*, L.R. Noblick & J.L. de S. Lima 4636* (CEPEC!, F!, GH!, HTSA!); Jaborandi, 5 km N of the village of Gatos, 640 m, –13.53, –44.28, 17 October 1988*, L.R. Noblick & J.L. de S. Lima 4637* (CEPEC!, F!, HTSA!); Santana, ca. de 10 km ao noroeste da cidade na estrada Santana/Baianópolis em cima de planício da serra, 700–850 m, –12.98, –44.05, 3 January 1986*, L.R. Noblick & J. Lobo 4527* (CEPEC!, F!, FTG!, HRB!, HUEFS!, K!, NY!, RB!, SP!); São Desidério, 8 km W of São Desidério on road to Sítio Grande, 660 m, –12.37, –45.97, 24 October 1988*, L.R. Noblick & J.L. de S. Lima 4659* (F!, FTG!, HTSA!), *4662* (CEPEC!, F!, FTG!, HTSA!). **Distrito Federal:** Brasília, Área de Chapada, CPAC, km 18, 22 May 1979, *S.P. Almeida et al. 60* (CEN); Brasília, CPAC—Planaltina, BR–020, km 18. Área de Chapada, 22 May 1979, *S.P. Almeida et al. 72* (CEN); Brasília, EEJBB, 102 m, –15.87, –47.85, 14 June 2005, *S.F.N. Aguiar 110* (HEPH); Brasília, Jardim Botânico de Brasília, –15.87, –47.83, 18 June 2004, *C. Bernardes 3* (UB!); Brasília, Fazenda Sucupira, –16.50, –48.00, 5 April 2007, *P.S. Carvalho 163* (UB!); Brasília, Chapada da Contagem, DF-001; km 11,3 do posto Colorado, 1160 m, 12 July 1990, *T.B. Cavalcanti et al. 494* (CEN); Brasília; A cerca de 2 km a leste do balão da Escola Fazenda, 1000 m, –15.83, –47.80, 2 June 1992, *Cavalcanti, T.B. et al. 1230* (CEN); Brasília, CPAC Área de Chapada-Bloco "A" do Experimento 11, 1175 m, –15.59, –47.71, 22 August 1979, *M.C.A. Conceição & J.C. de S. Silva 95* (CEN); Brasília, CPAC-bloco "B" do Exp. 112. Planaltina 1175 m, –15.59, –47.71, without date, *M.C.A. Conceição & J.C. de S. Silva 142* (CEN); Brasília, Cerrado próximo á Escola Fazendária (RECOR), á direita, –15.78, –47.93, 24 September 1979, *L. Coradin et al. 2357* (CEN, UB!); Brasília, Na DF-100 A 99, 7 km do CENARGEN/EMBRAPA 1085 m, –15.88, –47.38, 5 May 1992, *T.A.B. Dias et al. 100* (CEN); Brasília, Gama, Parque Recreativo e Reserva Ecológica do Gama, –16.05, –48.05, 4 April 2001, *B.M Gomes et al. 291, 292* (UB!); Brasília, Universidade, UnB to Av. das Nações path, (E); 0,7 km to laundry, 800–1200 m, –15.48, –47.32, 13 January 1970, *R. Goodland 4239* (UB!); Brasília, Estação Ecológica de Águas Emendadas, ca. 30 km NE of Brasília. The divide of the Tocantins basin (Corrego Vereda Grande-Rio Maranhão); and the Paraná basin (Corrego Brejinho-Rio São Bartolomeu); is located in the reserve, –15.58, –47.58, 17 September 1998, *G. Gottsberger & I.S. Gottsberger 21-170998* (UB!); Brasília, Parque Nacional de Brasília, –15.78, –47.93, 5 September 1974, *E.P. Heringer 13940* (UB!); Brasília, Jardim Botânico de Brasília, 1025–1150 m, –15.87, –47.85, 16 April 1998, *R.C. Martins & Ramos 204* (UB!); Brasília, Estação Ecológica do Jardim Botânico de Brasília, –15.78, –47.93, 21 April 1998, *R.C. Martins 214, 215, 216* (UB!); Brasília, Fazenda Água Limpa-UnB, –15.78, –47.93, 11 February 1999, *R.C. Martins 224* (UB!); Brasília, Núcleo Rural do Rio Preto, –15.78, –47.93, 13 April 1998, *R.C. Martins 232, 233, 234* (UB!); Brasília, EEJBB, –15.91, –47.96, 11 July 2006, *R.C. Martins 597*C (HEPH); Brasília, JBB Trilha Ecológica, 102 m, –15.87, –47.85, 15 August 2006, *R.C. Martins 618* (HEPH); Brasília, Estação Ecológica do Jardim Botânico de Brasília, –15.89, –47.85, 27 April 2011, *R.C. Martins et al. 1132, 1134* (UB!); Brasília, Fazenda Água Limpa, –15.92, –47.91, 2 September 2002, *R.C. Mendonça 4905* (UB!); Brasília, EEJBB Cristo Redentor, 18 September 2003, *L.C. Milhomens 249*, *250* (HEPH); Brasília, Centro Olímpico, Universidade de Brasília, 1012 m, –15.77, –47.86, 13 September 2006, *S.C. Miranda et al. 1020* (UB!); Brasília, Fazenda, Agua Limpa (Ecological reserve of the Universidade da Brasília), ca. 20 km SSW of the city of Brasília, 1100–1200 m, –15.95, –47.95, 4 May 1992, *L.R. Noblick 4861* (FTG!, UB!); Brasília, Universidade de Brasília, –15.78, –47.93, 23 October 1975, *F.H.F. Oldenburger 1584* (UB!); Brasília, EEJBB Beira de estrada, 102 m, –15.91, –47.89, 8 June 2006, *V.F. Paiva 386* (HEPH); Brasília, vicinity of Sobradinho, 14 September 1964, *G.T. Prance & N.T. Silva 59045* (NY!, UB!); Brasília, Parque Nacional, –15.78, –47.93, 4 October 1972, *J.A. Ratter 2591* (UB!); Brasília, Fazenda Água Limpa, –15.78, –47.93, 23 September 1976, *J.A. Ratter 3640* (UB!); Brasília, Fazenda Água Limpa, ca. 18 SSO da torre da TV, Vargem Bonita, –15.78, –47.93, 26 August 1980, *J.A. Ratter et al. 4368* (UB!); Brasília, Fazenda Água Limpa, –15.78, –47.93, 22 October 1980, *J.A. Ratter 4563* (UB!); Brasília, Fazenda Sucupira, Riacho Fundo I, 1100 m, –15.88, –48.02, 30 August 2003, *F.M. Santos et al. 53* (UB!); Brasília, 1140 m, –15.95, –47.92, 3 October 1987, *A.O. Scariot & L. de B. Bianchetti 19* (CEN); Brasília, ARIE do Cerradão, ARIE do Cerradão, –15.85, –47.82, 2 October 2007, *J.S. Silva 74* (UB!); Brasília; Condomínio Belo Horizonte, entrada para a Ermida D, 1030 m, –15.80, –47.81, 29 September 2001, *G.P. Silva 5451* (CEN); Brasília, Reserva Ecológica do IBGE, –15.92, –47.87, 16 May 2002, *M.A. Silva 5296* (UB!);

Gama, Núcleo Rural Ponte Alta, Recanto dos Buritis, 1073 m, –15.99, –48.19, 22 February 2011, *R.C. Martins & Moreira 1125–1130* (UB!); Distrito Federal, Riacho Fundo, Fazenda Sucupira, –15.92, –48.02, 19 May 1999, *J.G. Faria 137* (UB!); Distrito Federal, APA de Cafuringa. Região do Catingueiro II. Sítio Flor das Águas, 840 m, –15.54, –47.97, 3 June 2011, *M.R.V. Zanatta et al. 637* (UB!); **Goiás:** Anápolis, BR 414, saída de Anápolis para Pirenópolis, –16.22, –48.92, 18 December 2010, *R.C. Martins et al. 1105, 1106* (UB!); Anápolis, BR 414, depois de Anápolis, –16.15, –48.89, 18 December 2010, *R.C. Martins et al. 1110* (UB!); Anápolis, GO-330 towards Leopoldo Bulhões, 7–8 km S of the intersection with BR060/BR-153 (entrance to Anápolis). 700–800, –16.33, –48.97, 7 May 1992, *L.R. Noblick 4866* (FTG!, UB!); Caldas Novas; Alternativa 9; margem direita do Rio Corumbá, 720 m, –17.70, –48.53, 28 October 1993, *R.F. Vieira et al. 1779* (CEN); Campinaçu; Estrada Niquelândia-Campinaçu 420 m, –14.05, –48.50, 6 October 1995, *T.B. Cavalcanti et al. 1814* (CEN); Campo Alegre de Goiás, Região de Catalão, –17.63, –47.78, 14 August 1996, *A.G. Ribeiro 51* (HPL!); Campo Alegre de Goiás, no km 175, lado esquerda para quem sai de Cristalina, 953 m, –17.37, –47.79, 18 June 2008, *R. Tsuji et al. 2683* (HPL!); Cocalzinho, BR 414, depois de Cocalzinho, –15.76, –48.43, 18 December 2010, *R.C. Martins et al. 1111, 1112, 1113, 1114, 1115* (UB!); Corumbá de Goiás, Corumbá de Goiás, 15 km ao N de Corumbá de Goiás, Serra do Pirineus, 1250–1300 m, –15.92, –48.81, 14 May 1973, *W.R. Anderson 10247* (NY!, RB UB!); Corumbaíba, Afluente esquerda do córrego Gameleira, 600, –18.14, –48.56, 23 September 1993, *G.P. Silva et al. 1960* (UFG); Cristalina, na estrada para Catalão, 4 October 2004, *H. Lorenzi 4935* (HPL!); Cristalina, nas proximidades do Municipio de Cristalina, sentido Catalão (km 180), –16.77, –47.61, 19 June 2008, *R. Tsuji et al. 2686* (HPL!); Formosa, Na estrada para Cabeceira de GO, 3 March 2004, *H. Lorenzi 4707* (HPL!); Luziânia, Luziânia, –16.25, –47.95, 18 July 1978, *T.S. Filgueiras 234* (UB!); Luziânia; Borda Norte da Chapada, Faz. do Sr. Azarias, 940 m, –16.35, –48.20, 10 April 2003, *G.P. Silva et al. 7507* (CEN); Montes Claros de Goiás, Fazenda Funil, 382, –15.88, –51.90, 29 May 2010, *M.R.V. Zanatta et al. 533* (UB!); Morro da Frota, prés de Meia Ponte, 5 September 1894, *A.F.M. Glaziou 22254, 22255* (P!); Morro da Frota, prés de Meia Ponte et ano campos d'Abbada, 10 September 1894, *A.F.M. Glaziou 22262* (P!); Mossâmedes, S. Dourada, divisa dos mun. de Mossâmedes ao Sul e Goiás ao Note. Área da UFG, without date, *J.A. Rizzo 4200* (UFG!); Niquelândia, Mineradora Anglo American Brasil LTDA, Antiga CODE, –14.13, –48.35, 15 November 20007, *M.A. Silva et al. 6246* (UB!); Niquelândia, Estrada que sai da Rodovia Uruaçu-Niquelândia (ca. de 60 km de Uruaçu) em direção a Barra Alto, 600 m, –14.47, –48.46, 15 July 2000, *V.C. Souza et al. 23916* (ESA!) [var. alpina?]); Niquelândia; Beira de córrego, a cerca de 1 km da Serra Negra, 460 m, –14.47, –48.45, 23 November 1992, *R.F. Vieira et al. 1369* (CEN); Planaltina de Goiás, Limite com D.F., without date, *R.C. Martins 1077* (UB!); Planaltina, na estrada entre Planaltina e Formosa, ca. 6 km de Planaltina BR-020, 1063 m, –15.63, –47.60, 18 June 2008, *R. Tsuji et al. 2684* (HPL!); Prés la Capelinha de Santo Antonio, 21 October 1894, *A.F.M. Glaziou 22256* (P!); Uruaçu: Uruaçu-Niquelândia road (GO-237), ca. halfway between Uruaçu and Niquelândia or 60 km E of Uruaçu then S on a dirt road towards Alta Barra, ca. 633 m, –14.53, –48.70, 15 January 2014, *L.R. Noblick & H. Lorenzi 5642* (ESA!, HPL!, K!, FTG!, NY!) [var. alpina?]); **Minas Gerais:** Chapada Gaúcha, na estrada para Arinos, 794 m, –15.31, –45.62, 4 March 2009, *H. Lorenzi 6637* (HPL!); Chapada Gaúcha, Parque Nacional de Grande Sertão Veredas on park road (Formosa/Chapada Gaúcha) just 16 km W of the intersection with the paved road that goes to Chapada Gaúcha. Elevation ca. 872 m, –15.41, –45.98, *L.R. Noblick & H. Lorenzi 5652* (ESA!, HPL!, FTG!, NY!); Chapada Gaúcha, 16 km S of the city in direction of Serra das Araras. Elevation ca. 752 m, –15.38, –45.58, *L.R. Noblick & H. Lorenzi* 5653 (ESA!, FTG!); Chapada Gaúcha, 18 km E of the city on the road to Montalvania. Elevation ca. 739 m, –15.38, –45.58, *L.R. Noblick & H. Lorenzi 5654* (ESA!, HPL!, FTG!, NY!); Chapada Gaúcha, 64 km E of the city on the road to Montalvania. Elevation ca. 788 m, –14.96, –45.18, *L.R. Noblick & H. Lorenzi 5655* (ESA!, HPL!, FTG!, NY!); Chapada Gaúcha, 78 km E of the city on the road to Montalvania. Elevation ca. 812 m, –14.88, –45.10, *L.R. Noblick & H. Lorenzi 5656* (ESA!, HPL!, FTG!, NY!); Coromandel, na estrada entre Coromandel e Vazante, 980 m, –18.22, –47.08, 17 June 2008, *R. Tsuji et al. 2681* (HPL!); Delfinópolis: W of town on BR-464, then turn on road to Cachoeira do Ouro. Elevation ca. 807 m, –20.29, –46.87, *L.R. Noblick & H. Lorenzi 5660* (ESA!, HPL!, FTG!, NY!); [Patrocinho], between Patrocinho and Goiás, *H.A. Weddell 2536* (P!); São Roque de Minas, Estrada para Cachoeira Casca D'Anta, –20.25, –46.37, 28 September 1995, *R. Romero 2972* (HUFU, NY!); São Thomé das Letras, Fazenda dos Correia: Paredão, –21.72, –44.99, 16 November 2002, *F.M. Ferreira 402* (RB); Urucuia (Riachinho): at the turnoff from MG-202 for Urucuia. Elevation ca. 520 m, –6.12, –45.86, 28 January 2014, *L.R. Noblick & H. Lorenzi 5650* (ESA!, FTG!); Urucuia, entre Urucuia e Pintópolis, 670 m, –16.09, –45.49, 23 August 2011, *C.E.B. Proença & S.A. Harris 3839* (OXF, UB!).

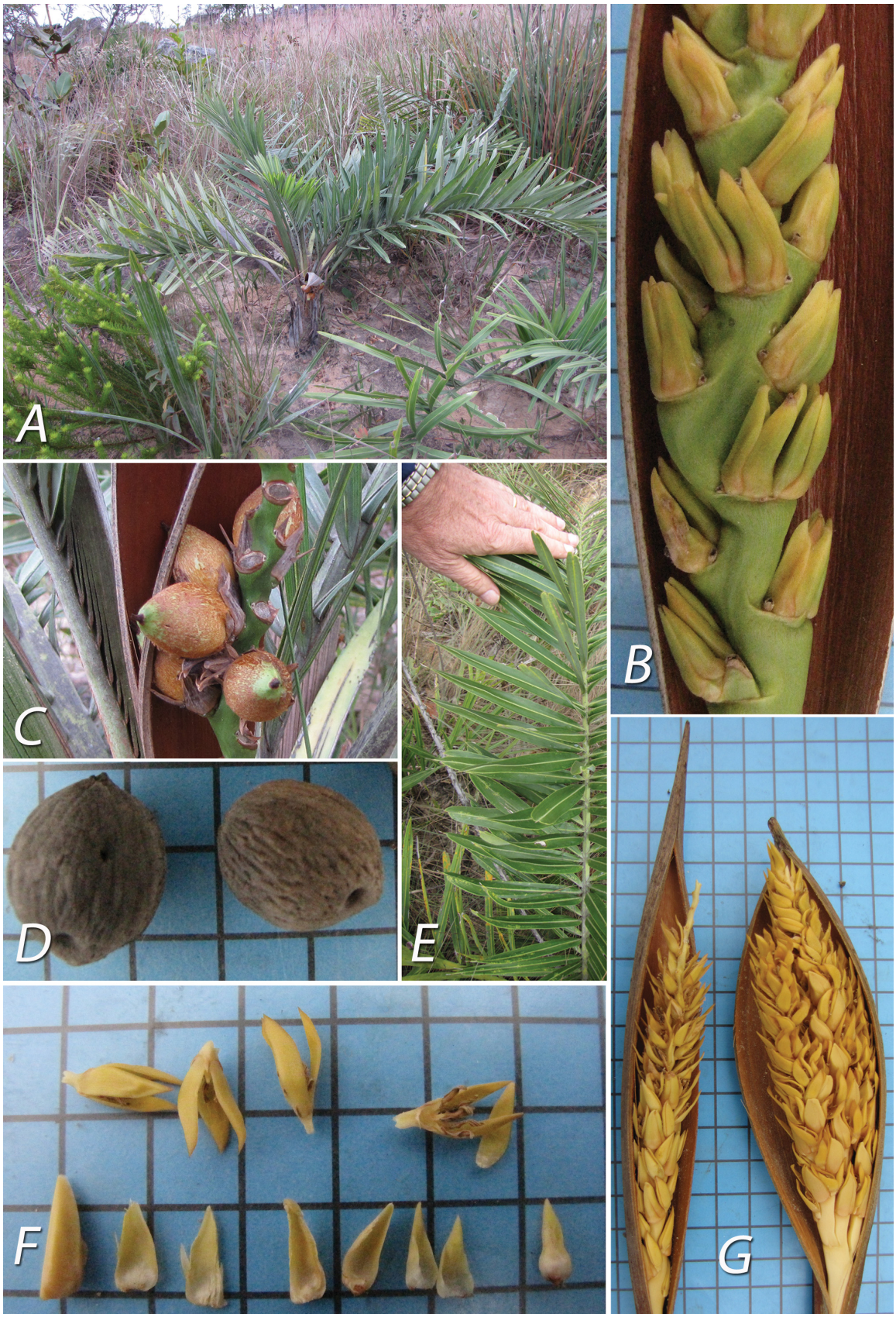

FIGURE 32. *Syagrus gouveiana*. A. Habit. B. Inflorescence with two sets of pistillate flowers part of a quatrad. C. Infructescence. D. Endocarps. E. Close-up of leaf showing concolorous leaflets. F. Staminate flowers above and dissected 4 parted pistillate flower below including the pistil with its 4th petal still attached. G. Spicate and branched inflorescence. All grids are in centimeters.

23. *Syagrus gouveiana* Noblick & Lorenzi (2010b: 30). Type:—BRAZIL. Minas Gerais: Municipio de Gouveia, collected on the Gouveia/Curvelo road 20 km from Gouveia [km 479 on BR-259], 1,269 m [ca. 1,200–1,270 m], –18.59, –43.90, 14 November 2008, *H. Lorenzi 6537* (holotype HPL!, isotypes ESA!, K!, NY!, RB!, SP!)

Figure 32 plate, Figure 29 map.

Small, solitary palm, usually less than 1 m tall. **Stem** with a very short or subterranean stem, appearing acaulescent. **Leaves** 3 or 4 arching, less than 1 m long, the general coloration medium to light green; *sheathing leaf base* 12–26 cm long 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, asymmetric, concolorous, distributed irregularly in clusters of 2 or 3, inserted at different angles along the rachis, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none or only a few simple hairs along the abaxial midvein; basal leaflets 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. **Inflorescence** erect, spicate or branched; *prophyll* 9–17 × 1.5–3.5 cm; *peduncular bract* 28–47 cm long, expanded part 14–24 × 4–6 cm; *peduncle* 17–28 cm long; *inflorescence axis* 8–15 cm long; *rachis* 0–5 cm; *rachillae* 1–6, 5–11 cm long; flowers usually arranged in triads, but occasionally arranged in tetrads with two central pistillate flowers each of which is flanked by a staminate flower, both staminate and pistillate flowers normally have 3 sepals and 3 petals, but occasionally have 4; *staminate flowers* 12–14 × 5–7 mm, sepals 2–3 × less than 1 mm, glabrous, petals 10 × 3–4 mm with acute tips, nerves indistinct to slightly raised, stamens 4.5–5.0 mm long, anthers 4 mm long, filaments 1.5 mm long, pistillode not measured; *pistillate flowers* elongate conical, ca. 10 × 4 mm at the apex, 13–15 × 5–6 mm at the base, glabrous, sepals 14–15 × 5–6 mm, petals 11–13 × 4–5 mm, valvate tips ca. 1/3 the length of the petals, ca. 3–5 mm long, glabrous, pistil 8–9 × 4–5 mm, glabrescent, stigmas 3–4 mm long, staminodal ring ca. 2 mm high, 6-dentate. **Fruit** globose, 1.7–2.4 cm in diameter, yellowish brown, epicarp less than 0.5 mm thick, mesocarp not measured, succulent and fibrous (pulpy); *endocarp* 1.6–2.2 × 1.5–1.7 cm, thickness on its sides not measured; *seed* more or less ellipsoid, not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—coquinho-da-pedra.

Etymology:—Named for the closest town to where it was first discovered, Gouveia, Minas Gerais.

Distribution and habitat:—Occurs in the state of Minas Gerais, Brazil, in the Cadeia do Espinhaço region (near Gouveia), in high elevation campo rupestre or cerrado, and generally in well-drained rocky terrain.

Conservation:—This palm has a very restricted distribution near Gouveia, Minas Gerais and is known from only one location. However, little exploration of the area has occurred to determine the true extent of its population. Even though it grows in rocky soils of low agricultural value, it could still be threatened by conversion to pasture. Based on its very small, restricted geographic range outside of a park or preserve, it is classified as critically endangered, EN B1 2ab(i,ii,v).

Phenology:—Flowering with some immature fruit in June.

Uses:—The plant is ornamental, could be cultivated with success in landscaping in full sun, as much in tropical regions as subtropical (tolerates weak freezes).

Notes:—This is an acaulescent palm with coriaceous, concolorous leaves which occasionally has 4 parted instead of 3 parted flowers and with flowers occasionally arranged in tetrads (two female flowers flanked on either side by a male flower) instead of the normal triads. The author was surprised to find this condition on more than one plant in the population.

Specimen examined:—BRAZIL. **Minas Gerais**: Gouveia, Serra do Espinhaço, Serra da Diamantina, 1200 m, –18.59, –43.90, 9 June 2009, *L.R. Noblick & R. Campos s.n.* (HPL!).

24. *Syagrus graminifolia* (Drude) Beccari (1916: 466)

Key to the subspecies:

1. Inflorescence unbranched, spicate, inflorescence axis 7–9.5 cm long.....subsp. *cabraliensis*
- Inflorescence branched 2–7, inflorescence axis 18–40(–66) cm long ..... 2.
2. Leaflets silvery blue-green, inflorescence quite long, peduncle 26–50 cm long ..... subsp. *graminifolia*
- Leaflets green to dark green, inflorescence generally shorter, peduncle ca. 26 cm or less.....subsp. *glazioviana*

24.1 ***Syagrus graminifolia*** (Drude) Beccari subsp. ***graminifolia***. *Cocos graminifolia* Drude in Martius (1881: 415). *Calappa graminifolia* (Drude ex Mart.) Kuntze (1891: 982). Type:—BRAZIL. Goiás: near R. Paranahyba [the Rio Paranaíba, not Parnaíba, exists only in Goiás not in Piauí], between S. Domingos and Borda do Mato, [1846], *Burchell 5956* (holotype K!)

Cocos graminifolia var. *nana* Drude (1881: 415). *Syagrus graminifolia* var. *nana* (Drude) Beccari (1916: 466). Type:—BRAZIL. Between Goiás and Cuyaba, 1844, *Weddell 2995*(P!);

Figure 33 plate, Figure 29 map.

Small, solitary to clustering palm usually ca. 40–100 cm tall, **Stem** 5–15 × 4 cm, usually short, subterranean. **Leaves** 3–15; *sheathing leaf base* ca. 7–17 × 2 cm; *pseudopetiole* 11–17(–25) cm long; *petiole* (1–)12–15 × 0.3–0.5 cm, 0.2–0.3 cm thick; *rachis* (30–)65–84 cm long; *leaflets* slightly lighter on the abaxial surface, 8–25 along one side, in clusters of 1–3, inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 15–49 × 0.1–0.8 cm, middle leaflets 19–47(–55) × 0.3–0.9 cm, apical leaflets 9–36 × 0.1–0.7 cm with long acuminate tips. **Inflorescence** erect, unilaterally branched; *prophyll* 12–15(–20) × 1.0–1.5(–2.0) cm; *peduncular bract* 30–91 cm, expanded portion 20–45 × 2–2.5 cm, including a 0.3–4.5 cm beak, 2.5–3 cm perimeter, 0.5–1.0 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument or wax to nearly glabrous; *peduncle* ca. (12–)26–50 cm × 3–5 mm, glabrous; *inflorescence axis* 20–40(–66) cm long; *rachis* 6.5–14(–31) cm long; *rachillae* 2–7, glabrous,(–4) 9–12 cm long at the apex, 10.5–20 cm long at the base; *staminate flowers* 3–7 mm long at the apex, 8–12 × 2–4.5 mm at the base, green to yellow, sepals 1–3 × 1–2 mm, glabrous, smooth, petals 3.5–7 mm long at the apex, 8–10 × 2–4 mm at the base with acute tips, nerves indistinct, stamens 1–6 mm long, anthers (1.5–)4–5.5 mm long, filaments ca. 2 mm long, pistillode less than 1 mm long; basal *pistillate flowers* elongate conical, (8–)10–13(–15) × 4–10 mm, yellow, glabrous, sepals 7–15 × 5–10 mm, petals 7.0–12 × 3–8 mm, glabrous, slightly valvate tips, pistil 7.5–9.5 × 3.5–4.5 mm, glabrous, stigmas 2–3.5 mm long, glabrous, staminodal ring ca. 1–2 mm high, 6-dentate. **Fruit** ellipsoid, 2–3.2 × 1.2–2.7 cm, yellow-green to brownish yellow when mature, covered by a rusty brown tomentum but glabrous at tip or apex, epicarp less than 0.5 mm thick, mesocarp ca. 1 mm thick, succulent and fibrous; *endocarp* ca. 1.8 × 1.1–1.1 cm, 1–2 mm thick on the sides, 2–3 mm thick at the ends, endocarp cavity with 1 or 2 locules, separated by a firm partition when 2 locules present; *seed* 1 (rarely 2) more or less ellipsoid not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—coquinho-do-cerrado, acumã-rasteiro, acumão-rasteiro.

Etymology:—The specific epithet and subspecies name, *graminifolia,* means grass-like leaf because its leaflets resemble the leaves of grass.

Distribution and habitat:—Southern Goiás, Brazil, in fields and cerrados, generally above 500 m. The originally described specimen of this species is the blue subspecies, and it is particularly frequent in the municipio of Cristalina, Goiás, in campo limpo vegetation. Such areas are so rocky and infertile that they are nearly devoid of any trees or shrubs, and thus the name campo limpo meaning clean fields.

Conservation:—This silvery-bluish subspecies can survive frequent fires but does not tolerate soil movement. Although its habitat appears to be harsh, the palm is not resilient if its roots are disturbed. This subspecies grows in rocky soils of little agricultural value, which is poor in nutrients and where very little else will grow (campo limpo) and therefore is not greatly threatened by agriculture. Nevertheless, since it is currently known from only a small area, not within the boundaries of any park or preserve, and has a limited area of occupancy, it must be classified as endangered, EN B1.

Phenology:—This species fruits sparsely in summer, and its fruits are eaten by insects or consumed by animals. The seed germination is slow, and the germination rate is low.

Uses:—The plant is delicate with attractive silvery or powdery-blue foliage. It is ornamentally a beautiful palm and would be great for landscaping, provided one could learn the secret to transplanting it.

Notes:—*Syagrus graminifolia* is a complex of variable individuals with similar inflorescences, leaflets or leaflet anatomy (Noblick *et al.* 2014) from northern Goiás to western Minas Gerais (Triangular Mineiro), which the author believes can be separated into various subspecies. All have similar-looking, slender inflorescences usually with 2–7 slender rachillae, but spicate in the subspecies *cabraliensis*. The subspecies, *graminifolia*, grows in campo limpo. It can be solitary to clustering and, unlike the other subspecies, is silvery-blue instead of green. The green subspecies (i.e. *cabraliensis* and *glazioviana*) transplant well, but the blue subspecies, *graminifolia*, does not.

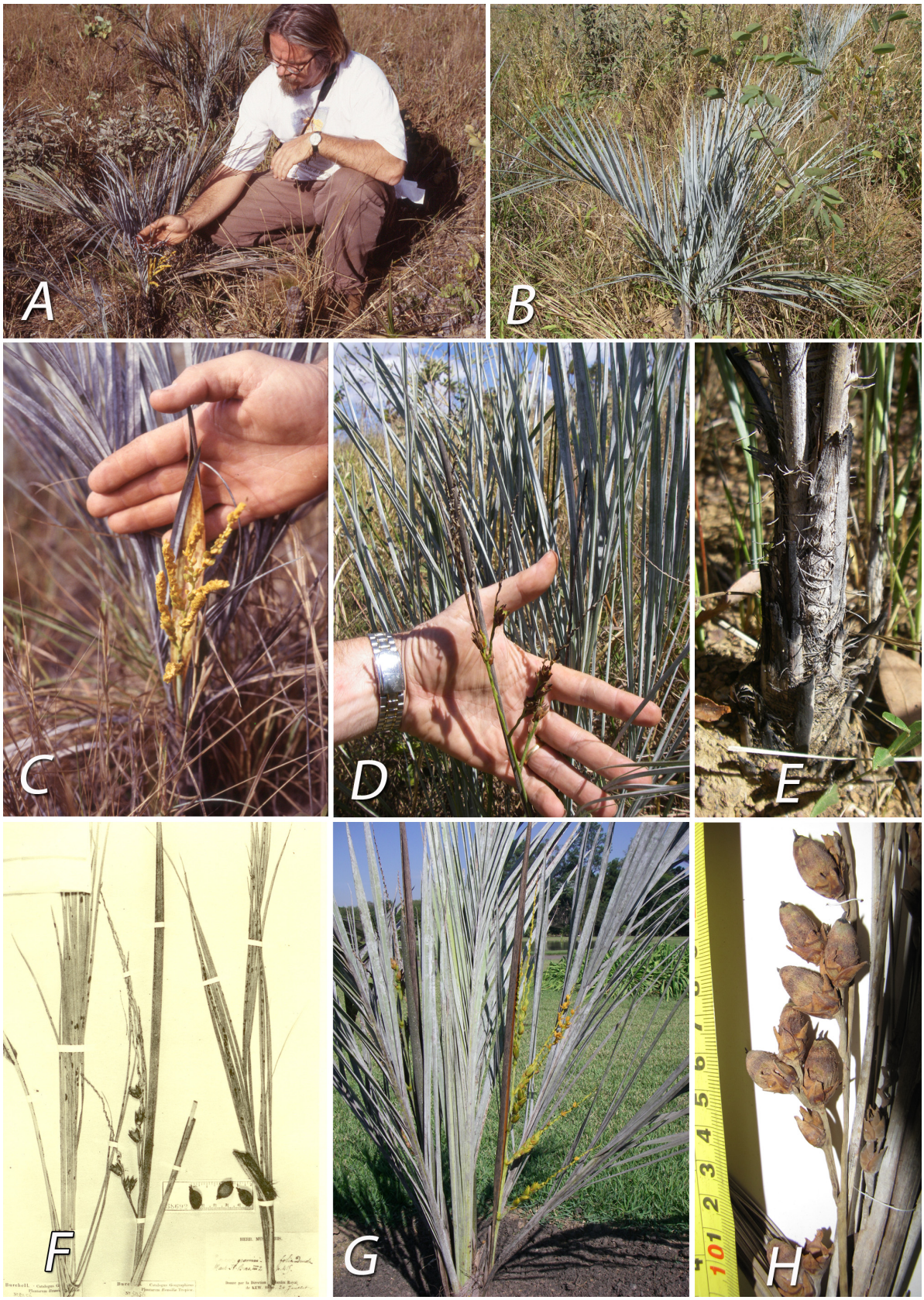

FIGURE 33. *Syagrus graminifolia* subsp. *graminifolia*. A. Single stemmed palm with Nikolaus von Behr near Campo Alegre de Goiás, Goiás (*Noblick & von Behr 5164*). B. Multistemmed habit with bluish leaves. C. Inflorescence. D. Inflorescence with pistillate flowers and young developing fruit. E. Base of palm showing leaf sheaths. F. Holotype (*Burchell 5956*). G. Flowering specimen at Jardim Botânico Plantarum. H. Infructescence. Scale in centimeters.

One reason that it does not transplant well is because it is difficult to extract it from the very rocky soils in which it grows without severely damaging its roots. Two subspecies grow in southern Goiás: the larger silvery-bluish subspecies *graminifolia*, and the smaller green subspecies *glazioviana*. All subspecies of *S. graminifolia* are geographically isolated and grow in specific soil conditions: *graminifolia* grows in gravelly, campo limpo soils, *glazioviana* in aluminum-rich deep, fine sandy to clay soils, *cabraliensis* grows in an isolated mountain range in iron-rich, *canga,* soils, and finally a possible fourth that appears to be restricted to nickel-rich soils. The fourth one is large, heavily clustering and has been collected from Niquelândia by Lorenzi (pers. comm.). The author did not have enough material of the fourth one to make any taxonomic decisions about it.

Key characters for subspecies, *graminifolia,* are powdery to silver-blue leaves, long narrow leaflets and an inflorescence with few branches and widely spaced female flowers. The original type specimen for *S. graminifolia* was collected in 1846 in southern Goiás, based on William Frank Burchell's field notes (Smith & Smith 1967), not Piauí as reported by Drude (1881) and Glassman (1987). Specimens from Goiás are most like the original holotype of *S. graminifolia,* so this silvery-bluish subspecies is recognized as *S. graminifolia* subsp. *graminifolia.*

Representative specimens:—BRAZIL. **Goiás:** Anapolis, 21 July 1952, *A. Macedo 3557a* (var. *nana*) (US); Campo Alegre de Goias, 82 km S of the turnoff to Pires do Rio on the BR-050, –17.41, –47.79, 2800 ft, 31 July 1997*, L.R. Noblick & N. von Behr 5164* (BHCB!); Campo Alegre de Goiás, na região de Catalão, –17.63, –47.78, 14 August 1996, *A.G. Ribeiro 55* (HPL!); Campo Alegre de Goiás, Rod. BR-050, 15 km SE de Campo Alegre, –17.63 –47.78, 22 June 1983, *G. Hatschbach 46590* (MBM!, NY); Catalão, na estrada para Cristalina—GO, –18.17, –47.95, 30 August 2008, *H. Lorenzi 6517* (HPL!); Catalão, Área da Copebrás, –18.16, –47.92, 22 October 2004, *J.A. Rizzo 12374* (UFG); Cristalina, Reserva Linda Serra dos Topázios, 1100 m, –16.73, –47.68, 26 February 2000, *Farias et al. 536* (RB, UB!); Cristalina, –16.77, –47.61, 25 March 2004, *H. Lorenzi 4771* (HPL!); Cristalina, Cristalina/Catalão, km 180-BR050 –16.77, –47.61, 19 June 2008, *R. Tsuji et al. 2687* (HPL!); Cristalina, 60–80 km S. of Brasília. Between Cristalina and Luziania, 900–1000 m, –16.77, –47.61, 8 July 1976, *P.H. Davis 60024* (NY!, UEC!); Cristalina, após o entroncamento para Catalão, 8 December 2012, *J.F.B. Pastore et al. 3911* (HUEFS!); Pichoa (Tichoa, Fichoa?), 5 October 1894, *A.F.M. Glaziou s.n.* (P! [P02147702]) (*Cocos graminifolia* var. *nana* Drude).

24.2 *Syagrus graminifolia* subsp. ***cabraliensis*** Noblick & Lorenzi (2014: 1). Type:—BRAZIL. Minas Gerais: Joaquin Felício, ca. 14 km from the city fountain plaza, just outside of the Parque Estadual da Serra Cabral, ca. 1137 m, –17.70, –44.22, 29 January 2014, *L.R. Noblick & H. Lorenzi 5659* (holotype ESA!, isotypes HPL!, BHCB!, RB!, SP!, K!, FTG!, NY!, MO!, US!)

Figure 34 plate, Figure 29 map.

Small palm, solitary to clustering to 40–50 cm. **Stem** short, subterranean. **Leaves** 3–6; *sheathing leaf base* ca. 8–12 cm long; *pseudopetiole* 9–17 cm long; *petiole* 7.5–13 × 0.4–0.5 cm, 0.2–0.3 cm thick, abaxial side of petiole and rachis tomentose; *rachis* 26–34 cm long; *leaflets* narrow, fold quickly on drying, slightly lighter on the abaxial surface, 9–14 along one side, in clusters of 2 or 3, inserted at various angles, ramenta scales or tomentum absent where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 12–22 × 0.1–0.2 cm, middle leaflets 24–37 × 0.5–0.8 cm, apical leaflets 16–32 × 0.2–0.4 cm with an asymmetric tip. **Inflorescence** spicate, prophyll 6–8 × 1.4–1.5 cm; *peduncular bract* 19–31 cm long, expanded portion 9.5–16 × 0.8–1.8 cm, 1.8–2.5 cm perimeter, 1 mm or less thickness, narrow, woody, sulcate, exterior with scattered thin indument becoming thicker at the base of the bract; *peduncle* ca. 10–17 cm × 3–4 mm, glabrous; *inflorescence axis* 7–9.5 cm long; *rachis* absent; *rachilla* 1, glabrous, 7–9.5 cm long; *staminate flowers* 5.4–5.9 × 2.2–3.3 mm at the apex, 10–10.2 × 2.5–2.6 mm at the base, green to yellow, sepals 1–2.4 × 0.5–0.7 mm, glabrous, no visible nerves, petals 4.4–5.4 × 1.2–2.2 mm at the apex, 7.0–8.2 × 1.5–2.0 mm at the base with acute tips, nerves indistinct, stamens 3.0–3.7 mm long, anthers 2.4–3.3 mm long, filaments 1.0–1.7 mm long, pistillode nearly absent; basal *pistillate flowers* elongate pyramidal, 10–10.2 × 5–5.5 mm at the apex, 11.5–11.7 × 4–4.4 mm at the base, glabrous, sepals 8.7–9.5 × 3.6–4.6 mm, yellow, glabrous, no visible venation, petals 7.7–9.5 × 2.5–3.7 mm, glabrous, obscurely nerved, nerves slightly raised on the lower third of the petal, valvate tips a little less than ½ the length of the petals, ca. 3–4 mm long, pistil 7.0–7.2 × 1.8–2.3 mm, glabrous, stigmas ca. 3.1–3.6 mm long, glabrous, staminodal ring ca. 0.7–1.2 mm high, 6-dentate. **Fruit** ellipsoid or ovoid, 1.9–2.2 × 1.3–1.5 cm, brown with yellowish base when



FIGURE 34. *Syagrus graminifolia* subsp. *cabraliensis*. A. Habit. B. Palms in habitat with the author, note gravelly iron-rich "canga" soils in foreground. C. Infructescence. D. Inflorescence. E. Close-up of plant with inflorescence. Scale of grid on C and D = 1 cm.

mature, tip glabrous, but rest of the fruit with a light to chestnut brown, scaly lepidote tomentum, epicarp less than 0.5 mm thick, mesocarp not measured, succulent and fibrous; *endocarp* 1.6–1.7 × 1.2–1.3 cm, ca. 1 mm thick, trivittate on the interior of the endocarp; *seed* ellipsoid to nearly globose, endosperm homogeneous. Germination remote-tubular.

Common name:—None recorded.

Etymology:—The subspecies name, *cabraliensis,* refers to the isolated Serra do Cabral mountain range, where it grows, and to the state park, Parque Estadual de Serra do Cabral in Minas Gerais.

Distribution and habitat:—Serra do Cabral is located south of Montes Claros, in the central northern part of Minas Gerais, Brazil, and is a mountainous region up to 1,500 m in elevation that is isolated from the rest of the Serra Espinhaço. It has a unique fauna and flora. The mountain range is located about 70 km SSW of Montes Claros and about 70 km east of Pirapora. The habitat is a high elevation rocky cerrado region where the plant grows on surface iron deposits called "canga."

Conservation:—This palm has been seen in only one locality just outside of the boundaries and protection of the Serra do Cabral state park. The area adjacent to the park is still theoretically an environmentally protected zone. This palm has a strong affinity for growing on the round, gravelly surface iron ore deposits called "canga," which makes it particularly vulnerable to mining operations. Even after an extended search, no specimens were found growing away from the "canga" iron deposits. About 60% of the current population has been destroyed by surface mining. The true extent of its distribution in the region has not yet been determined. However other deposits of "canga" do occur within the adjacent state park. Therefore, because of the limited and restricted distribution of this taxa and exploitation of the "canga," this taxon should be is classified as endangered, EN A2acd; Bab(i,ii,iii).

Phenology:—Flowering and immature fruits in January and February.

Uses:—This palm has horticultural potential, especially in iron-rich soils.

Notes:—This subspecies is from north central Minas Gerais in the Serra do Cabral mountain range, which is geographically isolated from the main Serra do Espinhaço. Serra do Cabral is known in Minas Gerais for its unique flora and fauna, and much of it has been annexed into a state park. This subspecies differs from other *S. graminifolia* in having only spicate inflorescences, growing often in dense clusters, darker green foliage, and an affinity for "canga" iron rich soils. It is different enough to merit its own subspecific status based on its geographical isolation, restricted range and spicate inflorescence.

Its similar leaflet anatomy can be seen in the comparable arrangement of the veins and fibers within the cross-sections of the subspecies *cabraliensis*, the holotype of *S. graminifolia* and the subspecies *glazioviana*. The repeating pattern is nearly identical in all three subspecies: large vascular bundle or vein, followed by three minor abaxial veins (the middle one being slightly larger) and above each minor vein is a narrow linear strand or fiber bundle. The silvery-blue *S. graminifolia* subsp. *graminifolia* endemic to southern Goiás shows a slight change in the pattern with additional smaller minor fibers and opposite faint minor veins between the minor veins. The similar anatomy between all of these suggests a relationship of this new palm from north central Minas Gerais to the others growing in Goiás and the Triangular Mineiro of western Minas Gerais.

Representative specimens:—Known only from the type specimen.

24.3 *Syagrus graminifolia* subsp. ***glazioviana*** (Dammer) Noblick *stat. nov. Cocos graminifolia* var. *glazioviana* Dammer (1902: 23). *Syagrus graminifolia* var. *glazioviana* (Dammer) Beccari (1916: 466). Type:—BRAZIL. Goiás: entre Lagoa do Piquiero et Buraco da Onça, 1894, *A.F.M. Glaziou 22253* (holotype C; isotypes G!, K!, U!)

Figure 35 plate, Figure 29 map.

Small, solitary to clustering palm usually less than 50 cm tall, but can vary from 40–80 cm tall. **Stem** with short subterranean stem, appearing acaulescent. **Leaves** 5–15, dark green, erect; *sheathing leaf base* ca. 15 × 1 cm; *pseudopetiole* 21–25 cm long; *petiole* 6–15 × 0.4–0.5 cm, 0.2–0.3 cm thick; *rachis* 38–70 cm long; *leaflets* slightly lighter on the abaxial surface, 8–25 along one side, clustered by twos which are inserted at various angles near the base but otherwise regularly arranged on the upper part to the leaf towards the tip, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 26–30 × 0.1–0.2 cm, middle leaflets 30–55 × 0.4–0.7 cm, apical leaflets ca. 26 × 0.2 cm with an asymmetric tip. **Inflorescence** erect, unilaterally branched; *prophyll* 10–20 cm long; *peduncular bract* 30–40 cm long, expanded

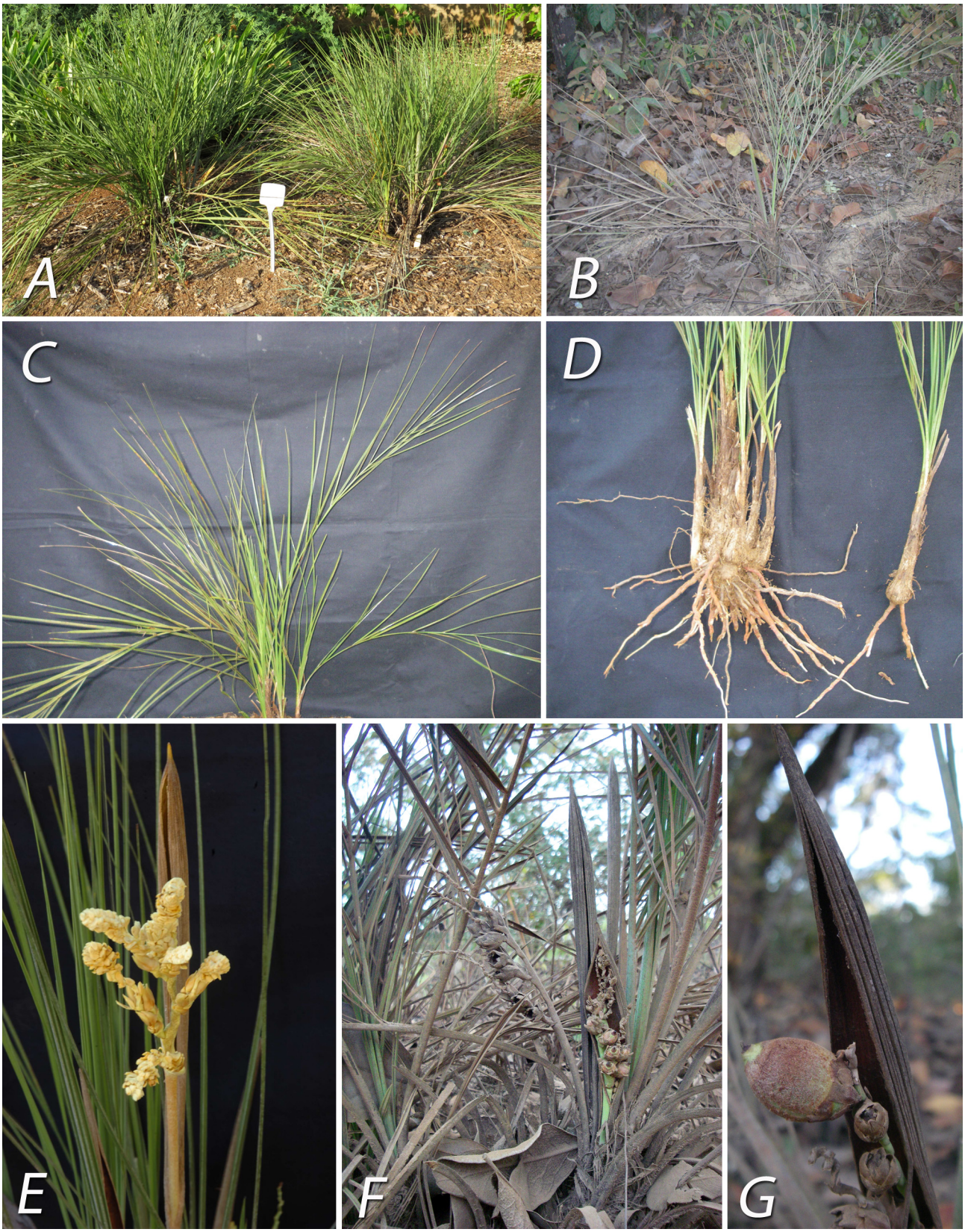

FIGURE 35. *Syagrus graminifolia* subsp. *glazioviana*. A. Multistemmed habitat at the Jardim Botânico Plantarum. B. Single stemmed habit with reclined or procumbent stem near Vazante, Minas Gerais (*Tsuji et al. 2682*). C. Narrow "grassy" leaflets. D. Multi or clustering stem and single stemmed specimens. E. Close up of newly opened inflorescence. F. Developing infructescence. G. Fruit.

portion 16–40 × 0.8–2.2 cm, including a 0.5–1.0 cm beak, 1.5–3.0 cm perimeter, 1 mm thickness, narrow, woody, sulcate, waxy to nearly glabrous; *peduncle* ca. 26 cm long, width and thickness not measured, elliptical in cross-section, glabrous; *inflorescence axis* 18–30 cm long; *rachis* 6.5–11 cm long; *rachillae* 2–7, glabrous, ca. 6.5 cm long at the apex, ca. 18 cm long at the base; *staminate flowers* 5.1–5.4 × 2.0–2.9 mm at the apex, 4.8–6.0 × 2.0–2.4 mm at the base, green to yellow, sepals 1.0 × 0.7–1.0 mm, glabrous, with no visible nerves, petals 4.1–5.4 × 1.5–1.9 mm with acute tips, nerves indistinct, stamens 2.4–2.7 mm long, anthers 1.7–2.4 mm long, filaments 0.85–1.0 mm long, pistillode less than 1 mm long, ca. 0.1–0.3 mm; *pistillate flowers* elongate conical or slightly triangular, 10.2–10.6 × 4.4–5.1 mm at the apex, 11–12 × 5.1–5.5 mm at the base, yellow, glabrous, sepals 7.3–11.0 × 4.0–4.7 mm, petals 8.8–9.5 × 3.7–4.4 mm, valvate tips not measured, glabrous, pistil 6.6–8.0 × 3.3–3.7 mm, glabrous, stigmas 11.5–2.2 mm long, glabrous, staminodal ring ca. 0.7–1.1 mm high, truncate, nearly without teeth or undulations. **Fruit** ellipsoid, 2.5–3.0 × 1.3–1.8 cm, yellowish-brown to green when mature, covered with a thin reddish brown tomentum, epicarp less than 0.5 mm thick, mesocarp 1–2 mm thick, succulent and fibrous; *endocarp* ca. 2.4 × 1.4 cm, thickness not measured; *seed* 1 (rarely 2) not measured, ellipsoid, endosperm homogeneous. Germination remote-tubular.

Common name:—coquinho-do-cerrado, acumã-rasteiro

Etymology:—The subspecies name, *glazioviana,* honors French-born Auguste François Marie Glaziou (1828–1906), a famous 19th century botanist, who first came to Brazil in 1858 at the invitation of the Portuguese Emperor Don Pedro II to manage the botanical garden in Rio de Janeiro, but ended up collecting many new species that received his name.

Distribution and habitat:—Goiás and Minas Gerais, Brazil, especially in the Triângulo Mineiro (also reported, perhaps erroneously, from Piauí, Bahia and Mato Grosso do Sul) in fields and cerrados, generally above 500 m in cerrado.

Conservation:—This subspecies of *S. graminifolia* is more common than the blue subspecies *graminifolia.* However, it has never been seen to grow in large populations, but it does grow in sandy, rocky terrain and therefore is not currently threatened by agriculture. This palm has so far been found only in sparse populations, but has a large area of distribution and it prefers soils of low agricultural value. Therefore, it is classified as least concern, LC.

Phenology:—Flowering May and December. Fruits sparsely in summer (December–March); fruits are eaten by insects or consumed by animals. The germination rate is slow and the percentage of germination low.

Uses:—This plant is delicate and ornamental, principally for its unusually narrow green, grass-like foliage. It possesses the potential for cultivation in full sun gardens.

Notes:—The green subspecies *glazioviana* is similar to the blue subspecies *graminifolia*. Normally subspecies *glazioviana* has narrower leaflets and is a bit smaller overall. Some specimens of subspecies *glazioviana* are smaller and others larger and more clustering. Subspecies *glazioviana* also transplants much more easily than subspecies *graminifolia*, but that is probably due to the fact that its roots are less likely to be damaged in the transplanting process due to the less rocky soils. The author suspects that subspecies *glazioviana* complex needs more research to properly understand it.

Representative specimens:—BRAZIL. **Distrito Federal**: Brasília, –15.78, –47.93, 20 November 1962, *E.P. Heringer s.n.* (SP!); Brasília; Margem esquerda do Rio Belchior, 950 m, –15.90, –48.22, 10 March 2003, *G.P. Silva et al. 7317* (CEN); Brasília, Estrada para Santo Antônio do Descoberto-GO, 984 m, –15.92, –48.19, 1 September 2012, *M.R.V. Zanatta & Faria 1427* (UB!); Gama, Núcleo Rural Ponte Alta, Recanto dos Buritis, 1034 m, –16.00, –48.20, 22 February 2011, *R.C. Martins & Moreira 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124* (UB!); **Goiás:** Anápolis, Rodovia Brasília-Anápolis, December 1965, *R.P. Belém 2029* (UB!); Anápolis, Rodovia Brasília-Anápolis, 30 July 1965, *E.P. Heringer 10476* (UB!); Anápolis, Rodovia Brasília-Anápolis, 8 June 1969, *E.P. Heringer 11848* (UB!); Cavalcante; Estrada obra-Rio do Carmo, km 10, 380 m, –13.62, –48.10, 21 May 2002, *G.P. Silva & E. de S.G. Guarino 6453* (CEN); Cavalcante; Estrada saindo da balsa do "Porto dos Paulistas", 410 m, –13.39, –48.11, 8 November 2000, *B.M.T. Walter et al. 4629* (CEN); Cocalzinho, BR 414, depois de Cocalzinho, –15.76, –48.43, 18 December 2010, *R.C. Martin et al. 1111, 1112, 1113, 1114* (UB!); Copelinha do S. Antonio, 1894, *A.F.M. Glaziou 22252* (C, FI, G, K, P); Cristalina, RPPN Linda Serra dos Topázios, –16.75, –47.67, 14 March 1998, *C.E.B. Proença et al. 1927* (UB!); Eclécta, km 20 da entrada para cidade Eclécta, 27 March 1979, *E.P. Heringer et al. 1121* (MG!); Luziânia, Hidrelétrica de Corumbá III, área a ser desmatada para enchimento do reservatório, 765 m, –16.78, –47.95, 26 September 2007, *C.H.G. Cezare et al. 125* (UB!); Luziania, Santo Antonio

do Descoberto, 27 March 1980, *R.C. Mendonça 86, 97* (MG!); Niquelândia; Estrada para Colinas do Sul, ca de 41 km de Niquelândia, 485 m, –14.40, –48.08, 7 May 1998, *M.L. Fonseca et al. 1786* (IBGE); Niquelândia, na estrada para Colinas do Sul, 510 m, –14.32, –48.14, 12 December 2009, *H. Lorenzi et al. 6791* (HPL!); Teresina de Goiás, Cachoeira Poço Encantado, Rio das Pedras, à 12 km de Teresina, 60 km depois de Alto Paraiso, –13.87, –47.26, 13 May 2011, *R.C. Martins 1144* (UB!); Goiás: 10 September 1894, *Simard s.n.* (US-1124170); **Minas Gerais:** Vazante, ca. 5 km da cidade sentido a estrada de GO, km 63, estrada de terra para Faz. Jatobá, –17.99, –46.91, 5 June 2008, *R. Tsuji 2632* (HPL!); Vazante, entrada no km 63 sentido do Faz Jatobá, em beira de estrada de terra ca. 5–7 km depois da rodovia asfaltada, 630 m, –17.90, –46.95, 18 June 2008, *R. Tsuji et al. 2682* (HPL!); **Tocantins:** Paraná, Valsa do coronel para balsa do rio Custódio, km 14, 360 m, –13.05, –48.09, 18 July 2007, *G. Pereira-Silva et al. 12072* (UB!).

25. *Syagrus guimaraesensis* Noblick & Lorenzi (2014: 10). Type:—BRAZIL. Mato Grosso: Chapada dos Guimarães, Parque Nacional da Chapada dos Guimarães, near Véu da Noiva (Bridal Veil) waterfalls, elevation ca. 611 m, –15.41, –55.83, 12 January 2014, *L.R. Noblick & H. Lorenzi 5640*. (holotype ESA!, isotypes HPL!, UFMT!, RB!, SP!, K!, FTG!, NY!, MO!, US!)

Figure 36 plate, Figure 29 map.

Small, solitary palm to ca. 80 cm. **Stem** short, subterranean; rhizome 4.5–10 × 3.5–5.5 cm. **Leaves** 2–4(–5); *sheathing leaf base* ca. 4.5–18 cm long; *pseudopetiole* 2.5–11 cm long; *petiole* 0.5–6 × 0.4–0.7 cm, 0.2–0.4 cm thick; *rachis* 11–56 cm long; *leaflets* slightly lighter on the abaxial surface, 6–16 along one side, distributed mostly regularly but in clusters of 2 or 3 near the base, ramenta scales or tomentum absent where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 27–48 × 0.1–0.5 cm, middle leaflets 36–75 × 0.4–0.7 cm, apical leaflets 24–38 × 0.1–0.5 cm with an asymmetric tip. **Inflorescence** spicate, *prophyll* 6.5–8.5 × 1–2 cm; *peduncular bract* 7.5–23 cm including a 0–1.5 cm beak, expanded portion 4.5–11 × 2–3 cm, beak not measured, 3–6 cm perimeter, 1–3 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 2.5–11 cm × 2–6 mm, glabrous or with a few scattered scales; *inflorescence axis* 3–7.5 cm long; *rachis* absent; *rachilla* 1, glabrous, 3–7.5 cm long; *staminate flowers* 10–11 × 3.8 mm at the apex, 12.5–12.8 × 3.5–4.0 mm at the base, green to yellow, sepals 2.3–3.4 × 1.0–1.7 mm, glabrous, no visible nerves, petals 8.7–11 × 2.9–3.7 mm at the base with acute tips, nerves indistinct, stamens 3.4–4.4 mm long, anthers 2.2–2.7 mm long, filaments 1.7–2 mm long, pistillode nearly absent; *pistillate flowers* elongate pyramidal, 11.5–11.7 × 6.2–6.6 mm at the apex, 13.2–16.8 × 6.9–7.9 mm at the base, yellow, glabrous, sepals 9.5–16.8 × 3.2–7.7 mm, glabrous, no visible venation, petals 6.7–15.3 × 2.8–5.5 mm, glabrous, obscurely nerved on the lower portion of the petal, valvate tips ½ or more the length of the petals, ca. 3.5–8 mm long, pistil 6.1–8.0 × 2.5–3.7 mm, glabrous, stigmas less than 3 mm long, glabrous, staminodal ring ca. 0.5–0.9 mm high, truncate to undulate. **Fruit** ellipsoid, 2.0 × 1.6 cm, reddish-brown when mature, covered with small stiff appressed brownish hairs, broadly epicarp less than 0.5 mm thick, mesocarp not measured, succulent and fibrous; *endocarp* not measured; *seed* ellipsoid not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—None recorded.

Etymology:—The specific epithet, *guimaraesensis,* refers to the Parque Nacional de Chapada dos Guimarães, where it was discovered and the type collected.

Distribution and habitat:—South central Mato Grosso, Brazil. This species grows in very rocky sandy soils both within and outside of the National Park of the Chapada dos Guimarães, near the town of Chapada dos Guimarães. It grows in decomposed sandstone soils, with specimens seen as far south as Rondonópolis and as far north as Diamantino. Also reported to be growing as far as 350 km to the west and at elevations usually above 600 m, but never in large numbers (Lorenzi, pers. comm.).

Conservation:—This species is well protected within the national park, and it usually grows in very rocky soils that are of no agricultural importance, except for pasture. Therefore, this palm is classified as least concern, LC.

Phenology:—Fruiting and flowering in January in exposed areas, but neither flowering nor fruiting in shadier areas at this time of year.

Uses:—None recorded. This palm has landscaping potential.



FIGURE 36. *Syagrus guimaraesensis*. A. Habit. B. Infructescence with side view of fruit. C. Inflorescence and older peduncular bract. D. Infructescence with apical view of fruit. White scale = ca. 1 cm.

Notes:—This species resembles the Bolivian *S. petraea,* which was formerly the name erroneously given to most acaulescent *Syagrus* in Brazil with spicate inflorescences. It even grows in a similar environment of decomposed sandstone weathered into "chapada" topography. However, morphologically *Syagrus guimaraesensis* differs in having a shorter leaf rachis (11–56 vs. 40–125 cm), fewer leaflets (6–16 vs.19–42), and thicker leaf blades. Their leaflet anatomy differs by the following characters: *S. guimaraesensis* has large major veins (vs. small major veins in *S. petraea*), presence of adaxial minor veins near the leaflet margin (vs. no adaxial minor veins near the leaflet margin) and small fiber bundles between the major veins along the adaxial surface (vs. large fiber bundles between the veins).

Representative specimens:—BRAZIL. **Mato Grosso:** Chapada dos Guimarães, Mirante do Centro Geodésico, 19 October 1995, *G. Hatschbach et al. 63584* (FTG!); Chapada dos Guimarães, na estrada para Cuiabá, km 49, próximo ao Parque Nacional da Chapada dos Guimarães em cerrado mais ou menos denso, sobre solo arenoso com muitos pedras, comum em toda a região numa extensão de mais de 350 km para o leste em elevation sempre superior a 600 m, porém sem nunca formar grandes infestações, 680 m, –15.39, –55.83, 9 December 2009, *H. Lorenzi, et al. 6786* (HPL!); PARNA Chapada dos Guimarães, 19 November 1999, *L.A. Neto et al. 989* (UFMT!); Chapada dos Guimarães, Parque Nacional da Chapada dos Guimarães, near the Monumento da Pedra in the National Park near km 49, Elevation ca. 601 m, –15.39, –55.83, 12 January 2014, *L.R. Noblick & H. Lorenzi 5639* (ESA!, HPL!, FTG!, NY!); Cuiabá, Rio Caxipozinho, próx. a Cachoeira Véu de Noiva, Área da Chapada dos Guimarães, 21 October 1985, *C.A. Cid Ferreira 6530* (SPF, NY); Diamantino, cerca de 20 km após o limite do município de Diamantino. Área de grandes afloramentos rochosos, 23 April 1983, *E.C.C. Moraes et al. 278* (UFMT!).

26. *Syagrus harleyi* Glassman (1978: 401). Type:—BRAZIL. Bahia: Serra do Sincorá, by Rio Cumbuca ca. 3 km S of Mucugê, 850 m, 4 February 1974, *R.M. Harley, S.A. Renvoize, C.M. Erskine, C.A. Brighton, & R. Pinheiro 15963* (holotype K!, isotypes BH, F!, MO, NY!, U, US!)

Figure 37 plate, Figure 38 map.

Small, usually clustered, sometimes solitary, unarmed palms 80–120 cm tall. **Stem** subterranean, appearing acaulescent. **Leaves** (2–)3–8 in crown, spirally arranged, spreading; *sheathing leaf base* 25–30 cm long, fibrous; *pseudopetiole* 50–70 cm long with smooth or fibrous margins; *petiole* 17–44 × 1.5 cm, 1.0–1.3 cm thick; *rachis* 61–178 cm long; *leaflets* shiny green above, pale green to white waxy beneath (at higher elevations), 14–57 along one side, regularly distributed in one plane; no ramenta scales present where the leaflets are inserted on the rachis, and none along the abaxial midvein, pendulous at lower elevations, but straighter, stiffer and strongly ascending at higher elevations; basal leaflets 17–23 × 0.6–1.0 cm, middle leaflets 26–62 × 1.2–2.4(–2.7) cm, apical leaflets 13–17 × 0.2–0.5 cm, mostly with acute to asymmetric tips. **Inflorescence** erect, spirally branched; *prophyll* 25–40 × 1–2 cm; *peduncular bract* ca. 100 cm long, expanded portion 18–68 × (1.5–)3–7 cm, bearing a 2–3 cm beak, woody, sulcate, more or less glabrous, light orange; *peduncle* ca. (12–)45–112 × (0.4–)0.6–1 cm; *inflorescence axis* 18–40 cm long; *rachis* 10–39 cm long; *rachillae* 5–31, 2–15 cm long, each rachilla, especially lower ones, subtended by a bract (0–)1–4 mm long; *staminate flowers* 4–5.5 mm long at the apex, 5–8 × 2.5–3 mm at the base, pale yellow, sepals 1–4.5 × (0.5–)2–3.5 mm, glabrous, no visible venation, petals 3–5 mm long at the apex, 4–7 × 1.5–3 mm at the base, glabrous, with broadly acute tips, indistinct nerves, stamens 2–4 mm long, anthers 1.8–3 mm long, filaments 0.8–2 mm long, pistillode 1.5 mm long; *pistillate flowers* short conical to rounded, brown to dark reddish brown (when dry), 4–6 × 3–5 mm, sepals 4–6 × 4–5 mm, glabrous, venation slightly raised to obscure, slightly keeled, petals 3–4.5 × 3–5 mm, valvate tips nearly absent–1/4 the length of the petal, ca. 0.2–1 mm long, glabrous, veins visible near the margins, pistil 3–4 × 2–3 mm, mostly glabrous, but occasionally with a few scattered hairs, stigmas 1 mm long, staminodal ring ca. 1–2 mm high. **Fruit** 1.5–2.5 × 1–2.5 cm, persistent perianth (cupule) dark reddish-brown, 10–11 mm wide, 3–5 mm deep, ring 2–3 mm in height, epicarp covered with dark brownish tomentum, orange-brown when mature, less than 0.5 mm thick, mesocarp 1–2 mm thick, orangish, succulent and fibrous; *endocarp* 1.3–1.7 × 0.8–0.9 cm, bony, yellowish brown, 1–2 mm thick, with no clusters of fibers; *seeds* (0.6–)0.8–11 × 0.5–0.6 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—côco-da-raposa, fox-palm.

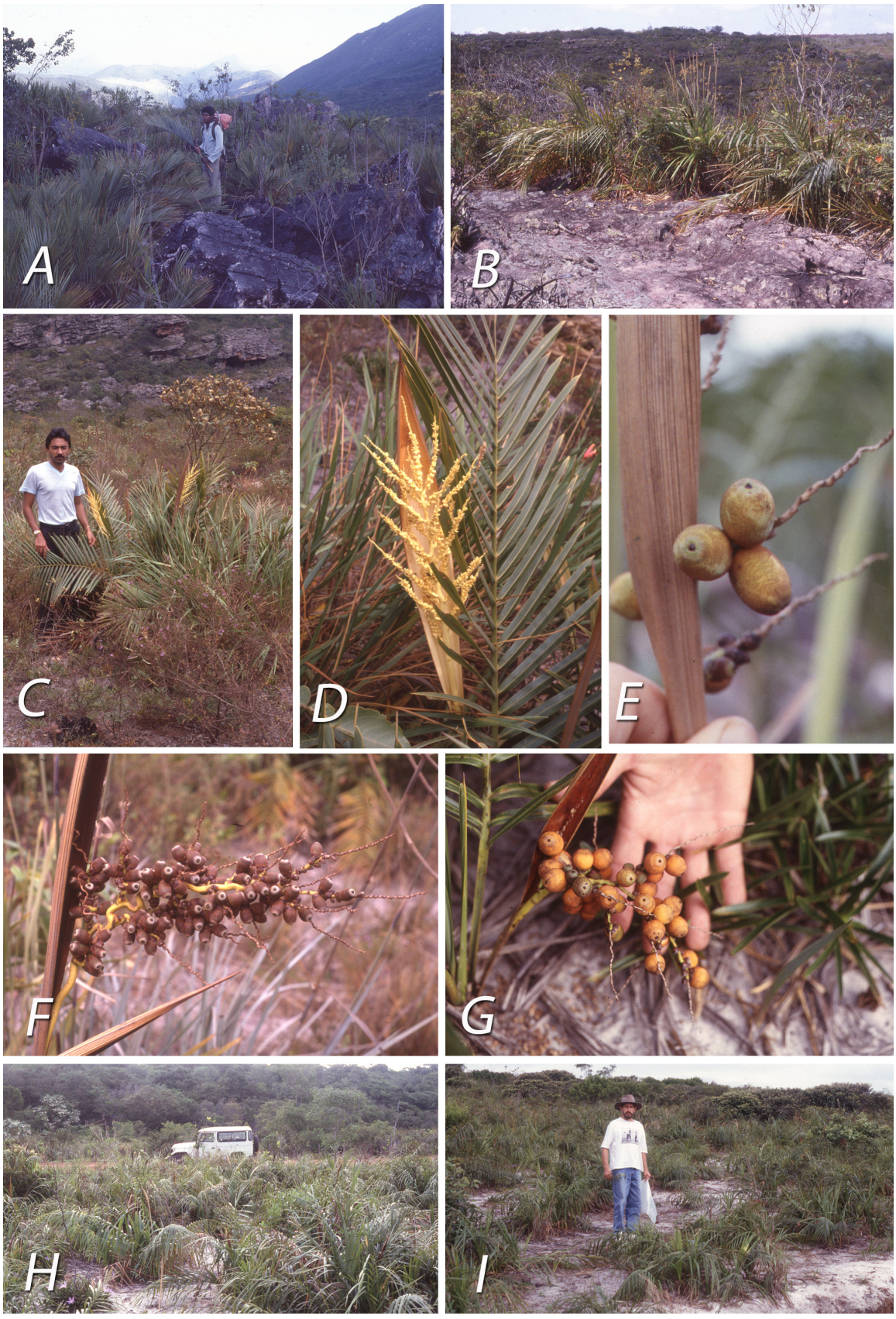

FIGURE 37. *Syagrus harleyi*. A. Rocky habitat near Jussiape, Bahia with guide (*Noblick & Lobo 4517*). B. High elevation habit in a rocky crevice near Mucugê, Bahia. C. Flowering palm with driver for scale near Mucugê, Bahia (*Noblick 4387*). D. Inflorescence with stiffer leaflets of high elevation form near Mucugê, Bahia. E. Infructescence with mature fruit. F. Infructescence with developing fruit. G. Mature infructescence of low elevation form. H. Low elevation population near Lençois, Bahia (*Noblick 5171*) in sandy soil. I. Low elevation habit with pendulous or lax leaflets with Roy Funch near Lençois, Bahia.

Etymology:—The specific epithet, *harleyi,* honors the principle collector, Dr. Raymond M. Harley (1936–2006), English botanist, a student of the Bahian Flora since the early 1970s and an expert on neotropical biodiversity and the flora of north-east Brazil.

Distribution and habitat:—This species is endemic to the Chapada Diamantina region of Bahia, Brazil, in high elevation campo rupestre, over sandy and rocky soils. It is distributed from as far north as Morro do Chapéu (where it is rare), common near Lençois, Palmeiras, and south to Jussiape (where it is abundant). All populations are found in the central Bahian sierras of the Serra do Sincorá in the South to the Serra do Tombador in the North.

This palm grows in campo rupestre at lower elevations but is more frequently at higher elevations above 900 m, growing in the little bit of sand and humus that collects in the cracks between the rocks. Sometimes this palm grows in large areas of sandy soils at the base of cliffs with an adjacent stream nearby (west of Mucugê) or in a sandy dune like deposit (Capetinga, northeast of Lençois). At lower elevations, 400–600 m, the plant still tends to grow in rocky soils, but the form of the leaf and peduncular bract take on a little different appearance (see notes).

Conservation:—This species grows within the boundaries of a national park and also in soils that are of no agricultural value, and many grow even in rather inaccessible places, so it is not considered to be threatened. Therefore, *S. harleyi* is classified as least concern, LC.

Phenology:—This species flowers and fruits all year around, but its flowers were seen in September to January and mature fruits were collected in September to February. This species fruits moderately in the beginning of the summer. The germination rate of the seed is low, and germination is slow (more than 6 months).

Uses:—Because of the large quantity of wax that accumulates on the leaves, children will sometimes gather the old dead leaves for starting domestic fires (fire tinder) for cooking etc. The plant is attractively ornamental such that it is recommended for cultivation in general landscaping and may be somewhat cold tolerant. It is particularly interesting for rock gardens.

Notes:—*Syagrus harleyi* has many short rachillae, up to 15 cm long, packed with pistillate flowers and ultimately congested with fruits.

Although the inflorescence remains consistent in its appearance, the leaves and peduncular bract vary depending on the elevation. At the higher elevations (above 900 m), the leaflets tend to be wider and are held stiffly from the rachis, that is, the ends of the leaflets are not pendulous and the peduncular bract is thicker and the expanded portion of the bract tends be wider or more inflated. At the lower elevations, 400–700 m, the narrower leaflets are flaccid, pendulous at their tips and the peduncular bract is thinner and the expanded portion skinner or rather much less inflated than its higher elevation relatives.

Among the high elevation acaulescent *Syagrus* species in central Bahia (*S. harleyi*, *S. microphylla*, *S. werdermannii*), *S. harleyi* tends to grow in true campo rupestre in rocky conditions and thin soils. *Syagrus microphylla* tends to grow in the lower white sandy areas that accumulate adjacent to the campo rupestre areas, although it will grow in rocky areas as well; and *S. werdermannii* actually grows in very deep light brown fine sandy soils on an isolated disjunct cerrado that could best be described as "campo limpo," clean fields, lacking trees.

Representative specimens:—BRAZIL. **Bahia**: Andaraí, South of Andaraí, 16 km along road to Mucugê near small town of Xique-Xique, 700–900 m, ca. –12.90, –41.32, 14 February 1977, *R.M. Harley et al. 18696* (CEPEC!, K!); Andaraí, um pouco antes de Rio Paraguaçu no caminho Andaraí/Mucugê, –12.82, –41.32, 28 September 1985*, L.R. Noblick 4388* (F!, HUEFS!); Andaraí, Serra do Sincora, 343 m, –12.81, –41.33, 5 August 2001, *Nonato, F.R. et al. 995* (HUEFS!); Andaraí, caminho para antiga estrada para Xique-Xique do Igatu, 560 m, –12.82, –41.30, 14 February 1997, *E. Saar 5601* (ALCB!, HUEFS!); Jussiape, Caraguatai, Serra de Tobira, 800–1400 m, 3 km oeste de Paxão, –13.32, –41.68, 28 January 1986*, L.R. Noblick & J. Lobo 4517* (AAU!, ALCB!, BH!, CEN!, CEPEC!, F!, FTG!, HRB!, HUEFS!, K!, MO!, U!); Lençóis, Afloramento próximo ao ribeirão do meio, –12.52, –41.38, 14 May 2008, *J.C. Brito 11* (HUEFS); Lençóis, Serra da Chapadinha-Chapadinha, 910 m, –12.46, –41.44, 27 October 1994, *A.M. de Carvalho 1094* (ALCB, UFP); Lençois, 1 km leste da estrada Lençois BR-242 (entrada no km 3), 550 m, –12.56, –41.39, 5 July 1983, *L. Coradin et al. 6481* (CEN!, K!, MO, NY!, RB!, VEPAG!, UFP); Lençóis, –12.57, –41.38, 27 August 2005, *Couto, A.P.L. 152* (HUEFS); Lençois, –12.56, –41.39, 24 August 1965, *A.P. Duarte 9341* (RB!); Lençóis, –12.56, –41.39, January 1997, *L.S. Funch 1081, 1083* (HUEFS); Lençóis, Serra da Chapadinha-Ao longo do córrego Chapadinha, 600 m, –12.45, –41.42, 6 February 1995, *A.M. Giulietti 1609* (ALCB, UFP); Lençóis, Serra da Chapadinha-Chapadinha, 750 m, –12.47, –41.42, 30 June 1995, *M.L. Guedes 2047* (ALCB, CEPEC, UFP); Lençois, 2 September 1985*, J.L. de S. Lima & L.R. Noblick s.n.* (HTSA!); Lençóis,

Estrada para Lençóis, próximo ao entroncamento para Fazenda Remanso, 500 m, –12.56, –41.39, without date, *G. Martinelli 5385* (RB!); Lençois, Capitinga-na estrada para o aterro, 5 September 1999, *E. Miranda-Silva et al. 212* (HUEFS!); Lençois, perto do cemetério, –12.57, –41.38, 29 September 1985*, L.R. Noblick 4389* (CEN!, CEPEC!, F!, FTG!, HRB!, HUEFS!, IPA!, K!, NY!, RB!, SP!, US!); Lençóis, ca. 6,0 km NE of the city on the main highway coming into Lençóis, in an area called Capetinga, 450 m, –12.57, –41.36, 16 November 1997, *L.R. Noblick 5171* (HUEFS!); Lençóis, Serra da Chapadinha-Serra da Chapadinha, 940 m, –12.45, –41.45, 30 July 1994, *A. Pereira 331* (ALCB, UFP); Lençóis, Rio Mandassaia, –12.47, –41.43, 17 May 2001, *A.A. Ribeiro-Filho 267* (HUEFS); Lençóis, Capitinga. Solo arenoso profundo, de fisionomia semelhante a vegetação de restinga, –12.50, –41.38, 29 April 1999, *F.F. Rocha 29* (HUEFS, SP); Lençóis, Capitinga, –12.50, –41.38, 4 September 1999, *F.F. Rocha 39* (HUEFS); Lençóis, Capitinga, –12.50, –41.38, 20 February 2000, *F.F. Rocha 55* (HUEFS); Lençóis, Serra da Chapadinha-Serra do Brejão, 640 m, –12.46, –41.441, 28 September 1994, *G. Stam 904* (ALCB, CEPEC, UFP); Lençóis, Chapadinha, 1 km W of road to Lençóis on BR 242, 850 m, –12.56, –41.39, 12 March 2002, *W.W. Thomas 12981* (NY); Morro do Chapéu, Chapada Diamantina, campinho para Venturra, na estrada, –11.55, –42.50, 7 September 2002, *M.L. Guedes 9820* (HUESB); Morro do Chapéu, Cachoeira do Ferro Doido, 900 m, –11.55, –41.16, 28 October 1978, *G. Martinelli et al. 5319* (RB!); Morro do Chapéu, estrada Seabra-Feira de Santana (BA), a partir de Palmeiras, –11.49, –41.32, 4 March 2006, *R. Tsuji et al. 1156* (HPL!, IAC); Mucugê, 800 m, –13.01, –41.37, 3 August 1989, *G. F. E. Abrahão s.n.* (MBML!); Mucugê, prox. Mucugê, 960 m, –13, –41.41, 25 March 1980, *A.P. de Araujo 289* (HRB!); Mucugê, beira da estrada para Andaraí, ca. de 2 km, 1000 m, 16 December 1989, *M.G. Arraes et al. 7014* (SPF 36814!); Mucugê, Serra do Sincorá, 2 km N of Mucugê city on road to Andaraí. 950 m, –13.01, –41.37, 9 May 1976, *C.E. Calderon et al. 2418* (CEPEC!, F!, US!); Mucugê, 6 December 1980, *M. Furlan et al. 437* (K!, SPF); Mucugê, without date, *M. Furlan et al. 1588* (CFCR!, K!); Mucugê, without date, *M. Furlan et al. 1952* (CFCR!, K!); Mucugê, Chapada Diamantina, 1000 m, –12.95, –41.47, 28 June 1997, *M.L. Guedes 4900* (ALCB!); Mucugê, Chapada Diamantina, 1000 m, –13, –41.37, 5 February 1997, *M.L. Guedes 5105* (ALCB!); Mucugé, by Rio Cumbuca ca. 3 km S of Mucugé. near site of small dam on road to Cascavel, 850 m, –13.02, –41.35, 4 February 1974, *R.M. Harley, S. Renvoize, C. Erskine & C. Brighton 15963* (CEPEC!, F!, IPA!, K!, MO!, NY!, RB!, US); Mucugê, Arredores de Mucugê, –13.01, –41.37, 17 June 1984, *G. Hatschbach & Kummrow 48000* (CEPEC, MBM!, NY, US); Mucugê, 2–3 km S, –13.01, –41.37, 8 April 1992, *G. Hatschbach et al. 56875* (MBM!); Mucugê, 2–3 km de las ville, Criminose, 11 September 1993, *F. Lechat* & *M. Pignal 459* (P!); Mucugê, na estrada da Barra da Estiva a ca. 3 km de Mucugê, 1000 m, –13.01, –41.41, 5 February 2009, *H. Lorenzi 6597* (HPL!); Mucugê, 3 km ao S de Mucugê, na estrada para Jussiape, 1000 m, –13.00, –41.40, 26 July 1979, *S.A. Mori et al. 12638* (BH!, CEPEC!, NY!, US!); Mucugê, Estrada entre Andaraí e Mucugê. 900–1000 m, –12.25, –41.30, 20 November 1983, *L.R. Noblick et al. 2867* (CEPEC!, F!, HUEFS!, MO!); Mucugê, 6 km W da cidade na entrada para Boninal, 900–1000 m, –13.00, –41.45, 28, 28 September 1985*, L.R. Noblick 4387* (CEPEC!, F!, HUEFS!, RB!, NY!); Mucugê, prés de l'entrée de la ville, –13.00, –41.37, 800 m, 20 August 2005, *M. Pignal et al. 2561* (P!); Mucugê, Parque Municipal Sempre-Viva. Trilha para cachoeira do tiburtino, –12.98, –41.33, 31 October 2011, *R.P. Oliveira 1913* (HUEFS!); Mucugê, without date, *J.R. Pirani et al. 1642* (CFCR!); Mucugê, 1000–1200 m, –12.97, –41.33, without date, *C.M. Pigozzo 30* (HUEFS); Mucugê, Chapada Diamantina, 980 m, –12.99, –41.34, 8 July 2006, *N. Roque 1424* (ALCB); Mucugê, Chapada Diamantina, 948 m, –13.02, –41.34, 19 May 2007, *N. Roque 1546* (ALCB); Mucugê, Chapada Diamantina, 941 m, –13.00, –41.39, 22 May 2010, *N. Roque 2828* (ALCB); Mucugê, Chapada Diamantina, –12.91, –41.25, 30 April 2001, *D.L. Santana 194* (ALCB); Mucugé, Chapada Diamantina. Parque Municipal de Mucugê/Projeto Sempre Viva. BA-km 42 a 46. Mata de Zé Leandro, 900 m, –12.98, –41.32, 7 January 1998, *M.T.S. Stradmann 576* (ALCB, CEPEC); Mucugê, a 6 km N de Mucugê, estrada Mucugê/Andaraí, 22 July 1985, *M.G.L. Wanderley et al. 967* (SP!); Mucugê, Parque Municipal de Mucugê, –13.01, –41.37, 7 April 2008, *M.G.L. Wanderley 2671* (SP); Palmeiras, –12.95, –42, 2 September 1985*, J.L. de S. Lima & L.R. Noblick 71* (HTSA!); Palmeiras, ca. 1–2 km oeste da entrada para serra Pai Inácio no BR 242, 890 m, –12.43, –41.53, 2 September 1985*, L.R. Noblick & J.L. de S. Lima 4379* (F!, HUEFS!); Palmeiras, 4 km leste de Posto Pai Inácio na BR 242, 810 m, –12.47, –41.42, 2 September 1985*, L.R. Noblick & J.L. de S. Lima 4380* (CEPEC!, F!, GH!, HUEFS!, MBM!, SP!); Palmeiras, a saída de Palmeiras a 15 km de Guine, 17 November 1983, *Pinto 416-A/83* (HRB!); Seabra, –12.44, –41.49, 3 February 2010, *H. Lorenzi et al. 6818* (HPL!).

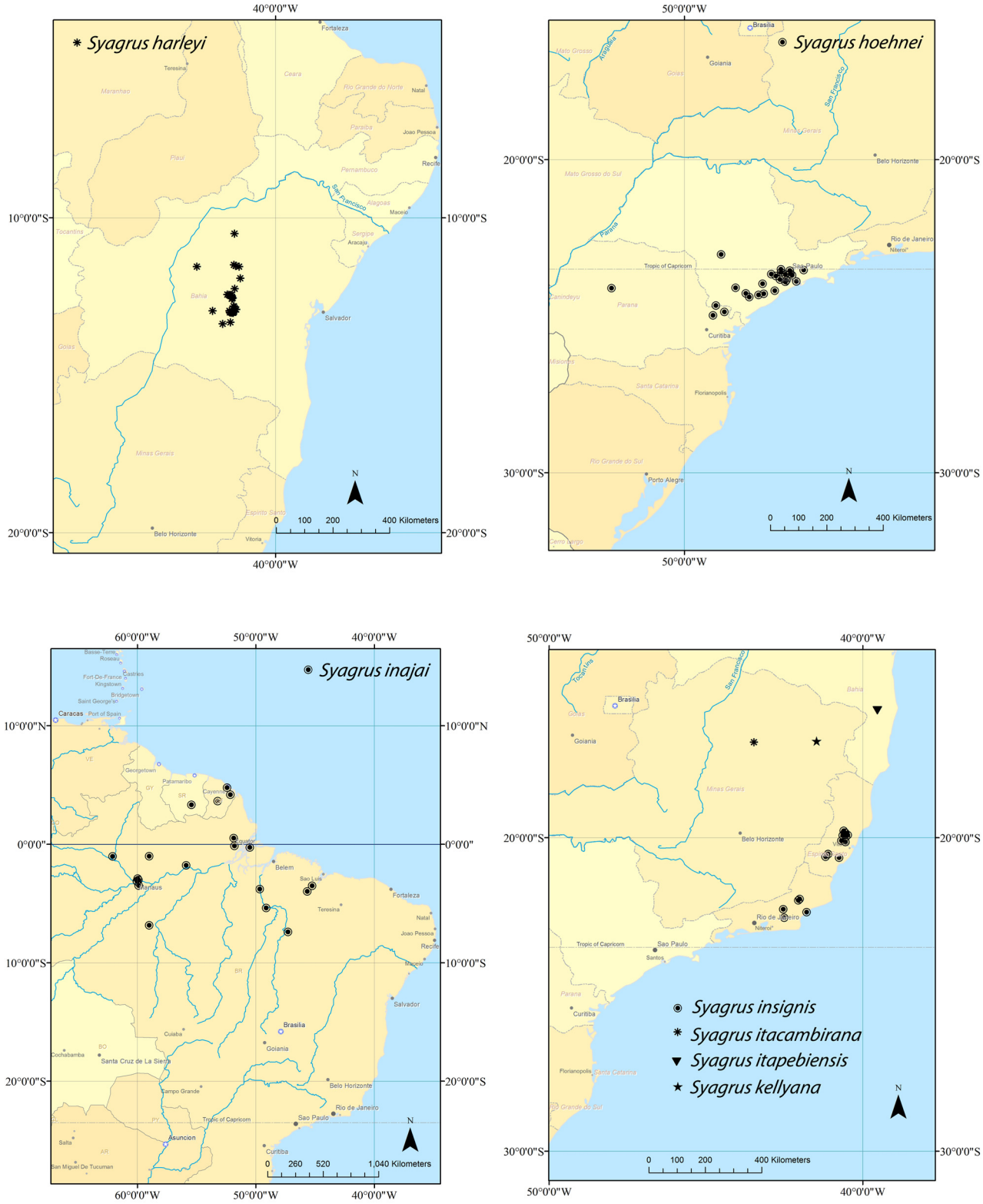

FIGURE 38. Distribution maps of *Syagrus harleyi, S. hoehnei, S. inajai, S. insignis, S. itacambirana, S. itapebiensis* and *S. kellyana*.

27. *Syagrus hoehnei* Burret (1937: 678). *Lytocaryum hoehnei* (Burret) Toledo (1944: 7). Type:—BRAZIL. São Paulo: Cotia, Barragem nova de Cotia, –23.60, –46.91, 12 June 1930, *A. Gehrt s.n.* (holotype SP! [SP-25318], isotypes B, BH, SPF).

Figure 39 plate, Figure 38 map.

Solitary palm with columnar **Stem** ca. 3–5 m × 10–15 cm, often covered with persistent leaf sheaths and fibers. **Leaves** 16–22; *sheathing leaf base* ca. 27–32 cm long; *pseudopetiole* 23–52 cm long with mostly smooth margins; *petiole* 10–26 × 1.2–2.2 cm, 0.5–1.2 cm thickness; *rachis* 140–155 cm long; *leaflets* narrowly linear, dark green adaxially, silvery to brownish silvery pubescent on the abaxial surface, 56–63 along one side, regularly arranged in one plane, ramenta scales or brownish tomentum present where the leaflets are inserted on the rachis and present in patches along the abaxial midvein; basal leaflets 15–25 × 0.25–0.55 cm, middle leaflets 38–40 × 1.5–2.0 cm, apical leaflets 10–21.5 × 0.4–0.8 cm with an asymmetric acuminate tip. **Inflorescence** erect, spirally branched; *prophyll* 16–27 × 2.5–3.2 cm; *peduncular bract* ca. 92 cm long, expanded portion 52–56 × 3–7 cm, including a 1.5–2.0 cm beak, 6–8 cm perimeter, 1.5–2.0 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 55 × 0.5–1.2 cm, elliptical in cross-section, lepidote to hairy; *inflorescence axis* 35–40 cm long; *rachis* 25–28 cm long; *rachillae* 34–50, glabrous, 7–11 cm long at the apex, 9–19 cm long at the base; *staminate flowers* 6–7 mm at the apex, 7–9.8 × 2.5–3.0 mm at the base, green to yellow, sepals 1.5–2.5 × 1.5–3.0 mm, glabrous, faintly visible nerves, petals 4–5 mm long at the apex, 6–8.5 × 1.7–2.3(–3) mm at the base with acute tips, nerves indistinct, stamens 4.0–6.5 mm long, anthers 3.5–4.5 mm long, filaments 0.8–1.2(–2) mm long, pistillode ca. 1 mm long; basal *pistillate flowers* conical, 6.0–8.5 × 5–6 mm, yellow, glabrous, sepals 6.0–7.3 × 3.8–5.0 mm, glabrous, no visible venation, petals 5.0–7.2 × 3–4 mm, glabrous, distinctly nerved, valvate tips less than to ½ the length of the petals, pistil 4.5–6.5 × 2.5–3.0 mm, glabrous to lepidote, stigmas ca. 1.5–2 mm long, glabrous, staminodal ring ca. 0.5–1 mm high, 6-dentate. **Fruit** globose to ovoid, 3.0–3.3 × 2.0–2.3 cm, brownish-green when mature, glabrous to short tomentose on the basal portion of the fruit, epicarp less than 0.5 mm thick, mesocarp 1 mm thick, succulent and fibrous, both epicarp and mesocarp split longitudinally at maturity into three or more parts and peels back exposing the endocarp; *endocarp* 2–2.1 × 1.7–1.8 cm, thin and fragile, 0.5–1.0 mm on its sides and 1 mm thick at the ends, *seed* broadly ellipsoid, ca. 1.7 × 1.3 cm, endosperm ruminate. Germination adjacent-ligular.

Common name:—icá, palmeira-prateada.

Etymology:—The specific epithet, *hoehnei,* honors the Brazilian botanist Dr. Fredrico Carlos Hoehne (1882–1959) from the state of São Paulo, who was a pioneer in the protection of the environment in Brazil.

Distribution and habitat:—São Paulo and Paraná, Brazil, in the Atlantic forest in the Serra do Mar region (800–1000 m elevation), in well-drained soils along slopes in open woodlands and forests.

Conservation:—This palm is rare and threatened, but with the discovery of new populations, it is in less danger than previously thought, and some plants are protected within state and national parks and reserves. Yet outside of these parks and reserves, the Atlantic forest is extremely fragmented. This species is classified as Vulnerable C2a(i).

Phenology:—Fruiting during the later spring and summer months, November to March.

Uses:—This palm is extremely ornamental with its graceful foliage. It possesses a great potential for landscaping. When young, it does well as a potted plant and tolerates low-light, interior conditions. In landscaping, it should always be cultivated in partial shade.

Notes:—This palm has dark green foliage with a silvery to brownish pubescence on the abaxial side of the leaflets, fruit with a spitting epicarp and mesocarp, and a ruminate endosperm.

Representative specimens:—BRAZIL. **Paraná:** Adrianópolis, Parque Estadual das Lauráceas, –24.86, –48.72, 900, 25 November 2008, *M.L. Brotto 264* (UPCB); Adrianópolis, Bernech, Fazenda Mato Limpo, Berneck, –24.66, –48.99, 23 November 2004, *J.M. Silva & L.M. Abe 4205* (HUEFS, MO, RB); Adrianópolis, Fazenda Mato Limpo, Berneck, –24.66, –48.99, 9 June 2005, *J.M. Silva 4347* (ALCB, UPCB); Campo Mourão, Parque Estadual Lago Azul (PELA), –24.10, –52.32, 1 June 2007, *M.G. Caxambu 1513* (HCF); Tunas do Paraná, Parque das Lauráceas, –24.97, –49.09, 5 October 1999, *J.M. Silva et al. s.n.* (MBM); **São Paulo:** Adeinha, 1940, *A. Gehrt s.n.* (SP-43163); Camping Ana Paula, região sul do município de São Paulo, –23.90, –46.77, 12 September 1994, *N.S. Ávila et al. 311* (SP); Capão Bonito, Parque Estadual Nascentes do Paranapanema, –23.024, –48.82, 720 m, 3 February 2012, *F.A.R.D.P. Arzolla et al. 1529* (SPSF); Cotia, Reserva Estadual de Morro Grande, Sub-bosque, –23.60,

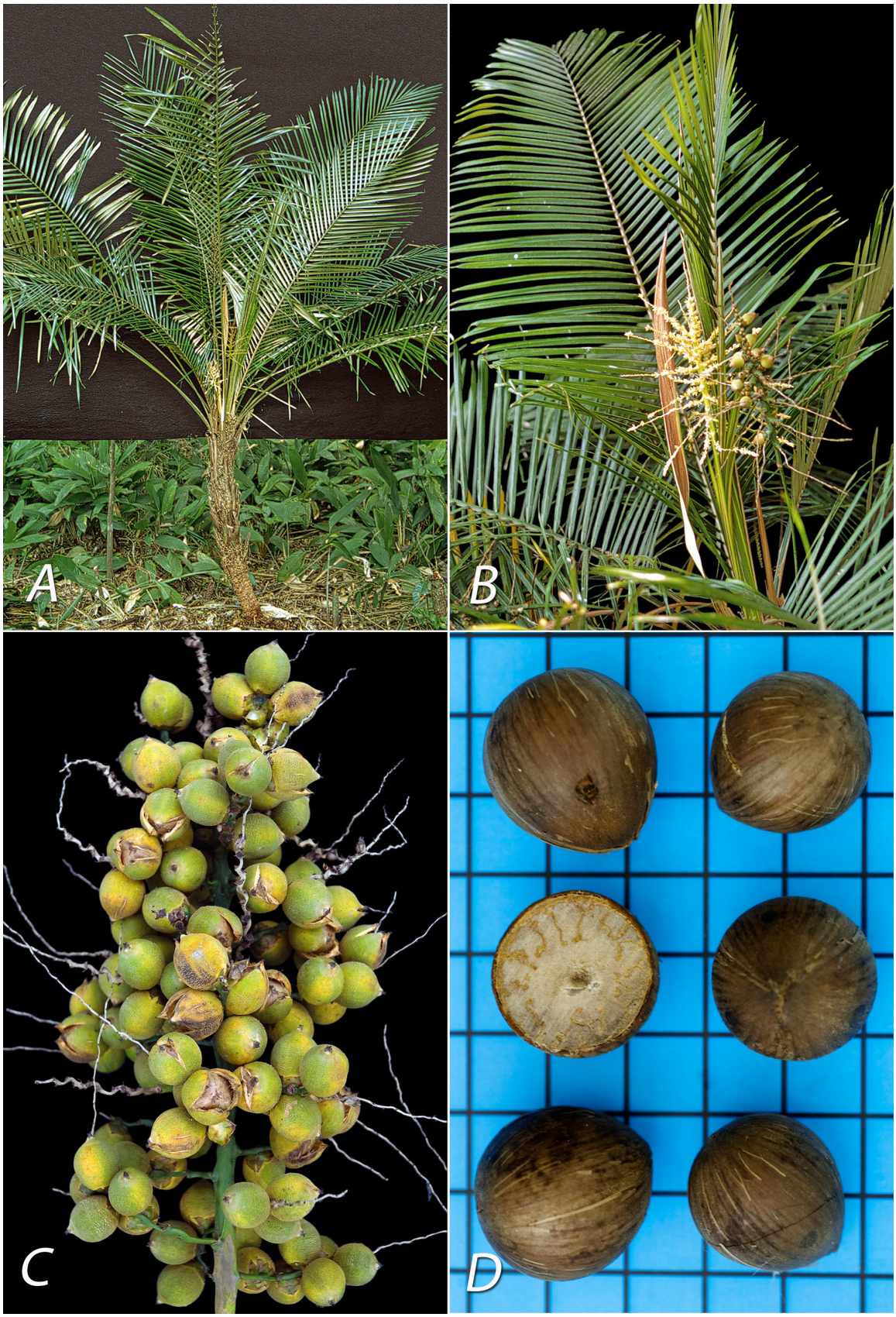

FIGURE 39. *Syagrus hoehnei*. A. Habit. B. Inflorescence. C. Mature fruit. D. Endocarps with one sectioned to show ruminate endosperm. Grid is in centimeters. Photos by Harri Lorenzi.

–46.91, 1 May 2003, *D.K. Ferraz s.n.* (UEC); Cotia, Reserva de Morro Grande, –23.50, –46.92, 25 February 2000, *P. Fiaschi et al. 146* (SPF); Cubatão, –23.89, –46.42, 9 May 1930, 1930, *F.C. Hoehne s.n.* (SP! [SP-26520]); Ibiúna, Parque Estadual de Jurupará, Caminho para a Fazenda Tucano, na orla da mata, –23.65, –47.22, 28 July 1995, *J.B. Baitello & J.A. Pastore 782, 784* (SP); Ibiúna, próximo ao distrito de Caucaia do Alto (Cotia-SP), fragmento Beto Borracheiro, –23.72, –47.07, 8 February 2001, *L.C. Bernacci et al. 3036* (IAC); Juquiá, Estrada vicinal não pavimentada, lado direiro do km 15 da rodovia SP 165 (Juquiá-Sete Barras), 3,7 km do entroncamento em direção à fazenda Santa Fé. Sítio Totoca, –24.32, –47.63, 13 May 1994, *R. Mello-Silva et al. 982* (SP); Miracatu, perto de Pedro Barros, –24.28, –47.46, 30 July 1966, *J.R. Mattos 13844* (SP!); Miracatu, –24.28, –47.46, January 2012, *V.C. Souza 34330* (ESA!); Miracatu, Serra do Cafezal. Área da futura duplicação da BR-116. BR-116 (km 344–363), –24.28, –47.46, January 2012, *V.C. Souza 36330* (ESA!); Mogi das Cruzes, *H. Lorenzi et al. 971* (HPL!); Mogi das Cruzes, –23.52, –46.19, 21 August 2008, *R. Tsuji 2718* (HPL!); Pedro de Toledo, Parque Estadual da Serra do Mar, –24.18, –47.11, 427, 16 September 2010, *N.M. Ivanauskas & A. Sister 6316* (SPSF); Ribeirão Grande, Estação Ecologica de Xitué, –24.09, –48.36, 19 September 2006, *F.M. Souza et al. 662* (SPSF); São Bernardo do Campo, Lote 3, Rodoanel Mário Covas, Trecho Sul, –23.69, –46.56, 21 July 2009, *R.T. Shirasuna 2474* (SP); São Lourenço da Serra, Reserva Particular do Patrimônio Natural Paiol Maria, –23.83, –46.95, 733, without date, *J.A. Lombardi 7856* (HRCB); São Paulo, Barragem Sto Amaro S. Paulo, 2 November 1950, *J.G. Batolomeu s.n.* (SPF); São Paulo, Parque Santos Dias, –23.54, –46.63, without date, *M.P. Botânico 17, 18, 19* (SPF); São Paulo, Parque Santos Dias. trilha principal, –23.66, –46.77, 15 April 1992, *R.J.F. Garcia 30* (SPF); São Paulo, Parque Santo Dias. Trilha das Quadras, –23.66, –46.77, 25 March 1993, *R.J.F. Garcia 372* (SPF); São Paulo, Parque Santo Dias. Trilha do Angico, –23.663056, –46.7725, 9999, 29 April 1993, *R.J.F. Garcia 393* (SPF); São Paulo, Distrito de Parelheiros. Sítio Morro Verde, à rua José Motta, –23.86, –46.74, 17 May 1996, *R.J.F. Garcia et al. 883* (SP); São Paulo, Mata do Governo, –23.54, –46.63, 8 May 1924, *A. Gehrt s.n.* (paratype SP! [SP-9716]); São Paulo, Santo Amaro. Parelheiros, –23.54, –46.63, 12 May 1930, *F.C. Hoehne s.n.* (paratype SP! [SP-26521]); São Paulo, Parque Estadual Fontes do Ipiranga, originalmente: Parque do Estado de S. Paulo, –23.54, –46.63, 28 March 1944, *W. Hoehne 1236* (SPF); São Paulo, Cratera da Colonia, –23.54, –46.63, 26 May 1999, *C.M. Izumisawa 203* (SPSF); São Paulo, Jardim Botânico,–23.54, –46.63, 23 August 1955, *M.P. Kuhlmann 3684* (SP!); São Paulo, Ipiranga, –23.54, –46.63, April 1921, *H. Luederwaldt s.n.* (SP!); São Paulo, Parque Estadual das Fontes do Ipiranga, –23.64, –46.61, 819, 20 January 2010, *R.T. Shirasuna 2739* (SP); São Paulo, Jardim Botânico, –23.54, –46.63, 16 June 1943, *J.F. Toledo & O. Handro s.n.* (SP!); Sete Barras, Parque Estadual Intervales, Bacia do Rio Saibadela. Trilha da Serra da Mina, quase no alto da serra divisora dos rios Forquilha e Saibadela, 500 m, –24.27, –48.03 (–24.39, –47.93), 26 July 1997, *H.Q. Boudet Fernandes et al. 3231* (MBML, SP, SPF); Tapiraí, Reserva Particular da Votorantim (CBA), Trilha da Serraria, –23.96, –47.50, 30 April 2013, *G.D. Colletta & V.C. Souza 1055* (ESA!).

28. *Syagrus inajai* (Spruce) Beccari (1916: 467). *Maximiliana inajai* Spruce (1869: 163). *Cocos inajai* (Spruce) Trail (1877: 79). *Calappa inajai* (Spruce ex Trail) Kuntze (1891: 982). Type:—BRAZIL. Amazon: Rio Negro, *Spruce 83* (K!)

Cocos aequatorialis Barbosa Rodrigues (1875: 38). *Syagrus aequatorialis* (Barb.Rodr.) Barbosa Rodrigues (1879: 33). Type:—none designated, a superfluous substitute name for *Maximiliana inajai*.

Cocos speciosa Barbosa Rodrigues (1875: 38). *Syagrus speciosa* (Barb.Rodr.) Barbosa Rodrigues (1879: 49). *Calappa specio*sa (Barb.Rodr.) Kuntze (1891: 982). Lectotype (designated by Glassman [1972b: 94]):—BRAZIL. Ad fluvious Capim et Pixuna. Barbosa Rodrigues (1907) t. 24, fig. B, 1907.

Cocos chavesiana Barbosa Rodrigues (1887: 445). *Syagrus chavesiana* (Barb.Rodr.) Barbosa Rodrigues (1888: 52). Type:—BRAZIL. Amazonas, Manaos [sic], *Barbosa Rodrigues s.n.* (FI).

Figure 40 plate, Figure 38 map.

Medium to tall, solitary palm. **Stem** ca. 3–15 m × 5–15 cm, smooth. **Leaves** 6–15; *sheathing leaf base* ca. 15–75 cm long; *pseudopetiole* 22–150 cm long; *petiole* 0–4 × 1.5–3.5 cm, 1.3–2.0 cm thick; *rachis* (130–)160–390 cm long, pseudopetiole and rachis are brown tomentose; *leaflets* slightly lighter on the abaxial surface, (50–)68–110 along one side, in clusters of 2–5(–7), inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis nor along the abaxial midvein, cross veins are distinctly raised, very visible on the upper or adaxial surface; basal leaflets (20–)47–106 × 0.3–1.4 cm, middle leaflets 43–85 × 2.5–4.0 cm, apical leaflets 10–35 × 0.1–0.8 cm with an asymmetric tip. **Inflorescence** erect to

pendulous, spirally branched; *prophyll* (20–)47–60 × 3–3.5 cm; *peduncular bract* 75–130 cm long, expanded portion 50–70(–80) × 9–11 cm, including a 1–2.5 cm beak, 10–17 cm perimeter, 3–8 mm thickness, narrow, woody, sulcate, exterior with scattered thin waxy indument; *peduncle* ca. 40–82 × 1.0–1.9 cm, 0.7–1.1 cm thick, elliptical in cross-section, glabrous on the upper portion, but scaly on the lower; *inflorescence axis* 34–68 cm long; *rachis* (6–)12–30 cm long; *rachillae* (6–)14–47, 6–45 cm long at the apex, 22–60 cm long at the base, glabrous; *staminate flowers* 5–7 mm long at the apex, 7–9 × 4–6 mm at the base, green to yellow, sepals 1–1.5 × less than 1 mm, glabrous, no visible nerves, petals 7–9 × 2–3(–5) mm at the base with acute tips, nerves indistinct, stamens 4–5 mm long, anthers 2.5–4 mm long, filaments 2 mm long, pistillode less than 1 mm long; basal *pistillate flowers* conical to rounded, 5–8 × 5–7 mm, yellow, glabrous, sepals 5–7 × 4–6 mm, glabrous with indistinct venation, slightly keeled, petals 5–7 × 4–6 mm, glabrous, visibly nerved, valvate tips ca. 1/3 the length of the petal, ca. 2 mm long, pistil 4–5 × 2–3.5 mm, glabrous, stigmas 1–2 mm long, glabrous, staminodal ring ca. 1–2 mm high, 6-dentate. **Fruit** ellipsoid, 3.2–4.5(–5.5) × 2.5–3 cm, yellow when mature, glabrous, epicarp less than 0.5 mm thick, mesocarp 1–2 mm thick, succulent and fibrous; *endocarp* ellipsoid, ca. 3 × 2.1–2.2 cm, 2–6 mm thick; *seed* ellipsoid, ca. 1.5–2 × 1–1.3 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—curua rana, guariroba, pupunharana, pupunha-brava, pupunha-de-porco, pupunha-rana, pirima, piririma, inaja-y, jara-rana, jariva (Brazil); peh-peh (Surinam); churruai, churrubay, yay-pepe, saray, pupuña silvestre, maiz-pepe (Colombia); feuille-chasseur (French Guyana, immature form only).

Etymology:—The specific epithet, *inajai,* is one of the indigenous names of this palm.

Distribution and habitat:—In Brazil, this palm is distributed in Amapá, Maranhão, Pará, Roraima and Amazonas, in tropical forest of terra firme and gallery forests, and in areas of low elevation swamp. It also grows in French Guiana and Suriname. Various references (Govaerts *et al.* 2016, Henderson *et al.* 1995) cite *S. inajai* from Guyana, but to date no specimens have been found in any of the major herbaria.

Conservation:—This species is widely distributed and is well protected in various preserves in Brazil and French Guiana. Therefore, it is not considered to be threatened and is classified as least concern, LC.

Phenology:—Fruits in the summer.

Uses:—Its seeds are edible, and its leaves are employed locally as thatch. The species possesses ornamental attributes that justify its cultivation in landscaping in tropical regions.

Notes:—This is a small-trunked, common *Syagrus* of the Amazon region. Raised cross veins on the leaflets, yellow fruit, and a triangular nut cavity (in cross-section) are distinguishing characters. The raised transverse veins are especially noticeable on dried specimens, which usually dry dark green.

Representative specimens:—BRAZIL. **Amapa:** Macapá, Road from Cupixi to rio Vila Nova, 13.6 km SSW of Cupixi, 0.53, –51.87, 5 January 1985, *S. A. Mori 17709* (NY!); Mazagão, BR 156, road under construction which will connect Macapá with Monte Dourado, 81 km WSW of Macapá, ca. 11 km SW of Rio Preto, –0.13, –51.80, 20 December 1984, *S. A. Mori 17466* (NY!); **Amazonas:** Borba, 3 km Sul de Borba, –4.39, –59.59, 15 May 1995, *F. Kahn 3589* (CEN!); Careiro, Sítio de Pesquisa PPBio, BR-319-M02_TN_0500 (forest plot, Módulo 02, Trilha Norte 0500), 42 m, –3.48, –59.88, 1 January 2010, *Emili & Moulatlet 501* (INPA); Manaus, Reserva Florestal Ducke,–3.10, –60.03, 1 January 1967, *Albuquerque & Elias 10* (INPA); Manaus, Reserva Florestal Ducke Mata de terra firme, solo arenoso, –3.10, –60.03, 1 January 1967, *Albuquerque & Elias 67/3* (INPA); Manaus, AM-10, Sítio Araçatuba. Espécie presente na capoeira do relevé nº 13, –3.10, –60.03, 1 January 1983, *A. de Castro 602* (INPA); Manaus, Rio Urubú, Reflorestadora Ajuricaba. M Mata de terra frime, na parte baixa da ladeira, quase chegando no igarapé, –3.10, –60.03, 1 January 1983, *A. de Castro 604* (INPA); Manaus, igarapé do Parque 10 de Novembro, –3.10, –60.03, 1 January 1955, *L.F. Coêlho s.n.* (INPA); Manaus, Ducke Reserve, km 26 Manaus-Itacoatiara Hwy. Transect 5, 80 m, –3.00, –59.97, 16 January 1990, *A.H. Gentry & J. Revilla 69193* (MO, NY!); Manaus, Vivienda Verde. Igapo, –3.13, –60.02, 1 January 1985, *A.J. Henderson et al. 185* (INPA); Manaus, Cidade Nova, near Conjunto Manoa, –3.10, –60.03, 30 July 1986, *A.J. Henderson 634* (INPA, NY); Manaus, Manaus, 60 km N of city on road to Caracarai, then 3 km E on ZF1, –3.10, –60.03, 4 August 1986, *A.J. Henderson & Nascimento 644* (INPA, NY!); Manaus, Reserva Ducke, Near Manaus on road to Itacoatiara, 1 January 1989, *A.J. Henderson & A.O. Scariot 1157* (INPA, NY!); Manaus, Rerseve km 60 ZF 2, km 38 in The reserve, –3.10, –60.03, 1 January 1981, *F. Kahn 601* (INPA); Manaus, Parque A. Duque, on Manaus-Itacoatira road, 15 March 1967, *H.E. Moore 9528* (BH, NY!); Manaus, Manaus- Itacoatiara Highway, Reserva florestal Ducke, km 26, 1 January 1966, *G.T. Prance & Pena 2157* (INPA); Manaus, Campus do INPA, próximo ao Herbário Originaria de lugares arenoso, –3.10, –60.03, 1 January 1983, *Silva & Coêlho s.n.* (INPA); Manaus, Campus do INPA, Coletada defronte à Secretaria de

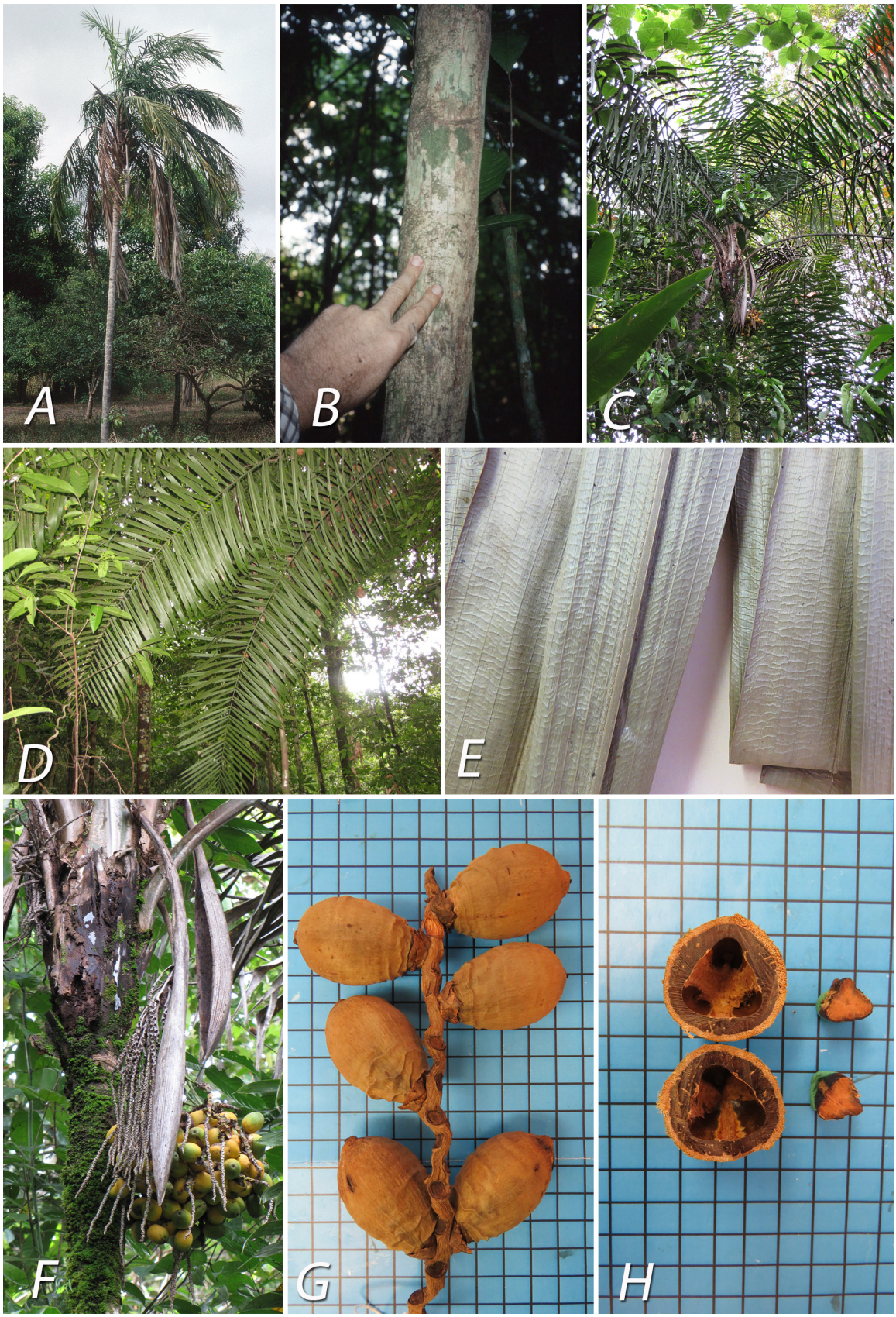

FIGURE 40. *Syagrus inajai*. A. Habit near Buriticupu, Maranhão, Brazil (*Noblick 4970*). B. Stem. C. Canopy of palm near Montsinery, Cayenne, French Guiana (*Noblick 5596*). D. Leaves near Saül, French Guiana (*Noblick & Moonen 5612*). E. Close up dried leaves showing raised cross-veins. F. Infructescence (*Noblick 5596*). G. Fruits. H. Cross-section of fruit showing triangular interior of the endocarp and triangular-shaped dried seed to the right (*Noblick 5014*). Grid is in centimeters.

Pós-Graduação-INPA, –3.10, –60.03, 1 January 2003, *Souza & Oliveira s.n.* (INPA); Manaus, Alto, Amazonas, –3.10, –60.03, 5 July 1982, *P. Schwacke 4054* (RB!); Manaus, –3.10, –60.03, 15 July 1982, *P. Schwacke 4059* (RB!); Manaus, Reserva Florestal Ducke. Manaus-Itacoatiara, km 26. Porçao Nordeste da Reserva, vale do Igarapé do Tinga, –2.88, –59.97, 28 April 1994, *A. Vicentini et al. 522, 523* (NY!, INPA); Presidente Figueiredo, Rebio Uatumã, grade do PPBio, –1, –59, without date, *Carvalho-Sobrinho et al. 1677* (INPA); Tocantins, River basin, 30 km S of Tururuí. understory of terra firme forest, plateau, 1 January 1981, *F. Kahn 604* (INPA); Amazonas, Margem direita do Rio Tocantins. Mata de terra firme nas proximidades de obras U.H.T., 11 December 1983, *M.F.F. da Silva et al. 256* (INPA, MG!); Amazonas, BDFF Reserve km 41, 64 km N of Manaus on BR-174 and then 41 km E on ZF-3, 21 August 1989, *A.J. Henderson et al. 1046* (INPA, NY!); Amazonas, North bank of Rio Negro, 20 km above Rio Taruma, 2 February 1974, *G. T. Prance 20198* (NY); Amazonas, Manaus, Rio Jara, 24 July 1875, *J.W.H. Trail 1122* (K, P!); **Maranhão:** Monçao, Ka'apor Indian Reserve, –3.49, –45.25, 10 May 1986, *W. L. Balée 2303* (NY); Santa Luzia, 1–2 km NE of Buriticupu along BR-222, 100–200 m, –3.96, –45.66, 4 September 1994, *L.R. Noblick 4970* (FTG!, NY!); **Pará:** Altamira, 3 km into forest at km 20 of BR 230, south of Altamira, 31 October 1977, *M.J. Balick et al. 909* (F!, INPA, MG!, NY!); Barcarena, *H. Lorenzi et al. 5042* (HPL!); Belem, ecological research plot of J.M. Pires, Instituto Agronomico do Norte, 21 March 1967, *H.E. Moore 9556* (IAN!); Belem, Pupunharana, IAN, mata da semaria, December 1952, *J.M. Pires 4425* (IAN!, US!); Belem, Mocambo, IPEAN: Reserva Mocambo, 19 April 1967, *J.M. Pires 10196, 10198* (IAN!); Belem, Mocambo, Quadra 10–26, 25 December 1968, *J.M. Pires 1999, 10198* (IAN!); Faro, São Jorge, Rio Jamundã, 10 November 1950, *G.A. Black & P. Ledoux 50-10689* (IAN!); Marabá, Reserva Florestal da Companhia Vale do Rio Doce, 53 km SW of the city, 50–100 m, –5.37, –49.12, 14 October 1994, *L.R. Noblick 5014* (FTG!, NY!); Nazare dos Patos, Nazarthe dos Patos, [Rio] Tocantins, 28 April 1924, *J.G. Kuhlmann 2099* (RB!); Oriximiná, Rio Trombetas, margem esquerda do lago Erepecu, –1.77, –55.87, 16 July 1980, *C.A. Cid Ferreira 1555* (NY!); Sebastiao de Boa Vista, on river Pracuubamirim, ca. 1 hour by boat upstream from São Sebastião de Boa Vista, Island of Marajó. Sítio campo, property of Manuel do Nascimento, Dona Casimira Cena do Nascimento, 20 October 1984, *J. J. Strudwick 4673* (NY!, US!); Tapojos region, Bôa Vista, 1932, *Capucho 524* (F!); Tocantins, 1907, *J.G. Kuhlmann s.n.* (F-611586); Tucuruí, Lower Tocantins River basin, Near Tucuruí Undertory terra firme forest, 1 January 1981, *F. Kahn, 593* (INPA); Tucuruí, Lower Tocantins River basin, 30 km south of Tucuruí. In understory of terra firme forest, 1 January 1981, *F. Kahn 602* (INPA); Tucuruí, PA-149, –3.77, –49.67, 5 October 1983, *J. Revilla 8575* (NY); Tucuruí, Margem do lago do Cagancho, –3.77, –49.67, 13 October 1983, *J. Revilla 8653* (NY); Ilha de Marajó, Rio Gipurú, a tributary of the Rio Anajas, –0.25, –50.50, 23 October 1987, *H.T. Beck & S. Souza 165* (INPA, NY!); Rio Mapuá, Canta Galo, 18 July 1950, *G.A. Black et al. 50-9867* (IAN!, UB!); Sitio Campina, on river Pracuubamirim, ca. 1 hour by boat upstream; Região do Anapú, Rio Pracupí, Portel, 9 July 1956, *R. de L. Fróes 32849* (IAN); km 204 da Rodovia Belém-Brasília, 31 May 1960, *E. Oliveira 849* (IAN!); Rio Capim, Apoaga, 17 June 1897, *J. Huber 741* (MG!); Rio Aramá, Rio Negor, Jatahy, 3 March 1900, *J. Huber 1887* (MG!); **Roraima:** Caracaraí, Próximo a Vila de Caicubi, –1.02, –62.08, 8 November 2003, *J.G. Soler A. 302* (RB); FRENCH GUIANA. **Cayenne:** Second sommet à 1 km Ouest de la DZ naturelle, 3–4 km ENE du Grand Croissant, bassin de l'Oyapock, 130–290 m, 4 December 1983, *G. Cremers 8293* (CAY!); Savane Roche de Virginie-Bassin de l'Approuague, 70 m, 11 February 1991, *G. Cremers & P. Petronelli 11839* (CAY!, NY); Savane Roche du Quatorze Juillet-Bassin du Bas-Oyapock, 50 m, 16 April 1991, *G. Cremers 12210* (CAY!, NY); Haut Oyapock: Takawana, au Nord en grande forêt, Basin de l'Oyapock, 500 m, 18 March 1975, *J.-J. de Granville 5242* (CAY!, P!); Mont Belvedere de la Haut Camopi, Basin de la Camopi, 30 November 1984, *J.-J. de Granville 7086* (CAY!, F!, US, P!); D.Z. 5-Route Régina-Saint-Georges, Bassin de l'Approuague, 100 m, 24 November 1995, *J.-J. de Granville & G. Cremers 13106* (CAY!); 1845, *Mélinon* (P!); Montsinery: Carrefour du Gallion km Post 19 Rt Nacional 2, Emerald Jungle Village, where N2 intersects with the road to Montsinery, the EJV forest trail, ca. 12 m, 4.78, –52.42, 25 April 2012, *L.R. Noblick 5596* (CAY!, FTG!); Regina: Savane Roche la Virgenie, on the trail a few km south of km 118 on Route Nacional 2, ca 61 m, 4.19, –52.15, 1 May 2012, *L.R. Noblick 5609* (CAY!, FTG!); Crique Cabaret 1, Bassin de l'Oyapock, 25 km de L'embouchure terrain accidenté, 26 January 1966, *R.A.A. Oldeman 1951* (CAY!, NY, P!, U!); Fleuve Oyapock, Crique Sikini, Bassin de l'Oyapock, premier Camp, 19 July 1969, *B. Oldeman 2479* (CAY!, P!); Basse crique Courouaïe (affluente Basse Approuague), 12 January 1970, *R.A.A. Oldeman 2716* (CAY!, P!, U!); **St. Laurent du Maroni:** Saül, Lieu-Dit Eaux Claires, Région de Saül, 13 December 1970, *J.-J. de Granville 694* (CAY! U!); Saül, Commune de Saül, Région de Saül, 1983, *J.-J. de Granville & F. Kahn 5408* (CAY!); Saül and vicinity. Route de Bélizon, ca. 1/4 km south of Eaux Claires, *S.V.*

Heald & R. Yahr 60 (NY); Saül: Eau Claire: Track to Eau Claire from Saül, ca. 7 km N of Saül, ca. 242 m, 3.66, –53.22, 3 May 2012*, L.R. Noblick & J. Moonen 5612* (CAY!, FTG!); Saül. Vicinity of Eaux Claires, on Route de Belizón, to 2 km S of Eaux Claires, 8 November 1992, *S.A. Mori et al. 22846* (NY); Saül and vicinity. Route de Bélizon, between Eaux Claires and entrance to Grand Bouef Mort Trail, 21 September 1995, *S.A. Mori et al. 24162* (NY); Rivière Petite Ouaqui = "Saut Baille Nom" Rive gauche [Rivière Waki, Bassin de la Waki], 16 July 1973, *J.-J. de Granville 1835* (CAY!, NY, P!, U!); Camp 4 Monpé Soula-Bassin du Marouini [Haut-Marcuini], 300 m, 5 km to the w, 31 August 1987, *J.-J. de Granville et al. 9913* (CAY!, US); Pedra Alice, 1 kilometer south of Pedra Alice, 18 August 1960, *H.S. Irwin et al. 47632* (NY); SURINAM. **Sipaliwini:** Palaima Creek, tributary of Sipaliwini River, 0–100 m, 22 February 1963, *J.G. Wessels Boer 702* (F!, U!); Paloemeu airstrip [3.35, –55.43], 17 April 1963, *J.G. Wessels Boer 1328* (NY, U!); Sipaliwini savanna area on Brazilian frontier, 22 January 1970, *F.H.F. Oldenburger et al. 1125* (U!).

29. *Syagrus insignis* (Devansaye) Beccari (1916: 467). *Glaziova insignis* Devansaye (1873: 270). *Cocos insignis* (Devansaye) Martius ex Hooker.f. (1884: 72, 74). C*alappa insignis* (Devansaye) Kuntze (1891: 982). *Lytocaryum insigne* (Devansaye) Toledo (1944: 8). *Microcoelum insigne* (Devansaye) Burret & Potztal (1956: 388). Lectotype (designated by Dahlgren 1959, plate 391):—BRAZIL. Rio de Janeiro: Petropolis, a la Grande Roche de la Mamminha, 1879, *A.F.M. Glaziou 11637* (lectotype C! [F neg. 21142]; isolectotypes K!, [also G, P fide Glassman 1987])

Figure 41 plate, Figure 38 map.

Solitary palm. **Stem** columnar, ca. 10–12 m × 10 cm. **Leaves** 8–20; *sheathing leaf base* ca. 48–51 cm long; *pseudopetiole* 48–55 cm long with mostly smooth margins, true *petiole* 13–17 × 1.8 cm, 0.3–0.4 cm thick; *rachis* 80–99 cm long, often covered with blackish hairs or fibers; *leaflets* dark green adaxially, silvery pubescent abaxially, linear, 42–60 along one side, regularly distributed in one plane, only a few ramenta scales or tomentum sometimes present where the leaflets are inserted on the rachis, only an occasional ramenta hair or ramenta patch on the proximal half of abaxial midvein; basal leaflets 25–32 × 0.2–0.4 cm, middle leaflets 20–30 × 0.9–1.5 cm, apical leaflets 15–18 × 0.1–0.2 cm with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 34–37 × 1–3 cm; *peduncular bract* 69–71 cm long, expanded portion 38–63 × 1.5–2.5 cm, including a 0–4.5 cm beak, 2.3–4.3 cm perimeter, 1.5–2 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 36–88 cm × 4–7 mm, elliptical in cross-section, scaly lepidote; *inflorescence axis* 28–54 cm long; *rachis* 18–33 cm long; *rachillae* 18–62, scaly lepidote, 4–16 cm long at the apex, 12–26 cm long at the base; *staminate flowers* ca. 2.5 cm long at the apex, 3.5–5 × 1.5–2.5 mm at the base, green to yellow, sepals 0.7–1.5 × 1–2 mm, glabrous, faintly visible nerves, petals 2.4 mm long at the apex, 2.5–4.0 × 0.8–1.2(–2.5) mm at the base with acute tips, nerves indistinct, stamens 1.2–2.2 mm long, anthers 0.8–1.2(–2) mm long, filaments 0.8–2.0 mm long, pistillode ca. 1 mm long; basal *pistillate flowers* 3.0–5.5 × 2.0–4.3 mm, conical, yellow, glabrous, sepals 4.5–5.0 × 2.5–3.5 mm, glabrous, no visible venation, petals 4.0–4.5 × 2–2.5 mm, glabrous, distinctly nerved, valvate tips less than ½ the length of the petals, pistil 4.0–4.5 × 1.4–1.5 mm, glabrous, stigmas ca. 2–2.3 mm long, glabrous, staminodal ring ca. 3–5 mm high, 6-dentate. **Fruit** globose to ovoid, 1.8–2.3 × 1.6–1.9 cm, brownish-green when mature, glabrous, epicarp less than 0.5 mm thick, mesocarp 1 mm thick, succulent and fibrous; *endocarp* 2.0 × 1.7 cm, 0.5–1.0 mm thick on its sides, 1 mm thick at the ends, *seed* broadly ellipsoid, ca. 1.0–1.2 × 1.2–1.3 cm, endosperm homogeneous. Germination adjacent-ligular. Seedlings continue to produce simple, entire leaves until the plant reaches about 30 cm.

Common name:—icá-gigante, icá-assú, coquerinho-de-serra.

Etymology:—The specific epithet, *insignis,* means outstanding.

Distribution and habitat:—Brazil near Nova Friburgo, Rio de Janeiro and extends northwards into the state of Espírito Santo at elevations of 1000–1800 m in seasonally dry forests.

Conservation:—This species is not collected very frequently, but it grows in very rocky terrain that is of no agricultural value. It is also within the boundaries of several reserves. Therefore, this species is classified as least concern, LC.

Phenology:—This palm probably flowers and fruits year around, but observed flowering and with young fruits in the spring (October).

Uses:—This elegant palm is ideal for landscaping.

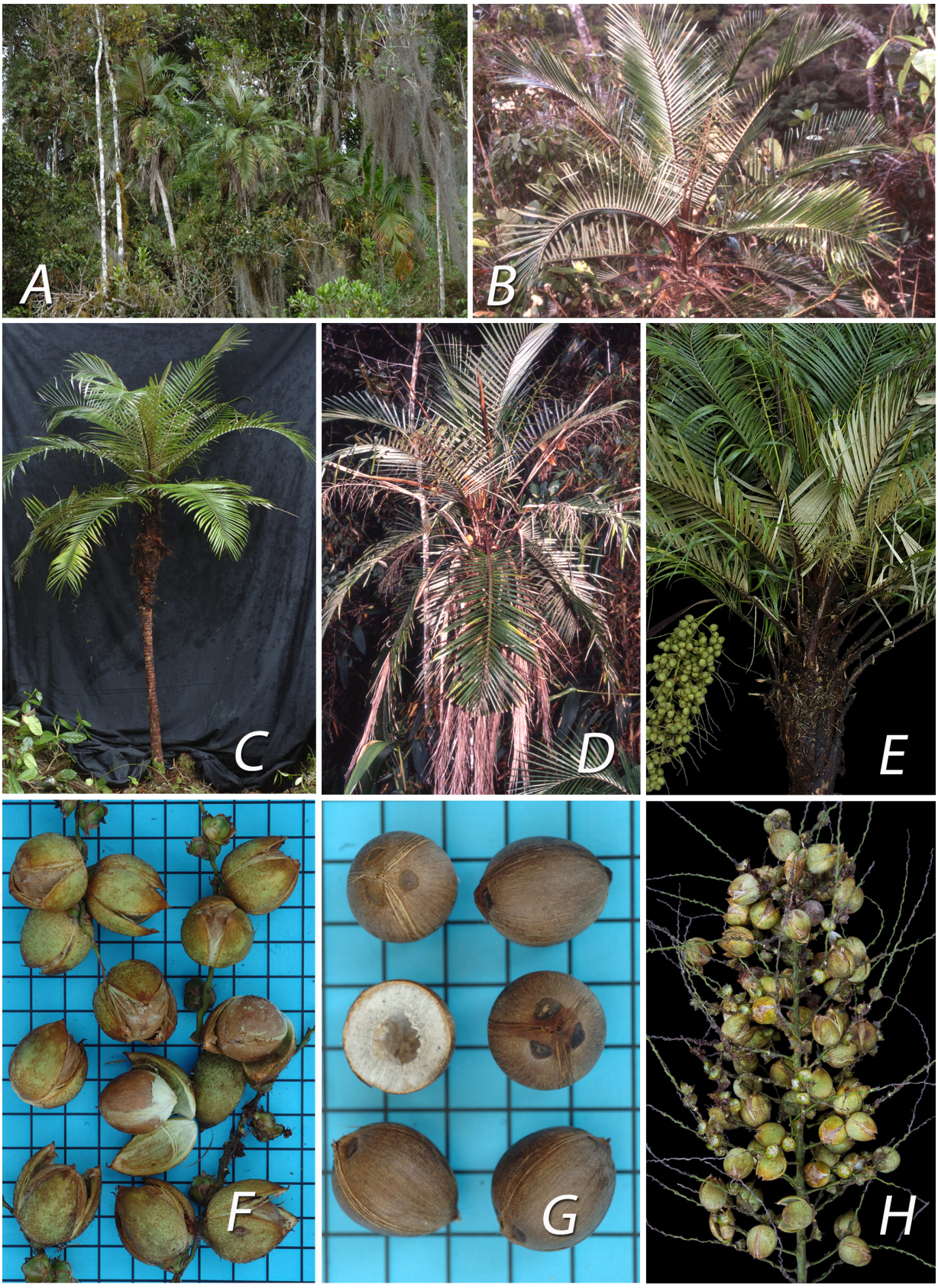

FIGURE 41. *Syagrus insignis*. A. Palm in habitat in Nova Friburgo, Rio de Janeiro. B. Habit in Espirito Santo. C. Habit in Nova Friburgo, Rio de Janeiro. D. Palm with old inflorescences, note silvery abaxial side of leaf. E. Crown with maturing infructescence and blackish fibers from the petioles and leaf sheaths. F. Fruits with spitting epicarps and mesocarps. G. Endocarps with one sectioned to show homogenous endosperm and interior cavity. H. Infructescence. Grid is in centimeters. All photos by Harri Lorenzi with the exception of B and D.

Notes:—This palm has sometimes been confused with *S. weddelliana*, but is more robust, taller (to 12 m vs. 3.5 m) with wider pinnae and covered with back-brown hairs rather than reddish chestnut brown hairs, and it grows above 1000 m. *Syagrus insignis* adults transplant very well, while *S. weddelliana* adults transplant poorly (Harri Lorenzi, pers. comm.). The eophyll of *S. insignis*, like most *Syagrus*, is simple and entire, followed by more simple, entire leaves until the plant reaches a height of ca. 30 cm, but the eophyll of *S. weddelliana* is a very small, simple and entire, immediately followed by pinnate leaves.

Representative specimens:—BRAZIL. **Espírito Santo:** Alfredo Chaves, São Bento de Urânia, –20.64, –40.75, 8 October 1994, *G. Hatschbach et al. 61145* (MBM); Castelo, Braço do Sul, –20.60, –41.18, 16 August 1948, *A.C. Brade 19307* (RB); Castelo, Parque Estadual do Forno Grande, –20.52, –41.10, 12 June 2004, *L. Kollmann 6759* (MBML); Castelo, Parque Estadual do Forno Grande, –20.52, –41.10, 11 July 2005, *L. Kollmann 7962* (MBML); Castelo, Parque Estadual do Forno Grande, Trilha da Balança, –20.53, –41.10, 18 July 2008, *L. Kollmann 11132* (MBML, RB); Fundão, Goiapaba-Açu, –19.91, –40.47, 13 October 2002, *A.P. Fontana 402* (MBML); Santa Leopoldina, Bragança, Mata do Tyrol, propr. Assunta Salvador, 560 m, –20.13, –40.55, 31 October 2006, *L.F.S.Magnago 1529* (MBML); Santa Leopoldina, Bragança, Mata do Tyrol, propr. Elcio Tomazini, –20.14, –40.55, 600, 19 April 2007, *V. Demuner 3690* (MBML); Santa Teresa, Country Club, –19.93, –40.64, 23 April 1985, *W. Boone 403* (MBML!); Santa Teresa, Country Club, –19.93, –40.64, 9 July 1985, *W. Boone 577* (MBML!, MO); Santa Teresa, Country Club, –19.93, –40.64, 11 September 1985, *W. Boone 750* (MBML!); Santa Teresa, Country Club, –19.93, –40.64, 23 April 1985, *H.Q. Boudet Fernandes 1110* (MBML!); Santa Teresa, Country Club, –19.93, –40.64, 19 November 1985, *H.Q. Boudet Fernandes 1665* (M, MBML!); Santa Teresa, 25 de Julho, Alto Julião, –19.78, –40.60, 7 May 1986, *H.Q. Boudet Fernandes 1967* (MBML!, MO); Santa Teresa, Estação Biológica de Santa Lúcia, –19.97, –40.53, 19 September 1988, *H.Q. Boudet Fernandes 2546* (MBML!); Santa Teresa, cabeceira do Rio Bonito, mata onde esta sendo construido o radar, October 1988, *L. Kollmann 40* (MO); Santa Teresa, Cabeceira do Rio Bonito, –19.85, –40.55, November 1988, *L. Kollmann s.n.* (MBML!); Santa Teresa, Reserva Biológica Augusto Ruschi-Nova Lombardia, –19.91, –40.55, 30 January 2002, *L. Kollmann 5402* (MBML); Santa Maria de Jetibá, Caramuru, –20.10, –40.68, 24 June 2003, *L. Kollmann 6246* (MBML); Santa Teresa, Santo Anselmo, –19.84, –40.57, 24 March 2006, *L. Kollmann 8824* (MBML); Santa Teresa, Estação Biológica de Santa Lúcia, –19.97, –40.53, 12 August 1992, *L.D. Thomaz 1841* (MBML); Santa Teresa, Reserva Biológica Augusto Ruschi-Nova Lombardia, –19.91, –40.55, 30 July 2002, *R.R. Vervloet 592* (MBML); Santa Teresa, Reserva Biológica Augusto Ruschi-Nova Lombardia, –19.91 –40.55, 29 October 2002, *R.R. Vervloet 1322* (MBML); Santa Teresa, Reserva Biológica Augusto Ruschi-Nova Lombardia, –19.91, –40.55, 29 April 2003, *R.R. Vervloet 2328* (MBML); Santa Teresa, Country Club, –19.93, –40.64, 9 July 1985, *J.M. Vimercat 295* (MBML!); Vargem Alta, 990, 14 November 2008, *H. Lorenzi et al. 6538* (HPL!); **Rio de Janeiro:** 25 March 1879, *A.F.M. Glaziou s.n.* (R); Macaé, –22.37, –41.79, 21 June 1937, *A.C. Brade 15877* (RB); Nova Friburgo, Distr. de Macaé de Cima, nascente do Rio das Flores (Fazenda Sophronitis), caminho para a pedra bicuda, –22.28, –42.53, 19 April 1989, *H.Q. Boudet Fernandes, H.Q. 2744* (MBML!, RB); Nova Friburgo, Mun. Nova Friburgo, nascente do Rio das Flores (Fazenda Sophronitis), margem direita do rio. Macaé de Cima, –22.28 –42.53, 20 April 1989, *H.Q. Boudet Fernandes, H.Q. 2762* (MBML!, RB); [Novo Friburgo], Est. do Rio Novo Friburgo, 1 January 1861, *A.F.M. Glaziou 2757* (FI, MO, P!, US); Nova Friburgo, Nascente do Rio das Flores, –22.55, –42.50, 21 October 1988, *H.C. de Lima s.n.* (RB); Nova Friburgo, Macaé de Cima. Região do Rio das Flores, 1038 m, –22.43, –42.50, 29 January 2010, *H. Lorenzi 6812* (HPL!); Nova Friburgo, Reserva Ecológica Municipal de Macaé de Cima, Nascente do Rio das Flores, –22.55, –42.50, 25 May 1987, *G. Martinelli 12068* (RB, SP!); Nova Friburgo, Reserva Ecológica Municipal de Macaé de Cima, nascente do Rio das Flores, –22.28, –42.53, 25 May1987, *G. Martinelli 12073* (RB); Nova Friburgo, Reserva Ecológica Municipal de Macaé de Cima, nacente do Rio das Flores, –22, –42.05, 1 November 1988, *S. de V. A. Pessôa 350* (NY, RB); Petropolis, Serra dos Orgãos, 1885, *A.F.M. Glaziou 16479* (C, K, LE, P); Santa Ana, 1909, *E. Garbe 6198* (SP!); Serra de Macahé, 1909, *E. Garbe 6199* (SP!); Santa Maria Madalena, Parque Estadual do Desengano, vertente NW. Projeto Flora dos Campos de Altitude-Área III, –21.96, –42.01, 6 October 1988, *G. Martinelli 13172* (RB); Santa Maria Madalena, Parque Estadual do Desengano, Pedra do Desengano, vertente N, –21.96, –42.01, 19 December 1988, *G. Martinelli 13207* (RB); Santa Maria Madalena, Parque Estadual do Desengano, Pedra do Desengano, vertentes SW e NW, –21.9553, –42.0081, 29 June 1989, *G. Martinelli 13381* (RB); Santa Maria Madalena, E do Rio, Sta. Maria Madalena, Rifa, –21.96, –42.01, 24 March 1955, *E. Pereira 1329* (RB); Serra de Estrela, 1879, *A.F.M. Glaziou 11632* (LE).

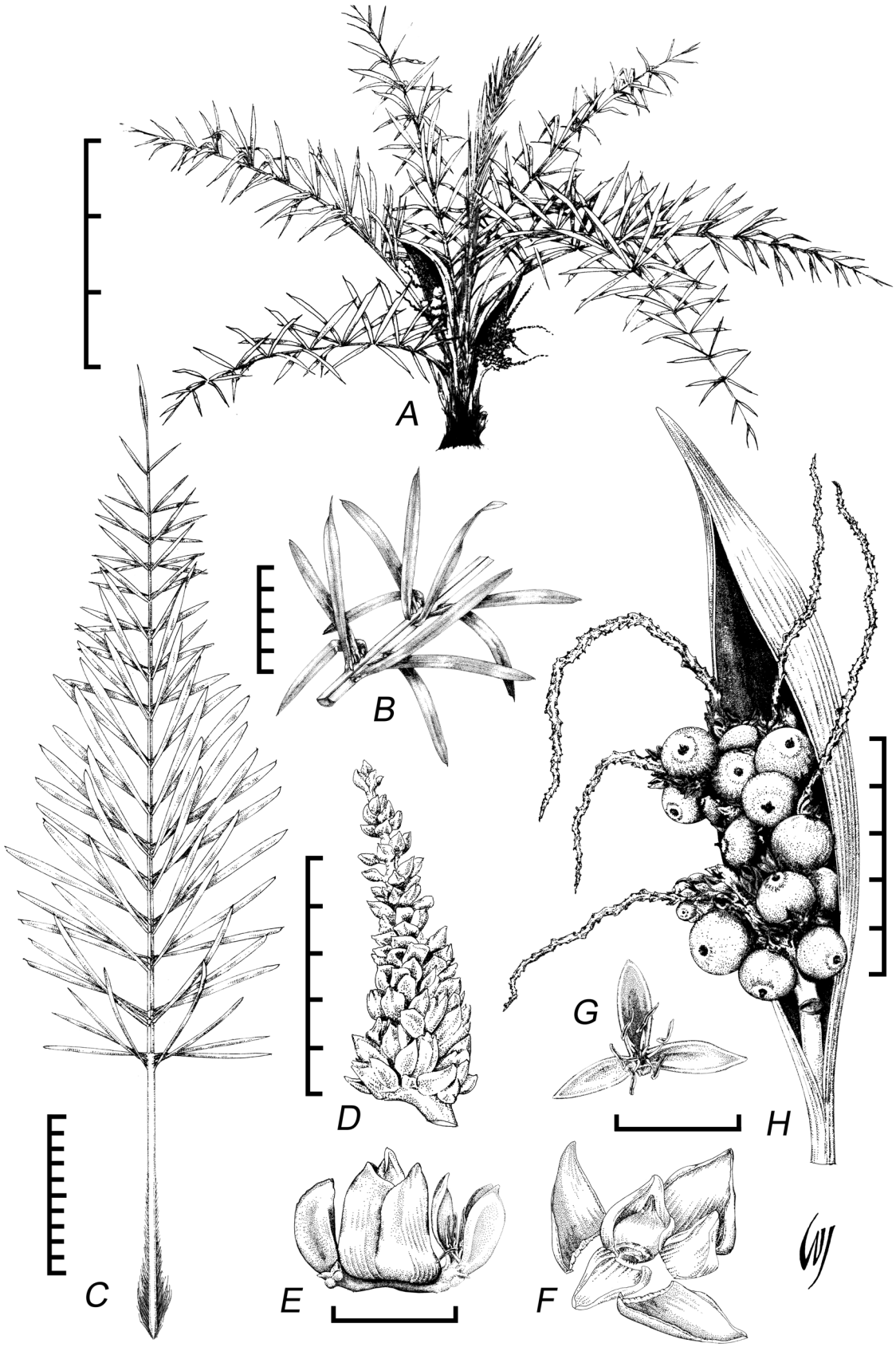

FIGURE 42. *Syagrus itacambirana.* A. Habit. B. Leaflets. C. Leaf. D. A primary branch with flowers. E. Triad with central pistillate flower flanked by two staminate flowers. F. Pistillate flower. G. Staminate flower. H. Infructescence. A–D drawn from photos taken by L. Noblick and H. Lorenzi, E–L drawn from *R. Tsuji et al. 2691*. All scales are in centimeters except A which is in decimeters. Drawn by Wes Jurgens.



FIGURE 43. *Syagrus itacambirana*. A. Cultivated palm at Jardim Botânico Plantarum. B. Abaxial surface of leaflets same as adaxial surface. C. Palm with inflorescence. D. Inflorescence. E. Flowers. Left side: open staminate flower, a triad of staminate and one pistillate flowers and a dissected male flower. Right side: with 4 pistils, third with petal still attached, and two sepals. F. Infructescence. G. Endocarps. H. Infructescence with mature fruits. Grids are in centimeters. Photos D, E, G and H by Harri Lorenzi.

30. *Syagrus itacambirana* Noblick & Lorenzi (2010b: 33). Type:—BRAZIL. Minas Gerais: Municipio of Juramento, collected on the Juramento/Itacambira road between Juramento and Itacambira on the right [south side], in the interior of an *Eucalyptus* planting, 27 km east of Juramento, 1,220 m, –16.95, –43.47, 20 June 2008, *R. Tsuji, H. Lorenzi, L.R. Noblick et al. 2706* (holotype HPL!, isotypes FTG!, K!, NY!, RB!, SP!)

Figures 42–43 plates, Figure 38 map.

Small solitary or clustering palm less than 50 cm tall. **Stem** very short or subterranean, appearing acaulescent. **Leaves** 5–9; *sheath* ca. 10–15 cm long; *pseudopetiole* 9–19 cm long with fibrous and smooth margins; *petiole* 7–15 × 0.7–1.0 cm, 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, inserted in different planes, lanceolate, slightly twisted, dark-green and glabrous on both sides, with acute, asymmetrical apex; no ramenta scales or tomentum present where the leaflets are inserted on the rachis, none along the abaxial midvein; basal leaflets 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. **Inflorescence** erect, unilaterally branched; *prophyll* ca. 8 × 1.5 cm; *peduncular bract* 20–30 cm long, the expanded portion 12–22 × 2.7–6 cm, 1 mm thickness; *peduncle* 6–14 cm × 5–10 mm, 3–7 mm thick, elliptical in cross-section, glabrous; *inflorescence axis* 7–18 cm long; *rachis* 2–10 cm long with 3–8 *rachillae* 3.5–11 cm long; *staminate flowers* 8–9.5 × 4–4.5 mm, sepals 1–1.5 × 1–1.5 mm, glabrous, petals 7.5 × 3.5 mm with acute tips, nerves indistinct to slightly raised, stamens 2.4–3.5 mm long, anthers 1.7–2.5 mm long, filaments ca. 1.4–1.5 mm long; basal *pistillate flowers* elongate pyramidal, 9–10 × 6–7 mm, glabrous, sepals 8–9 × 4–5 mm, petals 9.5 × 5 mm, glabrous, slightly valvate at the tips, pistil 7 × 3.5–4.0 mm, glabrous, stigmas 2.5–3.0 mm long, staminodal ring ca. 3 mm high, 6-dentate. **Fruit** globose, 1.8–2.5 × 2.1–2.7 cm, green when mature, with mesocarp ca. 3 mm thick, succulent and fibrous (pulpy), yellowish; *endocarp* ca. ca. 1.5–1.7 × 1.1–1.4 cm, 2.5 mm thick, with suture lines visible at the base but obscured at the apex; *seed* nearly globose, ca. 7 mm with no internal cavity, endosperm homogeneous. Germination remote-tubular.

Common name:—palmeira-de-vassoura.

Etymology:—The specific epithet, *itacambirana*, refers to the municipio close to where this species was originally collected, Itacambira, Minas Gerais.

Distribution and habitat:—This palm is endemic to the state of Minas Gerais, Brazil, in the Cadeia do Espinhaço, generally in rocky, sandy soils of high elevation cerrado or campo rupestre. One of the few known surviving populations was discovered in a *Eucalyptus* plantation along the road between Juramento and Itacambira, where it is growing as an understory palm.

Conservation:—This species is resilient, growing within the disturbed soils of *Eucalyptus* plantations in northeastern Minas Gerais. It appears to be rather restricted in its distribution. However, not enough collections have been made to truly access its conservation status accurately, but since it survives along roadsides and within *Eucalyptus* plantations this species appears not to be under any threat. There are a few other reserves in the area within which this species could possibly be found. It is classified as least concern, LC.

Phenology:—Immature fruit can be found in June. In cultivation mature fruit was present in September.

Uses:—The tasty and nutritious fruits, which are easily accessible, are eaten by small rodents. The plant has a potential for cultivation in gardens.

Notes:—This species is a small acaulescent palm with branched inflorescences, tightly clustered coriaceous, dark green, concolorous leaflets, which are slightly twisted. The fruit is globose.

Representative specimens:—Known only from the type collection.

31. *Syagrus itapebiensis* (Noblick & Lorenzi) Noblick & Meerow (2015: 61). *Lytocaryum itapebiense* Noblick & Lorenzi (2010a: 13). Type:—BRAZIL. Bahia: Municipio de Itapebi, [the exact location has been withheld because of the vulnerable state of this population] 23 June 2008, *H. Lorenzi, L.R. Noblick, et al.* [*C. A. Guimarães, J. E. dos Santos*] *6496* (holotype HPL!, isotypes FTG!, NY!, K!, CEPEC!, RB!, SP!)

Figures 44–45 plates, Figure 38 map.

Small solitary palm 35–65 cm tall. **Stem** short, subterranean. **Leaves** 4–11 in the crown; *sheathing leaf base* ca. 8–11 cm long; *pseudopetiole* 12–25 cm long; *petiole* 3–7 × 0.5–0.6 cm, 0.4 cm thick; *rachis* 31–52 cm long; *leaflets* dark shiny green, discolorous, abaxial surface with a silvery pubescence, 21–26 along one side, regularly

distributed along rachis, ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none or only occasional ramenta or tomentum along the abaxial midvein; basal leaflets 10–13.5 × 0.2–0.6 cm, middle leaflets 11–16 × 1.2–1.9 cm, apical leaflets 5–7 × 0.4–0.5 cm with an asymmetric tip and a long drip tip. **Inflorescence** erect, bilaterally branched; *prophyll* 4–8 × 1.3–1.5 cm; *peduncular bract* 21–24 cm long, usually with no expanded portion (one exception measured 5–12 × 0.6 cm with a 1 cm beak, 1.5 cm perimeter), 0.5 mm thickness or less, very narrow, thin, woody, slightly sulcate, exterior with scattered thin indument; *peduncle* ca. 32–66 cm × 2.5–3 mm, nearly round in cross-section, glabrous; *inflorescence axis*, 7–9 cm long; zig-zag *rachis* 2–4 cm long; *rachillae* 4–6, glabrous, lying in nearly the same plane, 5–5.5 at the apex, 6.5 cm long at the base; *staminate flowers* 4–4.5 × 2 mm, green to yellow, sepals 1.7–2.5 × 1–1.5 mm, glabrous, with raised nerves, petals 3.5–4 × 2 mm with acute tips, nerves indistinct to slightly raised, stamens 2–3 mm long, anthers 1.5–1.8 mm long, filaments 1–2 mm long, pistillode 1.8–2 mm long; *pistillate flowers* elongate, conical, 3–2 mm long at the apex, 5 × 3 mm at the base, glabrous, sepals 2.5–3 × 3 mm, green, glabrous, petals 3–5 × 3 mm, green to yellow, glabrous, obscurely nerved, valvate tips less than ¼ the length of the petals, less than 1 mm long, pistil 4 × 2 mm, glabrous, stigmas less than 0.5 mm long, glabrous, staminodal ring ca. 1 mm high, 6-dentate. **Fruit** conical, 1.2–1.5 × 0.9–1.1 cm, red to reddish-orange when mature, glabrous, epicarp less than 0.5 mm thick, mesocarp 2–2.5, mm, succulent and fibrous, composed of two layers, an out red or orange fleshy part ca. 1.5 mm thick with an inner white fibrous layer 0.8–1 mm thick; *endocarp* 1.0–1.3 × 0.6–0.7 cm, very thin, less than 0.5 mm thick; *seed* ellipsoid, ca. 10–12 × 5–6 mm, endosperm homogeneous. Germination adjacent-ligular.

Common name:—icá-mirim.

Etymology:—The specific epithet, *itapebiensis*, refers to the municipality of Itapebi, Bahia, Brazil, where the only known population of this species is found.

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

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 forest where this palm grows. The only known population is extremely threatened with only a few plants left in the wild. Most of the known plants were removed to save them from the expanding pastures. 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 (C. A. Guimarães, pers. comm.). Nevertheless from our current knowledge, it is classified as Critically Endangered, CR B2ab(i, ii, iii, iv, v); C2a(i, ii); D.

Phenology:—Flowering in the wild in June with some plants having immature fruits also in June. 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, João E. de Santos (see *Syagrus santosii*), when he noticed an attractive potted palm that had shiny dark green foliage with silvery undersides and beautiful red fruits. He inquired where his friend had purchased the plant, and his friend responded that the palm was native. Alex sent images to the author, and in June 2008, the author and Harri Lorenzi went to look at this palm in the wild and confirmed that it was new to science. *Syagrus itapebiensis* is acaulescent. The inflorescence is unique in that the branches of the inflorescence appear to be oriented in nearly the same plane (nearly dichotomously so). The peduncular bract often tightly hugs the peduncle with no or little expanded portion, which is very atypical of most Attaleinae palms, but has been observed in some of the grassy *Butia* species, i.e. *Butia exospadix*. 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; 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. It has a very thin endocarp and a very small fruit in comparison to most other *Syagrus*.

Specimen examined:—Known only from the holotype.

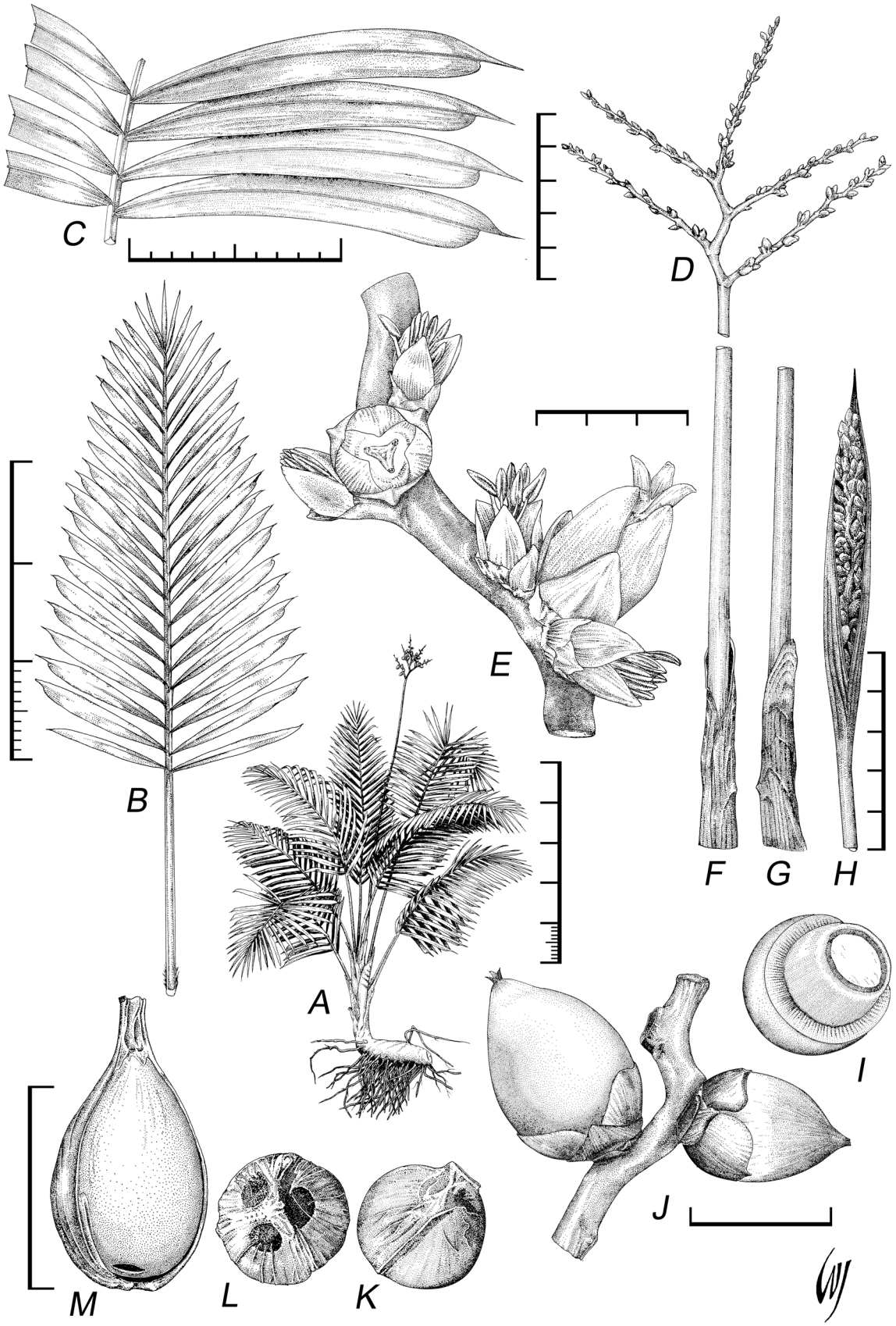

FIGURE 44. *Syagrus itapebiensis*. A. Habit. B. Leaf. C. Leaflets. D. Inflorescence. E. Flowers. F. Prophyll front-view. G. Prophyll side-view. H. Peduncular bract with emerging inflorescence. I. Fruit showing layers with fleshy mesocarp, white fibrous layer, thin endocarp and central endosperm. J. Fruit. 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.

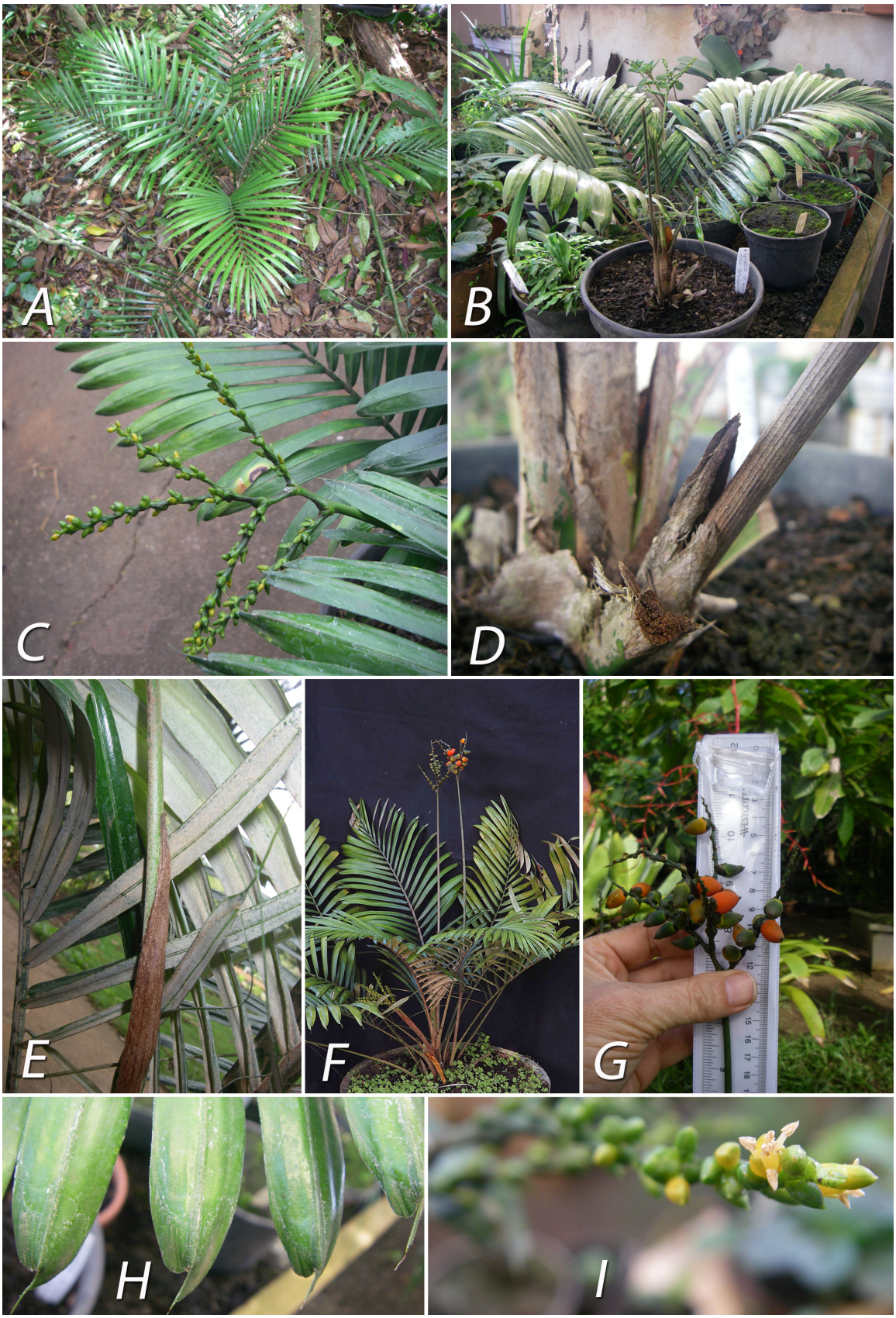

FIGURE 45. *Syagrus itapebiensis*. A. Habit in the forest near Itapebi, Bahia. B. Potted palm with inflorescence. C. Inflorescence. D. Base of palm showing prophyll with sulcate peduncular bract on the right. E. Middle leaflets, base of peduncle, and top of narrow striate peduncular bract. F. Potted palm with infructescence. G. Infructescence with mature red fruits. H. Leaflet tips with one half, a drip tip. I. Open yellow staminate flowers. Scale in inches and centimeters. Photo F by Harri Lorenzi.

32. *Syagrus kellyana* Noblick & Lorenzi (2010b: 21). Type:—BRAZIL. Minas Gerais: Padre Paraíso, 22 km N of the city on BR-116 at Ponte de Dois Valante [Ponto dos Volantes], 500–600 m, –16.92, –41.48. [Montgomery Botanical Center] Garden accession number 97289 and 97290. 23 July 1997, *L.R. Noblick & L. Cline 5156* (holotype IPA!, isotype FTG!)

Figures 46–47 plates, Figure 38 map.

Moderate-sized, solitary palm. **Stem** 2–5 m × 16–18 cm, caulescent, erect, columnar, with visible leaf scars. **Leaves** 8–12 in the crown, somewhat plumose, spirally arranged, spreading in the crown, ca. 3 m long; *sheath* fibrous on the margins 70–138 cm long; *pseudopetiole* 27–64 cm long; *petiole* short, absent–11 × 3.5–4 cm, 1.5–2 cm thick; *rachis* 2.4–4 m long; leaflets 104–131 each side of the rachis, linear with acuminate, nearly symmetrical apex, distributed irregularly in clusters of 2–4(–5), inserted in more than one plane, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 58 × 0.8 cm, middle leaflets 57–72 × 3.3–4.5 cm, apical leaflets 24–26 × 0.3–0.6 cm. *INFLORESENCE* erect to pendulous, spirally branched; *prophyll* 40–67 × 6–8 cm; *peduncular bract* 110–160 cm long, expanded portion 62–97 × 15–20 cm, including a 3–8 cm beak, perimeter 14–25(–35) cm, 4–5 mm thickness, woody, deeply sulcate, strongly recurved; *peduncle* 56–82 × 3–4 cm, 2–2.5 cm thick, elliptical in cross-section, glabrous or covered with a lepidote indument; *inflorescence axis* 53–88 cm long; *rachis* 42–70 cm long; *rachillae* 47–69, 8–47 cm long; *staminate flowers* 11–21 × 4–7 mm, sepals 3–7 × 1–2 mm, glabrous, petals 12–17 × 5–6 mm with acute tips, nerves indistinct to slightly raised, stamens 7 mm long, anthers 6 mm long, filaments 2.5–3.0 mm long; *pistillate flowers* pyramidal, 8–15 × 7–13 mm at the apex, 16–21 × 9–13 mm at the base, glabrous, sepals 10–21 × 7–13 mm, petals 11–13 × 5–8 mm, valvate portion 1/3 to 2/5 the length of the petals, ca. 4–5 mm long, glabrous, pistil 7–11 × 4–9 mm, with short white indument on the lower half becoming a brownish lepidote on more mature ovaries, stigmas 2–3 mm long, glabrous, staminodal ring ca. 2–3 mm high, 6-dentate. **Fruit** ovoid, 3.5–4 × 2.6–2.9 cm, with rougher brownish-yellow epicarp splitting a little at the apex when mature, less than 0.5 mm thick, mesocarp 3–7 mm thick, succulent and fibrous, mucilaginous, and thickest at the base of the fruit; *endocarp* 3.3–3.5 × 1.8–2.6 cm, 4–6 mm thick on the sides, 7–10 mm thick on the ends; *seed* ellipsoid, ca. 1.5–1.7 cm × ca. 1 cm, endosperm homogeneous with a central cavity. Germination remote-tubular.

Common name:—coco-de-quarta.

Etymology:—The specific epithet, *kellyana,* honors Loyd Kelly and his family, who have so generously supported the Montgomery Botanical Center and the author's research over the years.

Distribution and habitat:—In eastern Minas Gerais in the Atlantic forest of Brazil, in well-drained soils, usually on rock granitic outcrops in thin soils at an elevation of ca. 550 m. Its distribution appears to run from Salinas to Padre Paraíso, Minas Gerais in the rocky outcrop areas.

Conservation:—This species grows in rocky outcrops, which are of no agricultural value, produces lots of seeds that germinate easily. For these reasons it is not threatened and is classified as least concern, LC.

Phenology:—Flowering and fruiting in July. This species fruits moderately during the summer (December–March). The seeds germinate relatively easily in 2 to 4 months.

Uses:—The fruits and seeds are edible. The plant is ornamental with potential for landscaping in tropical regions.

Notes:—This palm has seed with a large central cavity like a coconut. The fruits are pulpier with more mucilage than the drier, thinner mesocarps of *S. picrophylla* and *S. lorenzoniorum*. Unlike *S. picrophylla* and *S. lorenzoniorum,* whose rachillae tips remain straight, turn green and have no or small rachillae bracts, the rachillae of *S. kellyana* dry up become twisted, turn brown or gray and have large rachillae bracts. Fruits are totally covered by a fine lepidote, but less than 1/3 covered in the other two species.

When this species from Minas Gerais was first collected by the author, it was believed to be a short *Syagrus oleracea*. However, after closer examination, it was discovered that it had pistillate flower petals that are broad at the base but terminate abruptly in a brief, acute, apiculate tip, which is characteristic of *S. picrophylla*. Therefore the author originally classified it as *S. picrophylla*.

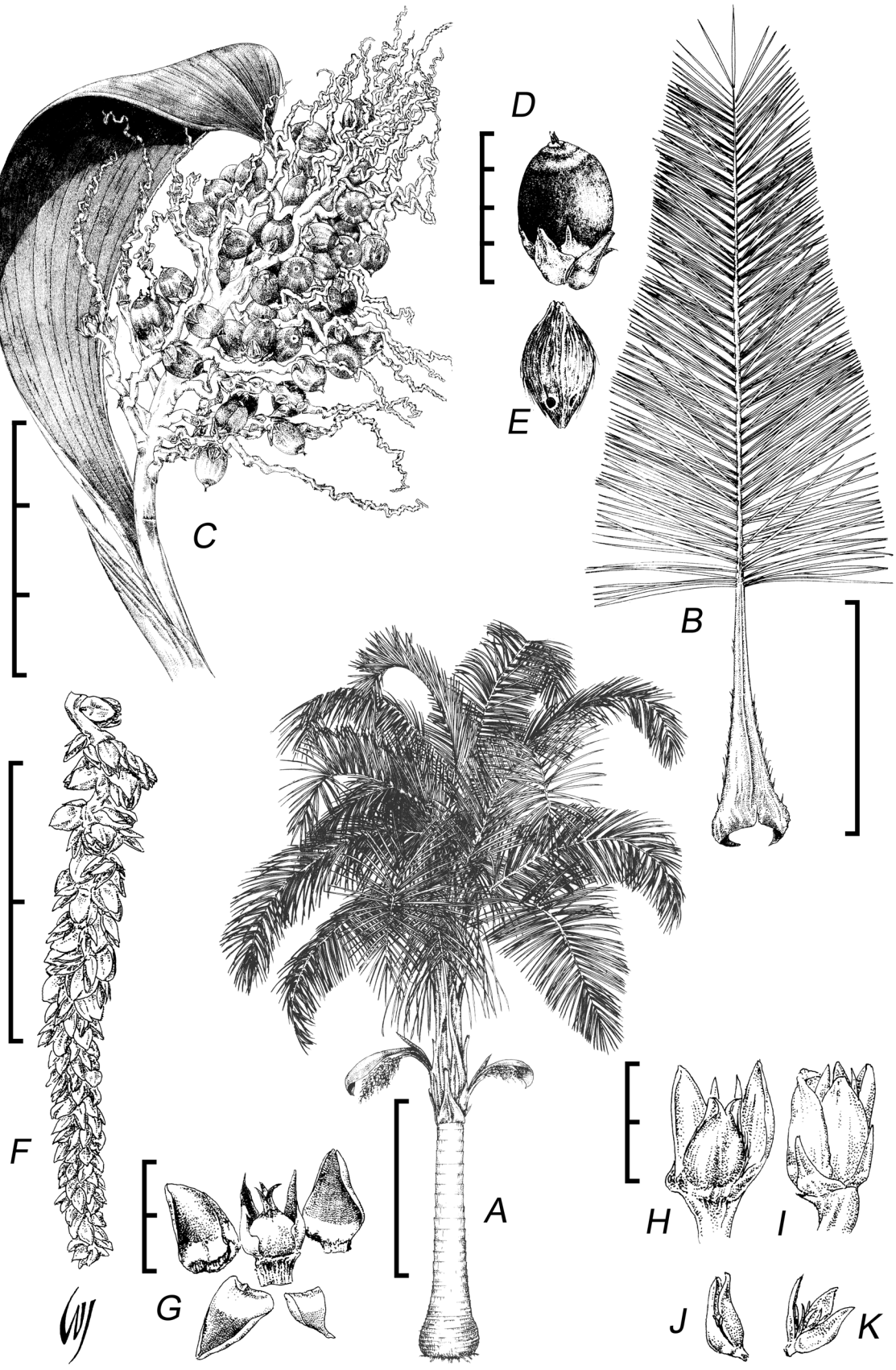

FIGURE 46. *Syagrus kellyana*. A. Habit. B. Leaf. C. Infructescence. D. Fruit. E. Endocarp. F. Primary branch with flowers. G. Pistillate flower opened. H–I. Pistillate flowers. J–K. Staminate flowers. Drawn fresh from MBC accession 97290 (*Noblick 5157*). The scales are as follows: A–B are in meters, D–F are in decimeters and all others are in centimeters. Drawn by Wes Jurgens.

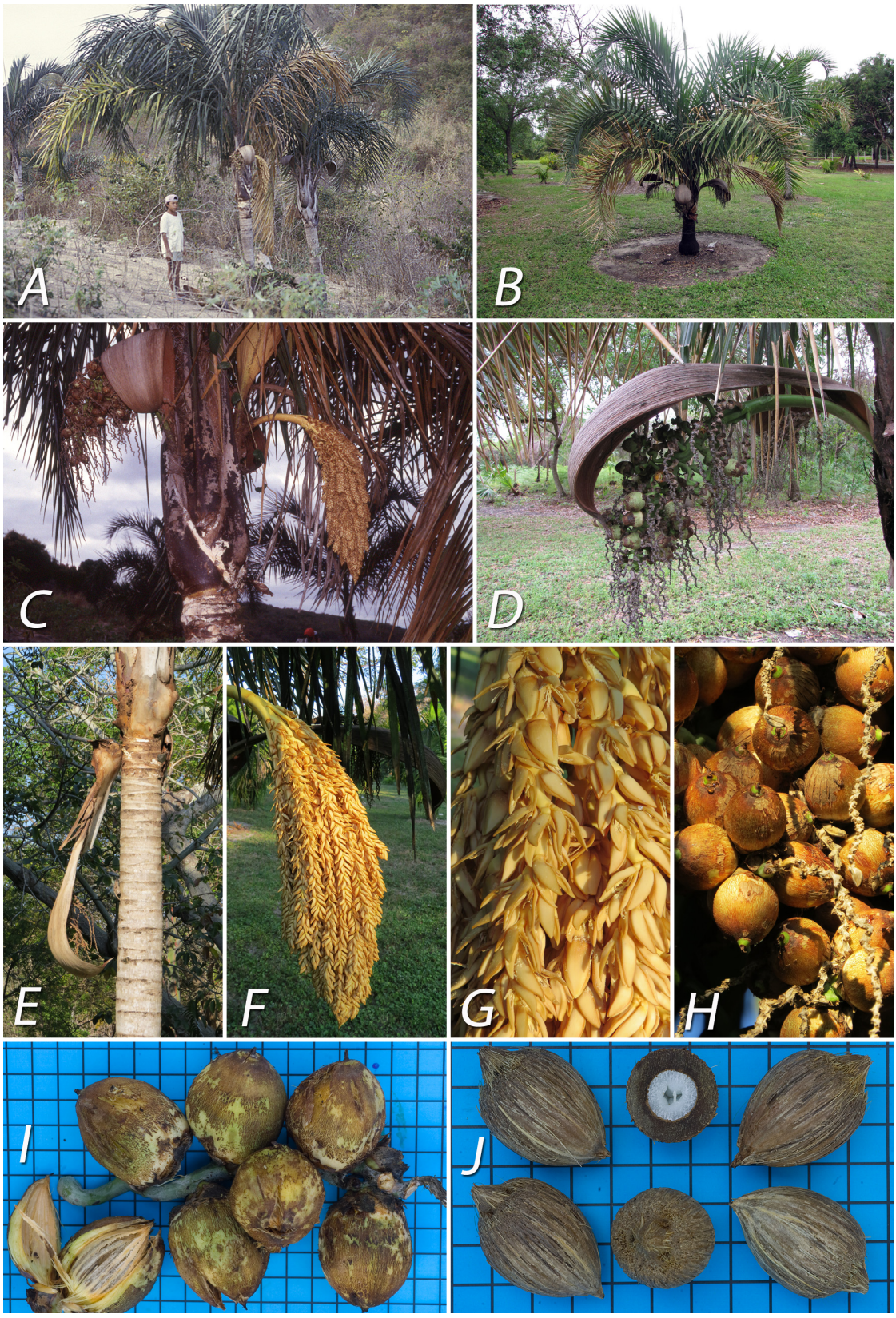

FIGURE 47. *Syagrus kellyana*. A. Habit in near Padre Paraíso, Minas Gerais, Brazil (*Noblick & Cline 5156*). B. Palm at MBC. C. Lower crown of palm in Minas Gerais with a newly opened inflorescence (*Noblick & Cline 5156*). D. Infructescence. E. Stem with old often characteristically recurved peduncular bract. F. Inflorescence. G. Staminate flowers. H. Maturing fruits on the infructescence. I. Fruits with one showing mesocarp and fibers. Note two lower fruits with spitting apices. J. Endocarps with cross-section showing thick endocarp walls and homogeneous endosperm and small internal cavity. Photos I and J by Harri Lorenzi. All grids are in centimeters.

The *S. picrophylla* complex (*S. cearensis, S. lorenzoniorum*, *S. kellyana*, and *S. picrophylla*) has caused much confusion among earlier botanists. They are superficially similar in appearance and are among the few *Syagrus* species to have seeds with large central cavities like a coconut. Most grow in very rocky terrain in shallow soils. Their distributions and similar rocky habitats stretch from Ceará on the north (*S. cearensis*) to Rio de Janeiro on the south (*S. picrophylla*). Perhaps it was the similarity of the palms and similarity of their habitat which led J. Barbosa Rodrigues (1903a) to write that the species (*S. picrophylla*) grew from Ceará to Rio de Janeiro. His 1903 publication had two drawings of *S. picrophylla*, neither of which resembled the other, causing more confusion. Barbosa Rodrigues' original description was based on palms growing in the state of Rio de Janeiro and southern Espirito Santo. Fieldwork and closer examination of plants collected from northern Espirito Santo, Minas Gerais, Bahia, and Montgomery Botanical Center revealed morphological and anatomical differences that aided the author in distinguishing both *S. kellyana* from Minas Gerais, and *S. lorenzoniorum* from the northern half of Espirito Santo and southern Bahia. *Syagrus kellyana* differs from *S. picrophylla* and *S. lorenzoniorum* in being a stouter, thicker-stemmed palm with spreading, more arching leaves (rather than straighter, more ascending leaves). The fruits of *S. kellyana* are completely covered by a thin scaly lepidote, but those of *S. picrophylla* and *S. lorenzoniorum* are covered only at the tip or on the upper third. In *S. kellyana*, the tips of the inflorescence dry up and become twisted and shriveled during fruit development, but the tips stay alive, are nearly straight and turn a dark green in *S. picrophylla*. The primary branch tips also have conspicuous sub floral rachillae bracts (nearly absent in *S. picrophylla*), giving *S. kellyana* a more ragged appearance. Anatomically, the abaxial surface of the leaflet has several distinct nonvascular fiber strands, which are missing in both *S. lorenzoniorum* and *S. picrophylla*.

Specimen examined:—BRAZIL. **Minas Gerais:** Municipio de Ponto dos Volantes, na rodovia BR 101 (km 158), na localidade denominada "Morais," –16.92, –41.47, 12 February 2009, *H. Lorenzi, R. Campos & R. Pimenta 6628* (HPL!).

33. *Syagrus lilliputiana* (Barb.Rodr.) Beccari (1916: 467). *Cocos lilliputiana* Barbosa Rodrigues (1900: 96). Type:—PARAGUAY. In campus ad ripam fluvium Capibary, *E. Hassler 4458* (holotype G!)

Figure 48 plate, Figure 49 map.

Very short, solitary palm 30–40 cm tall. **Stem** 0.06 m × 2.5 cm or nearly absent, appearing acaulescent. **Leaves** 2–8; leaves emerging in one semicircular leaflet fan when very young, but spiraled later, *sheathing leaf base* ca. 6–15 × 1.2–2.3 cm; *pseudopetiole* 3.5–9 cm long; *petiole* 2–8 × 0.5–0.9 cm, 0.2–0.5 cm thick; *rachis* 22–30 cm long; *leaflets* slightly lighter on the abaxial surface, lanceolate, dark-green, glabrous on both sides, with acute, symmetrical apex, 9–31 along one side, regularly spaced, inserted at various angles, giving the leaf a plumose appearance, no ramenta scales present where the leaflets are inserted on the rachis, nor along the abaxial midvein; basal leaflets 9–36(–50) × 0.2–0.7 cm, middle leaflets 30–37 × 0.8–1.5 cm, apical leaflets 12–38 × 0.2–0.6 cm with an asymmetric tip. **Inflorescence** erect, spirally branched; *prophyll* 7–14 × 0.8–1 cm; *peduncular bract* 12.4–12.8 cm long, expanded portion 5.9–7 × 1–1.3 cm, beak nearly absent, 1.7–2 cm perimeter, 0.9–2.5 mm thickness, narrow, woody, sulcate, exterior with scattered thin to dense indument; *peduncle* ca. 9–11.5 cm × 3 mm, white wooly tomentose; *inflorescence axis* 3.2–4.2 cm long; *rachis* 0.5–1.2 cm long; *rachillae* 2–9, glabrous, 3–4.5 cm long at both the apex and at the base; *staminate flowers* 6–8 mm long at the apex, 9–10 × 4 mm at the base, green to yellow, sepals ca. 1.5 × 1.0–1.5 mm, glabrous, with obscure nerves, petals 6–7 mm long at the apex, ca. 9–10 × 3–4 mm at the base with acute tips, nerves indistinct, stamens 5–6 mm long, anthers 4–5 mm long, filaments 1.5–2.0 mm long, pistillode 0.7–1.0 mm long; basal *pistillate flowers* pyramidal, yellow, glabrous, 6–8 × 4–6 mm, sepals 6–8 × 4–6 mm, petals 5–7 × 4 mm, glabrous, valvate tips 2/5 to ½ the length of the petals, ca. 2.0–2.5 mm long, pistil 5–6 × 3 mm, glabrous, stigmas ca. 3 mm long, glabrous, staminodal ring ca. 1–1.5 mm high, 6-dentate. **Fruit** ovoid, 1.7–1.8 × 1.4–1.5 cm, yellowish green to brown when mature, covered with brownish tomentum, epicarp 1.5–1.6 × 1.2–1.3 cm and less than 1 mm thick, mesocarp thickness not measured, succulent and fibrous; *endocarp* not measured; *seed* more or less ellipsoid not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—palmeirinha.

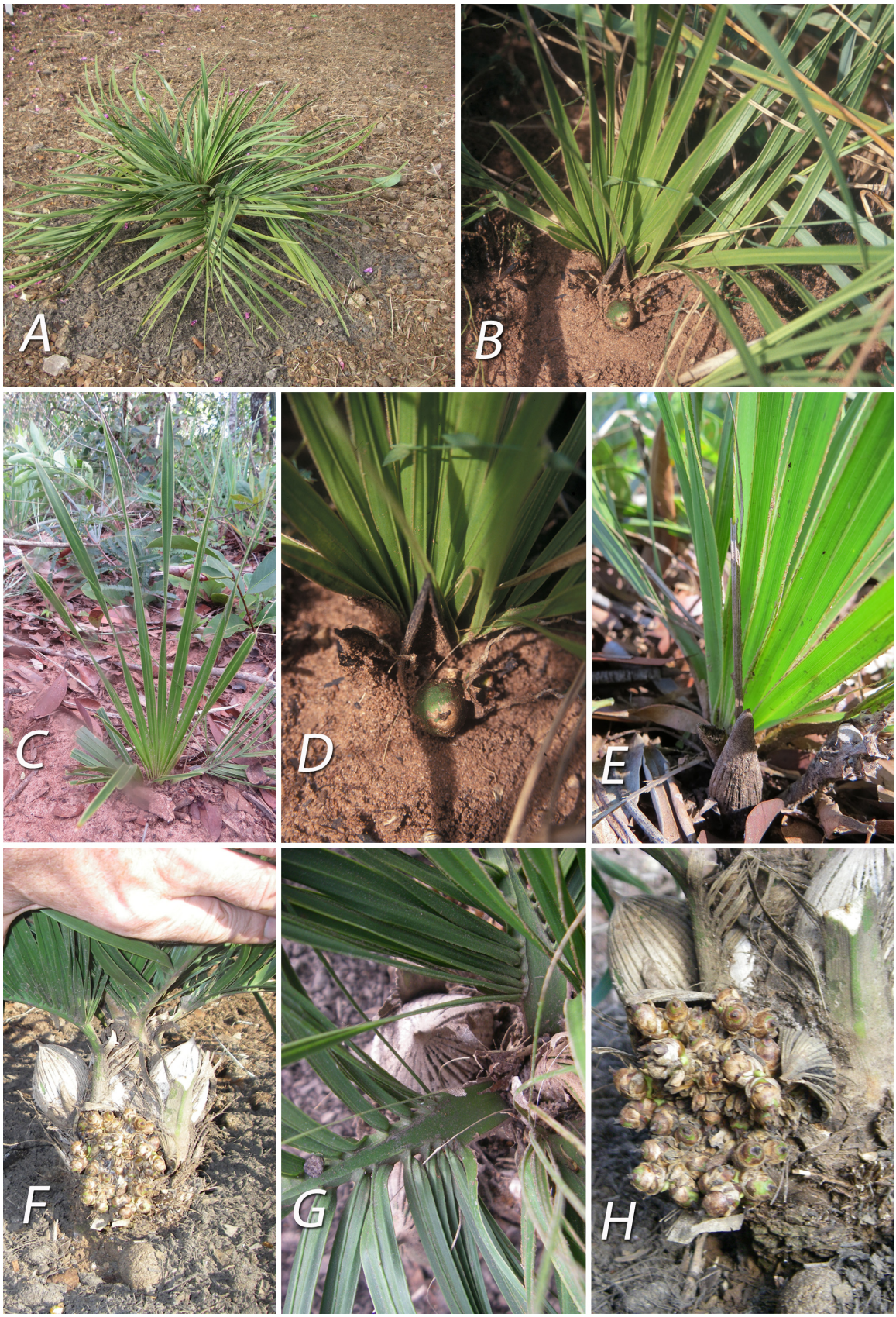

FIGURE 48. *Syagrus lilliputiana*. A. Habit at Jardim Botânico Plantarum (JBP), from Ponte Porã, Mato Grosso do Sul, Brazil. B. Normal habit of young plant near Ygatimi, Canindeyú, Paraguay (*Noblick et al. 5296*). C. Habit near Antônio João, Mato Grosso do Sul, Brazil. D. Infructescence. E. Emerging inflorescence. F. Infructescence on plant at JBP from Ponte Porã, Mato Grosso do Sul. G. Basal portion of leaves on more developed plants. H. Infructescence on an older, well developed plant at JBP.

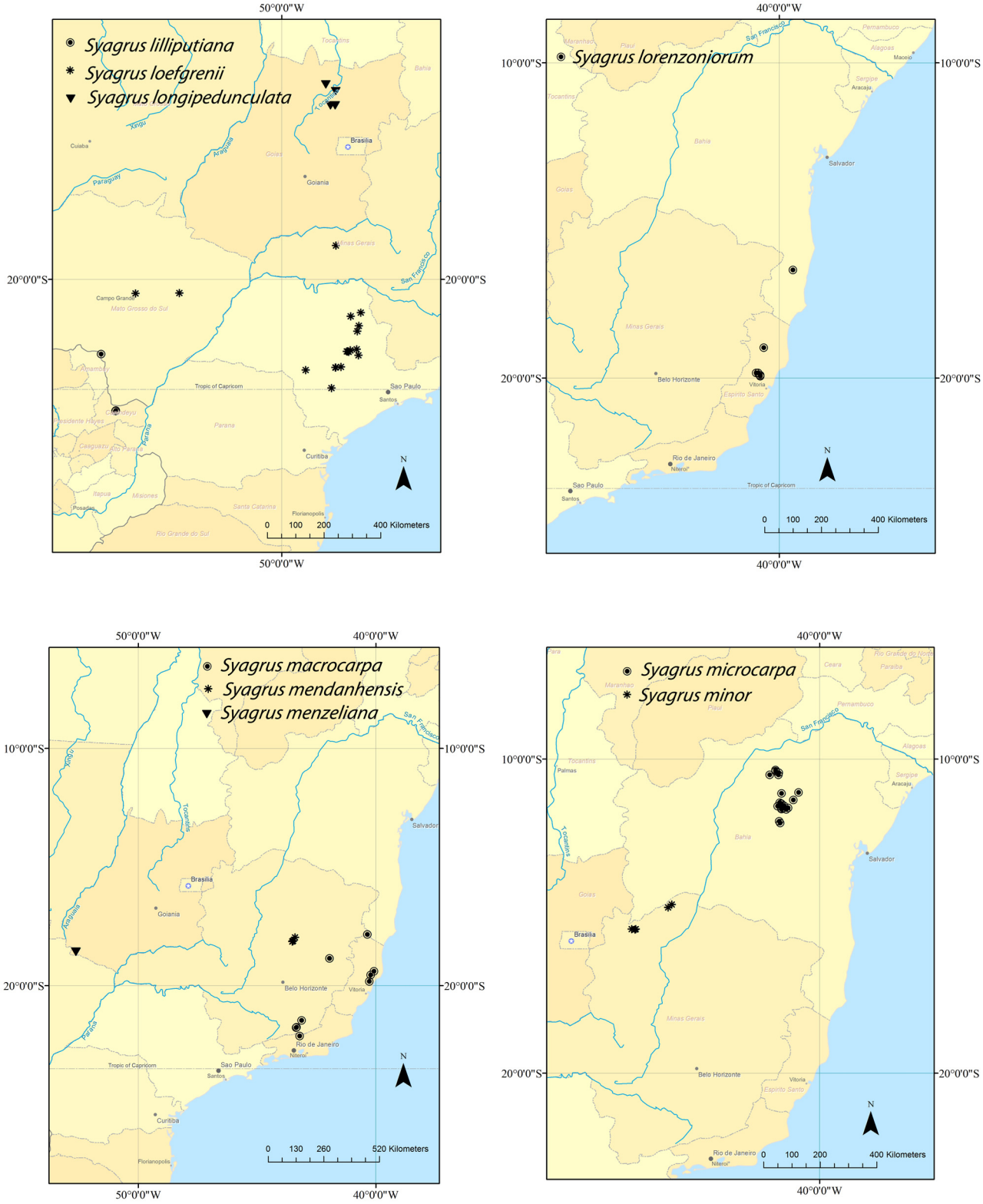

FIGURE 49. Distribution maps of *Syagrus lilliputiana, S. loefgrenii, S. longipedunculata, S. lorenzoniorum, S. macrocarpa, S. mendanhensis, S. menzeliana, S. microphylla* and *S. minor*.

Etymology:—The specific epithet, *lilliputiana,* refers to the tiny size of this palm and honors the country of Lilliput, a fictional island nation located in the Indian Ocean populated by people only one-twelfth the height of normal humans, from *Gulliver's Travels* by Jonathan Swift.

Distribution and habitat:—Mato Grosso do Sul, Brazil, on the border with Paraguay, in open cerrados in sandy soils, where it is very rare. Rare also in Paraguay along the Serra do Amambay and Mbaracayú, which forms the boundary between Paraguay and Brazil. It can still be occasionally found in fragmented cerrado parcels, especially near Amambai, Coronel Sapucaia and Ponto Porã, Brazil, wherever the vegetation and especially the original soils have been left relatively undisturbed.

Conservation:—Even though this palm is rare, it is fortunately well-protected in Paraguay within the Mbaracayú Natural Forest Preserve in the Aguara Ñu cerrado region. Therefore it is under no threat within the preserve. It has been rarely seen along railroad right-of-ways and in a few scattered cerrado fragments, where its chances of survival are slim. It produces few fruits, the seeds do not germinate well, and young plants grow slowly, often in soils of high agricultural value. Only 3 locations, including the preserve, are known for this species. It is classified as endangered, EN B2ab(ii,iii,iv,v).

Phenology:—This species fruits in the spring and beginning of summer (October–January). Each infructescence produces 5–8 fruits, which are rapidly consumed by animals, making it difficult to obtain seeds from the wild. Seeds germinate with difficulty in 3–5 months.

Uses:—It has the potential for use in gardens, as much for its curiosity as for the beauty of its foliage.

Notes:—Once thought to be the smallest *Syagrus;* it is an acaulescent palm with coriaceous leaves, the lowest of which tend to lay flat on the ground or parallel to it. It has been mistakenly synonymized with *S. graminifolia* (Henderson *et al.* 1995) or with *S. petraea* (Hahn 1990), but its growth habit is distinctively different, as are its inflorescence structure and leaflet anatomy (Noblick 2013a).

One might think that they are dealing with two different species. Examining figure 48, one can see that the palms in A and F–H, with its pinnate leaflets and the whitish indument on the peduncular bract, looks suspiciously different from the palms in B–E. The palms from B–E are from or near the original Paraguayan type locality. The B–E inflorescence, with its narrow, brownish bract, better matches Barbosa Rodrigues's illustration (Barbosa Rodrigues 1903) for *Cocos lilliputiana* (t. 69a), and yet the pinnate leaves of A, F–H are a better match for the same illustration and the holotype specimen (*Hassler 4458*) than are the leaves of B–E. The author and his colleagues have confirmed that the differences noted here are only a difference between juvenile forms (B–E) and more mature forms (A, F–H) of the same species. The stunted leaves of B–E maybe a result of more frequent fires, whereas A, F–H comes from a more protected area. Even Barbosa Rodrigues (1900) implied that burning and grazing did not allow these palms to grow to their full natural size in their natural habitat.

Representative specimens:—BRAZIL. **Mato Grosso do Sul:** Ponta Porã, na estrada para Antonio João, próximo ao posto Aquidabá 21 km de Ponta Porã, –22.37, –55.74, 10 August 2001, *H. Lorenzi et al. 2805*, (HPL!). PARAGUAY. **Canindeyú:** 9 August 1996, M. *Jiménez 1354* (BM, CTES!, MO, PY!); Canindeyú: closest town: Ygatimi, Mbaracayu Natural Forest Reserve, just E of Ygatimi, Aguara Ñu, 40 km E of the reserve headquarters, ca 260 m, –24.16, –55.27, 5 December 2002, *L.R. Noblick et al. 5296* (FTG!, PY!); Ygatimi, Mbaracayu Natural Forest Reserve, just E of Ygatimi, managed by the Fundacion Moises Bertoni, Aguara Ñu, ca. 40 km E of the reserve headquarters, ca. 230 m, –24.18, –55.27, 5 December 2002, *L.R. Noblick et al. 5300* (FTG!, PY!); Aguará Ñu, Mbaracayú Natural Reserve, –24.18, –55.28, 22 September 1999, *E.M. Zardini 51072* (AS, MO, FTG!); Aguará Ñu, Mbaracayú Natural Reserve, –24.18, –55.28, 28 August 2000, *E.M. Zardini 54938, 54939* (FTG!). **Without a specific locality:** 1905, *E. Hassler 9519* (G!).

34. *Syagrus loefgrenii* Glassman (1967a: 240). Type:—BRAZIL. São Paulo: Rio Claro, without date, *Löfgren 573* (holotype SP! [SP-12260])

Syagrus rachidii Glassman (1967a: 240). Type:—BRAZIL. São Paulo: Pirassununga, *Rachid s.n.* (holotype SP! [SP-53520]).

Figure 50 plate, Figure 49 map.

Small, solitary to clustering palm, ca. 50 cm tall (may be taller in cultivation). **Stem** ca. 0–0.6 m × 10–15 cm or nearly absent, short, subterranean, appearing acaulescent, and often leaning or prostrate. **Leaves** 4–8 in the crown held somewhat erect; *sheathing leaf base* ca. 4–21 × 1–3 cm; *pseudopetiole* (7–)34–50 cm long; *petiole* 4–23 × 0.6–1 cm, 0.3–0.6 cm thick; *rachis* 35–70 cm long; *leaflets* lighter on the abaxial surface, 26–66 along one side, apex long acuminate, dark bluish-green, glaucous white on the lower surface when young often wearing off, becoming concolorous, distributed irregularly in clusters of 2–4, inserted at various angles, giving the leaf a plumose appearance, no ramenta scales present where the leaflets are inserted on the rachis, and none along the

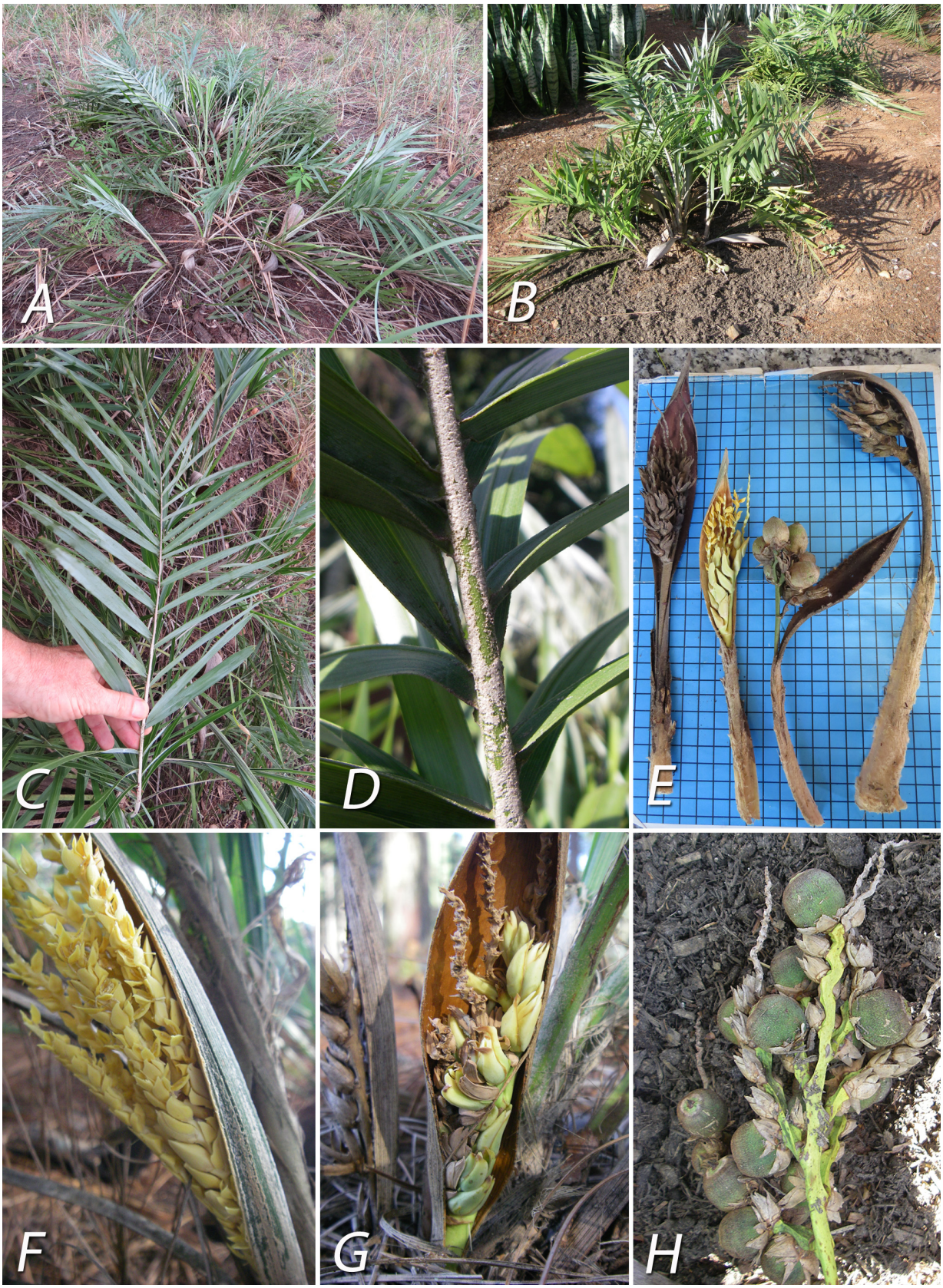

FIGURE 50. *Syagrus loefgrenii*. A. Reclined, clustering stem habit near Altinópolis, São Paulo (*Noblick & Lorenzi 5630*). B. Habit with leaves showing abaxial waxy bloom at Jardim Botânico Plantarum. C. Waxy bloom on abaxial side of leaf. D. Tomentum on leaf midvein. E. Inflorescences and infructescences (Noblick & Lorenzi 5630). F. Inflorescence with open staminate flowers. G. Inflorescence with receptive pistillate flowers. H. Infructescence. Grid is in centimeters.

abaxial midvein; basal leaflets 5.5–17 × 0.2–0.7 cm, middle leaflets 11–25 × 0.5–1.5 cm, apical leaflets 6.0–18 × 0.2–0.5 cm with an asymmetric tip. **Inflorescence** erect, unilaterally branched; *prophyll* 10–22 × 1.5–2.5 cm, covered with a wooly to short indument; *peduncular bract* 27–44 cm long, expanded portion 13–21 × 1.2–4.5 cm, including a 0.7–4 cm beak, 2.5–6 cm perimeter, 1–2 mm thickness, narrow, woody, sulcate, exterior with short to wooly tomentose indument, especially near the base; *peduncle* ca. 13–25 cm × 3–7 mm, elliptical in cross-section, tomentose; *inflorescence axis* 8–17 cm long; *rachis* 3.5–10 cm long; *rachillae* 4–9, glabrous, 3.5–9 cm long at the apex, 6–18 cm long at the base; *staminate flowers* 4–8 mm long at the apex, 7–10(–17) × 2–3.7 mm at the base, green to yellow, sepals 1–2 × 1.2–2.5 mm, glabrous, with indistinct nerves, petals 4.5–7 mm long at the apex, 6–9.5 × 1.5–3 mm at the base, with acute tips, glabrous, nerves indistinct, stamens 3–4.5 mm long, anthers 2.8–3.5 mm long, filaments 1–2.3 mm long, pistillode less than 0.5–1 mm long; basal *pistillate flowers* elongate pyramidal, 8–15 × 5–7.5(–9) mm, yellow, glabrous, sepals 8–15 × 3.5–6 mm, glabrous, petals 6–12 × 2.5–4.5 mm, glabrous, obscurely veined at the tip, visible at the base, valvate tips 2/3 of the length of the petal, ca. 4–8 mm long, pistil 4–7.5 × 2–4 mm, glabrous to tomentose, stigmas ca. 2.4–4 mm long, staminodal ring ca. 0.8–1.5 mm high, 6-dentate. **Fruit** narrowly ellipsoid, (2–)3–3.2 × 1–1.5 cm, green brown turning brown to yellowish brown when mature, tomentose to wooly, epicarp less than 0.5 mm thick, mesocarp 1–2 mm thick, succulent and fibrous; *endocarp* ca. 2.2–2.5 × 1.3–1.5 cm, 2 mm thick on the sides, 1–3 mm thick at the ends; *seed* one, rarely 2, ellipsoid ca. 1.5 × 0.6–0.7 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—acumã-mirim, acumã-rasteiro.

Etymology:—The specific epithet, *loefgrenii,* honors the original Brazilian collector, Swedish born (Johan) Albert (Constantin) Löfgren. He is also known as Alberto Loefgren (1854–1918), former director of the São Paulo Botanical Garden.

Distribution and habitat:—This palm grows in most of the Brazilian state of São Paulo in cerrado and former cerrado regions, often persisting in the understory of several *Eucalyptus* plantations. It has also been discovered in the eastern portion of the state of Mato Grosso do Sul.

Conservation:—This palm is protected within the cerrado preserves found within the state of São Paulo (i.e. Altinópolis). It also persists within the pine forest plantations outside of the preserves (i.e. Itirapina). It is not considered to be threatened and is classified as least concern, LC.

Phenology:—Flowering May to July and January and December with some plants having fruit from January to March and May. It fruits sparsely at the end of spring (October).

Uses:—The seeds are consumed by small animals. It has a potential for cultivation in gardens.

Notes:—This is an acaulescent palm with tightly clustered membranaceous, dark green leaflets that are whitish waxy beneath and that are inserted at steep angles to the rachis. It has an easily identifiable leaflet anatomy that distinguishes it from *S. petraea,* a species with which it has been synonymized (Henderson *et al.* 1995). *Syagrus loefgrenii* has a large vein with an exaggerated vascular bundle running along the margin of the leaflets and with only an occasional adaxial fiber strand and few minor abaxial veins present, but *S. petraea* is lacking this large vein with exaggerated vascular bundle on its leaflet margins, has an abundance of fiber strands between the major veins along its adaxial surface and also many minor abaxial veins (Noblick 2013a). This species varies widely in appearance (Glassman 1987), which caused Glassman to mistakenly identify a new species, *Syagrus rachidii* (Glassman 1968a). He then synonymized his own species only a few years later (Glassman 1971b), when he realized that the differences fell within the range of *S. loefgrenii*. There is a rare hybrid of this species with *S. romanzoffiana* near Boituva, São Paulo (Ricardo Pimenta, pers. comm.).

Representative specimens:—BRAZIL. **Mato Grosso do Sul:** Campo Grande, Fazenda Santa Inês, –20.44, –54.65, 26 April 1991, *U.M. Resende 478* (CGMS!); Mato Grosso do Sul, Agua Clara: W of the city on MS-262 towards Campo Grande, ca. 0.5 km E, km 184. Fazenda Lazaro, ca. 466 m, –20.43, –53.25, 23 January 2014, *L.R. Noblick & R. Pimenta 5645* (ESA!, HPL!, UB!, RB!, SP!, K!, FTG!, NY!, MO!, US!); **Minas Gerais:** Triângulo region, 1967–1968, *R. Goodland 725, 900* (NY!); Uberlândia, Fazenda de Glória, –18.92, –48.28, 27 May 1983, *R.C. Vieira 201* (HUFU!); Uberlândia, Reserva do Clube Caça e Peca Itororó, –18.92, –48.28, 9 February 1994, *A.A. Arantes 151* (HUFU); Uberlândia, Reserva do Clube Caça e Pesca Itororó, –18.92, –48.28, 13 September 1997, *E.O. Lenza 455* (HUFU); **São Paulo:** Águas De Santa Bárbara, Estado Ecológico de Santa Bárbara, –22.88, –49.24, 31 May 1989, *J.A.A. Meira Neto 415* (UEC); Águas De Santa Bárbara, Estado Ecológico de Santa Bárbara, –22.88, –49.24, 8 December 1989, *J.A.A. Meira Neto 497* (UEC); Águas de Santa Bárbara, Estado Ecológico de Santa Bárbara, –22.88, –49.24, 9 October 1990, *J.A.A. Meira Neto 715* (UEC); Águas de Santa Bárbara, ca. 11 km

de cidade em direção a Lençois, próximo a entrada da Reserva da Instituto Florestal, 19 December 1995, *V.C. Souza & J.P. Souza 9631* (ESA!); Américo Brasiliense, 15 km NE of Araraquara on SP-255 (Aragaquara/Ribeirão Preto), belonging tot he Clube Nautico de Araquara, 30 January 1993, *L.R. Noblick 4923* (FTG!); Angatuba, Floresta de Angatuba, Instituto Florestal de SP, –23.45, –48.42, 23 November 1983, *J.A. Ratter 4957* (K!, SPSF, UEC!); Anhembi, Fazenda Barreiro Rico, –22.78, –48.12, without date, *O. Cesar 807* (HRCB); Anhembi, Fazenda Barreiro Rico, 1956, *M.P. Kuhlmann 3964* (FTG!, SP!); Altinópolis, ca. 12 km SW of the city on the road to Serrano, 606 m, –21.056, –47.49, 7 January 2014, *L.R. Noblick & H. Lorenzi 5630* (FTG!, HPL!, NY!); Boa Esperança do Sul, na Fazenda Itaquerê, February 1957, *M. Kuhlman s.n.* (SP-120542!); Botucatu, Fazenda Gold Farm à margem da rodovia municipal (Estrada do Roberto), que liga Victoria ao Rio Bonito Campo e Náutica, a mais ou menos 5 km de Victoriana, –22.80, –48.30, 13 May 1986, *L.R.H. Bicudo 1138* (UEC); Botucatu, Fazenda Gold Farm, –22.80, –48.28, without date, *L.R.H. Bicudo 1759* (HRCB); Botucatu, 18 km N of Botucatu, 14 km E of São Manuel, along the São Manuel-Piracicaba highway, 550 m, 1 October 1971, *I.S. Gottsberger 1060* (US!); Botucatu, 18 km N of Botucatu, 14 km E of Sao Manuel, along the Sao Manuel-Piracicaba highway, 550 m, 19 October 1972, *I.S. Gottsberger 333r-191072* (US); Brotas, a few meters northeast of intersection to the Brotas-Itirapina road with the road to Camp Alegre, 750 m, –22.28, –47.93, 16 June 1961, *G. Eiten et al. 2955* (SP!, UB!); Campo Alegre, 25 September 1940, *J.F. Toledo & A. Gehrt s.n.* (SP-43184!, F!, US-2562850–2562853!); Corumbataí, APA de Corumbataí, –22.22, –47.62, 6 May 1992, *J.A. Lombardi 90* (UEC); Itirapina, Rodovia Washington Luiz, –22.25, –47.82, 30 September 1993, *K.D. Barreto et al. 1333* (ESA!, MBML); Itirapina, –22.25, –47.82, 17 September 2005, *B. Battaglia s.n.* (ESA!); Itirapina, Estação Experimental de Itirapina, –22.25, –47.82, 27 July 1988, *L.C. Bernacci 20685* (UEC); Itirapina, –22.25, –47.82, 13 January 1983, *R.A. Camargo s.n.* (HRCB); Itirapina, –22.25, –47.82, without date, *O. Cesar 252* (HRCB); Itirapina, –22.25, –47.82, without date, *O. Cesar 262* (HRCB); Itirapina, –22.25, –47.82, without date, *N.M.L. Cunha 67* (HRCB); Itirapina, 12 km NW of cidade, –22.25, –47.82, 2 July 1965, *S.F. Glassman & J.C. Gomes 8011* (RB!)*, 8012* (SP!), *8013, 8015, 8016* (F!, FTG!); Itirapina, –22.25, –47.82, 19 July 1991, *J.A. Pastore 355* (SPSF); Itirapina, Cerrado da Estação Experimental de Itirapina e arredores, –22.25, –47.82, 26 January 1984, *H.F. Leitão Filho 15922* (UEC); Itirapina (camarca in Rio Claro), 8 km N of the city in the Reserva Horto Florestal do Estado (State Forest Preserve), 600–700 m, –22.30, –47.87, 29 May 1992, *L.R. Noblick & C. Buzeiro 4888* (BHCB!, FTG!, K!, MO!, NY!, US!); Itirapina, 1965, *J.E. de Paula 117* (SP!); Itirapina, 700 m, –22.29, –47.90, 29 March 2005, *G.H. Recchia s.n.* (ESA!); Itirapina, km 200 da Rodovia Washington Luís, 24 March 1993, *V.C. Souza & L. Ferraro 2582* (ESA!); Itirapina, na Repressa do Lobo em floresta de Pinus, –22.25, –47.82, 17 March 2005, *R. Tsuji & E.R. Salviani 1030* (HPL!); Luiz Antônio, Estação Experimental de Luiz Antônio-Instituto Florestal, fazenda Jataí, 3 May 1978, *D.V. Toledo Filho 9089* (UEC); Luiz Antônio, Estação Experimental de Luiz Antônio-Instituto Florestal, July 1978, *D.V. Toledo Filho 9898* (UEC); Pirassununga, 1947, *M.P. Kuhlmann 1572* (F!, SP!); Pirassununga, 9–11 km NW of Pirassununga, 1969*, S.F. Glassman 8748, 8751* (F!); Ribeirao Preto, 280 m N of Sao Paulo on Rib Preto Road, 1 km E of road. Sao Simáo, –21.17, –47.81, 19 May 1966, *R. Goodland 380* (NY!); Rio Claro, –22.41, –47.56, 5 June 1888, *A. Loefgren CGG573* (SP!); Santa Rita do Passa Quatro, Parque Estadual da Vassununga, Gleba Pé de Gigante, Rod. Anhanguera, km 255–257, 690 m, –21.65, –47.60, August 1985, *A.A.I.F. Castro 19720* (SPSF, UEC); São Carlos, na via Washington Luis, parada Visconde do Rio Branco, ca. 1 km do pedagio, August 1988, *J.L. Waechter 2326* (ICN!, PEL); São Simão, Fazenda Aritozina, –21.47, –47.55, 29 January 1982, *H.F. Leitão Filho s.n.* (UEC).

35. *Syagrus longipedunculata* Noblick & Lorenzi (2010b: 36). Type:—BRAZIL. Goiás: Niquelândia, collected on the road to Alto Paraíso, ca. 20 km from the town of Niquelândia, 530 m, –14.47, –48.30, 12 December 2009, *H. Lorenzi, K. Soares & R. Campos 6790* (holotype HPL!, isotypes RB!, SP!, BHCB!, NY!, K!)

Figure 51 plate, Figure 49 map.

Small to medium, solitary palm, 40–60 cm tall. **Stem** subterranean, very short, nearly acaulescent with a rhizome 6–14 × 5–6 cm. **Leaves** 3–6 in the crown, more or less erect, longest leaves often slightly twisted; *sheath* ca. (312–14 cm long; *pseudopetiole* 8–14 cm long with fibrous or smooth margins; *petiole* 5–11 × 0.5–1.0 cm, 0.3–0.7 cm thick; *rachis* 46–89 cm long; *leaflets*, 20–45 along each side of the rachis, often distributed regularly or evenly along the rachis, but sometimes in clusters of 2–4 near the leaf base, lanceolate, grayish blue, glabrous on both sides, but a waxy bloom sometimes on abaxial surface, with acute, asymmetrical apex; no ramenta scales

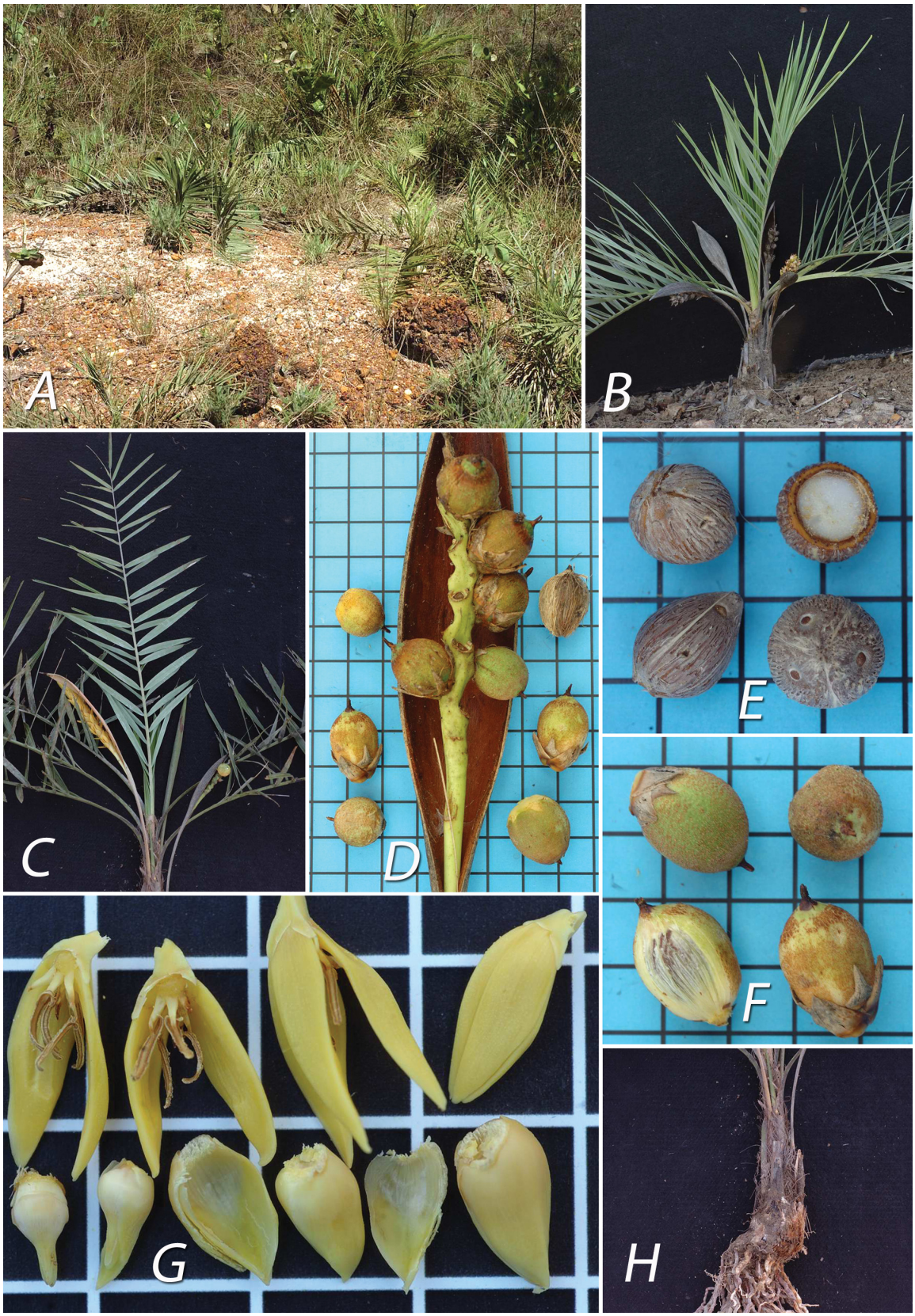

FIGURE 51. *Syagrus longipedunculata*. A. Palms in habitat. B. Habit with infructescences. C. Discolorous leaf with inflorescence and infructescence. D. Infructescence and fruits. E. Endocarps. F. Close-up of fruits. G. Staminate flowers above with the first two dissected to show the stamens and pistillate flower below showing a pistil, pistil with a petal, sepal and petal, partially dissected pistillate flower, sepal and pistillate flower intact. H. Underground stem. All grids are in centimeters. All images taken by Harri Lorenzi.

or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 9–16 × 0.2–1.1 cm, middle leaflets 10–20 × 0.7–1.2 cm, apical leaflets 3–15 × 0.2–0.9 cm. **Inflorescence** spicate, *prophyll* ca. 6–10 × 1.2–2.0; *peduncular bract* 20–41 cm long, the expanded part 8–19 × 1.1–2.0 cm, perimeter 2.2–3.3 cm; *inflorescence axis* 8.0–15.5 cm long, *peduncle* 12–31 cm × ca. 3–5 mm, elliptical in cross-section, glabrous; *rachis* absent, *rachilla* 1, 4.5–19 cm long; *staminate flowers* 14–18 × 4.5–7.0 mm, sepals 3.0–4.7 × 1.0–1.2 mm, glabrous, 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, anthers 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 7–10 × 4.9–5.5 mm, petals 7.5–8.2 × 3.5–4.7 mm, slightly valvate, valvate tips ca. ¼ to 1/3 the length of the petals, ca. 2–3 mm long, glabrous, pistil 6.5–7.1 × 3.5 mm, glabrous, stigmas 2.4–2.5 mm long, staminodal ring ca. 0.7–1.2 mm high and 6-dentate. **Fruit** globose or somewhat ellipsoid, 2.0–2.3 × 1.3–1.7 cm, green when mature with a little bit of indument on the epicarp, mesocarp ca. 2–3 mm thick, succulent and fibrous (pulpy); *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 in diameter with no internal cavity, endosperm homogeneous. Germination remote-tubular.

Common name:—ariri-mirim.

Etymology:—The specific epithet, *longipedunculata,* means long peduncle and refers to the strikingly long peduncle seen in this acaulescent palm.

Distribution and habitat:—Endemic to the Brazilian state of Goiás, in rocky, gravelly, sandy clay soils rich in nickel in sparsely vegetated cerrado at 500 m, but disappearing above 700 m, just east of Niquelândia.

Conservation:—This palm is not found within any reserve and has been collected in only one location. It grows in soils that are very rocky and of no agricultural value. The area is currently being used as a pasture and it is subject to frequent burning. A portion of the population has already been compromised by the widening of the road. This species is classified as critically endangered, CR B2ab(i,ii,iii,iv).

Phenology:—Flowers and older fruits have been seen in December.

Uses:—This palm is somewhat ornamental due to the silvery leaf and may be used as a landscape palm.

Notes:—This is a small acaulescent palm with normally spicate inflorescences, globose fruit and a long peduncle, growing in nickel-rich soils.

Representative specimens:—BRAZIL. **Goiás:** Niquelândia; Estrada de acesso a Barra do rio Bagagem com o Tocantins, 450 m, –14.02, –48.28, 20 July 1995, *T.B. Cavalcanti et al. 1479* (CEN); Niquelândia: ca. 20 km E of town on Niquelândia road (GO-237), ca. 542 m, –14.47, –48.30, 15 January 2014, *L.R. Noblick & H. Lorenzi 5643* (ESA!, HPL!, UB!, K!, FTG!, NY!); Niquelândia; Futuro reservatório do Aproveitamento Hidrelétrico, 400 m, –14.47, –48.45, 23 November 1992, ***R.F. Vieira*** *et al. 1352* (CEN); Niquelândia; Estrada da Jacira-antiga estrada de terra, 480 m, –13.80, –48.60, 21 June 1995, *B.M.T. Walter et al. 2388* (CEN).

36. *Syagrus lorenzoniorum* Noblick & Lorenzi (2010b: 23). Type:—BRAZIL. Espirito Santo, São Gabriel da Palha, collected in Corrego Comprido, Sítio Pedro Castela, 200 m, –19.03, –40.49, 22 June 2008, *R. Tsuji, H. Lorenzi, L.R. Noblick et al. 2713* (holotype HPL!, isotypes FTG!, K!, NY!, RB!, SP!)

Figures 52–53 plates, Figure 49 map.

Moderately-sized, solitary palm. **Stem** 2–4 m × 9–16 cm (up to 6–7 m in better soil), caulescent, erect, ringed, with a slightly ventricose stem, self-cleaning with no persistent leaf bases. **Leaves** strongly ascending, slightly arched, 7–17 in the crown, 1.5–2.5 m long; *sheath* (28–)40–70 cm long, with dark chestnut-brown fibrous margins or a fabric matting of the same fibers; *pseudopetiole* 15–50 cm long, with fibrous margins; *petiole* nearly always absent to less than 2 × 2–2.5 cm; *rachis* (90–)160–270 cm long; *leaflets* linear, rigid, concolorous, medium green to slightly paler on the lower surface, with acute apex, 55–123 leaflets along each side of the rachis, distributed irregularly in clusters of 2–4(–6), inserted in one plane or forming a V, ramenta scales or tomentum present where the leaflets are inserted on the rachis and also along the abaxial midvein; basal leaflets 28–52 × 0.3–0.8 cm, middle leaflets 30–56 × 2.1–4.0 cm, apical leaflets 10–19 × 0.3–0.6 cm. **Inflorescence** spirally branched; *prophyll* 34–57 × 3–4.5 cm; *peduncular bract* 80–160 cm long, expanded part 40–80 × 4–10 cm; *peduncle* 60–110 cm long; *inflorescence axis* (26–)33–51 cm long; *rachis* 17–24 cm long; *rachillae* 25–47, (5–)11–40 cm long; *staminate flowers* 9–13 × 3–5 mm, sepals 1.0–1.3 × 0.5 mm, glabrous with no distinct venation, petals 8–10 × 3 mm with acute

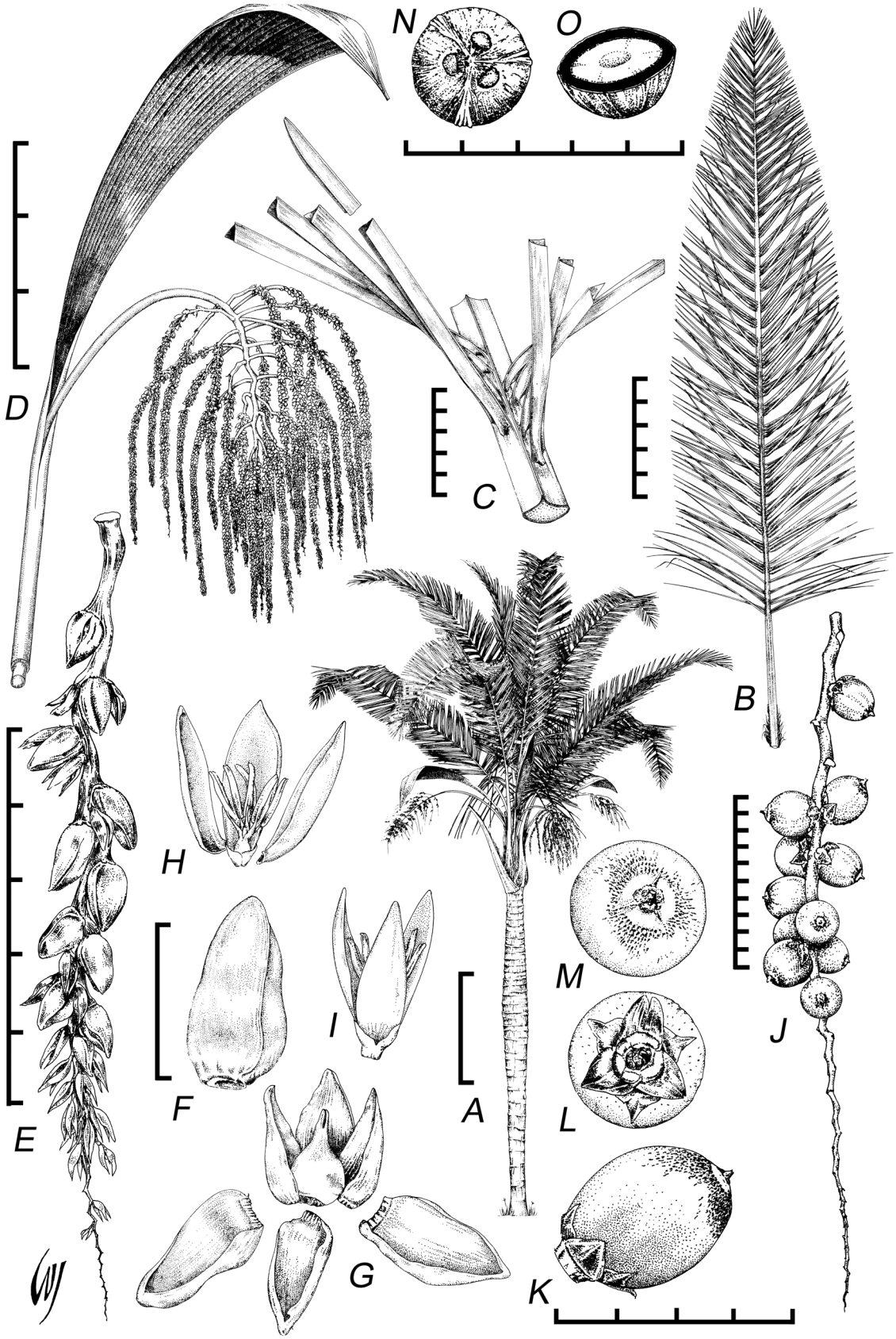

FIGURE 52. *Syagrus lorenzoniorum*. A. Habit. B. Leaf. C. Leaflets. D. Inflorescence. E. Portion of a primary branch with flowers. F–G. Pistillate flowers. H–I. Staminate flowers. J. Primary branch of an infructescence. K–M. Fruit side, basal and apical view. N–O. Endocarp basal view showing pores and cross-section showing interior cavity and homogeneous endosperm. A–D drawn from images taken by L. Noblick, E–L drawn from *Tsuji et al. 2713*. All scales are in centimeters except A, which is in meters, and B and D, which are in decimeters. Drawn by Wes Jurgens. Drawn by Wes Jurgens.

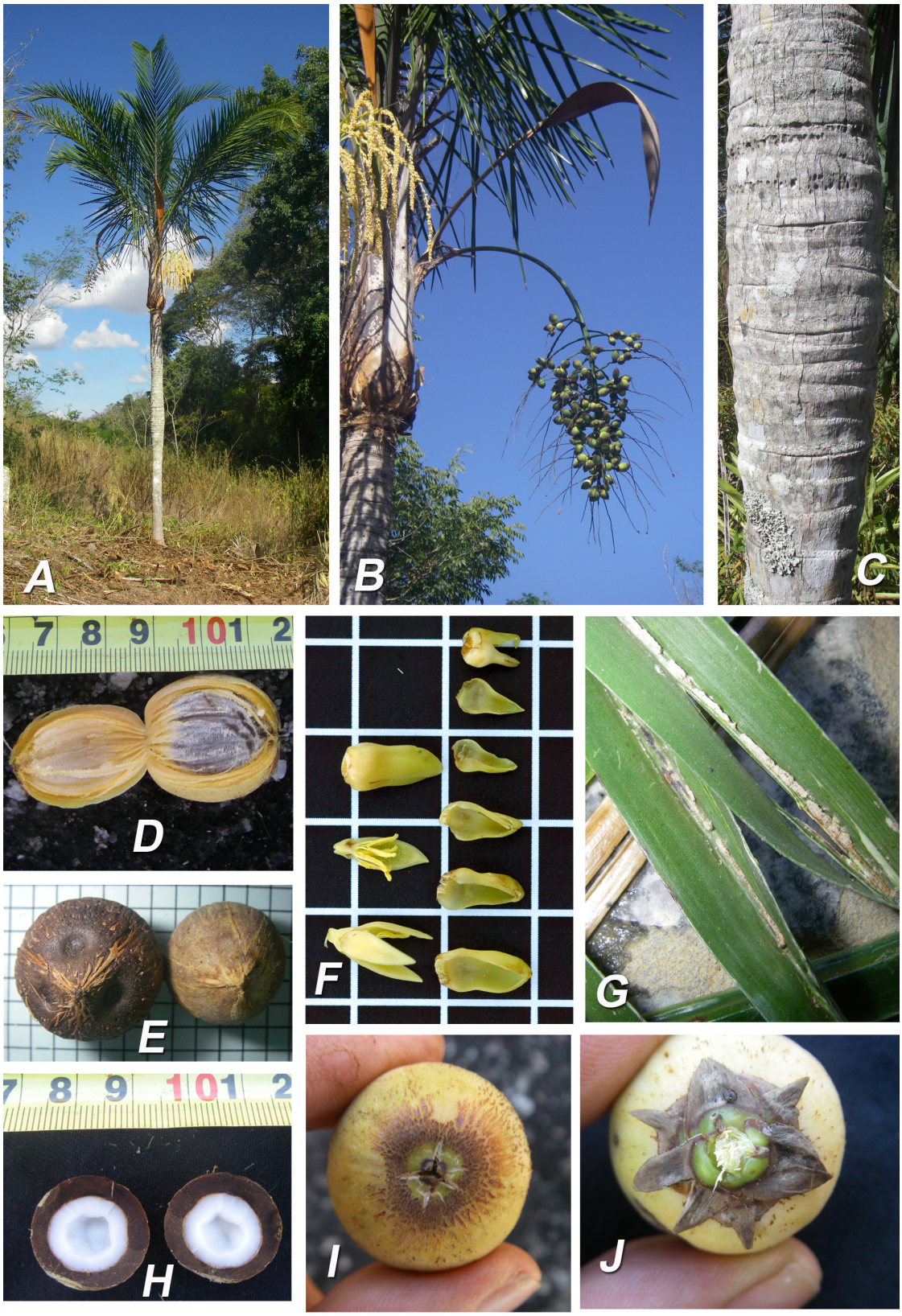

FIGURE 53. *Syagrus lorenzoniorum*. A. Habit near São Gabriel da Palha, Espirito Santo (*Tsuji et al. 2713*). B. Infructescence and inflorescence with long peduncle and long, narrow peduncular bract. C. Stem showing swollen or ventricose trunk. D. Fruit showing mesocarp and exposed endocarp. E. Endocarp base and apex. F. Flowers. Pistillate flower on top left followed by two staminate flowers and on the right is a pistil with one petal still attached, two petals and three sepals of the pistillate flower. G. Ramenta on abaxial side of leaflets. H. Cross-section of endocarp showing homogenous endosperm with central cavity. I. Apex of fruit. J. Base of fruit. Grid of E is 0.5 cm. Grid of F is 1 cm. Image F by Harri Lorenzi.

tips, nerves indistinct to slightly raised at the base, stamens 5 mm long, anthers 4.0–4.5 mm long, filaments 2 mm long; basal *pistillate flowers* elongate conical, ca. 8 × 4 mm at the apex, ca. 11–15 × 5–8 mm at the base, glabrous, sepals 10–13 × 3–5 mm, indistinctly keeled, obscurely veined only at the tip, petals 8–13 × 3–6 mm, glabrous with no visible venation, valvate tips ¼–1/3 the length of the petal, ca. 2–4 mm long, pistil 5–8 × 2–4 mm, glabrous or with a thin indument, stigmas 3–5 mm long, glabrous, staminodal ring ca. 1–1.5 mm high, 6-dentate. **Fruit** globose to oblong, 2.5–3.0 × 2.5–2.8 cm, yellowish-green when mature, mostly covered with a fine lepidote, mostly on the apical portion, epicarp less than 0.5 mm thick, covered with brownish fibers or lepidote, yellowish-green to orange-brown when mature, mesocarp thickness not measured, fibrous and not particularly succulent; *endocarp* nearly globose, 2.4–2.8 × 2.4–2.6 cm, 3–4 mm thick; *seed* nearly globose, 1.0–1.1 cm in diameter with a large central cavity, endosperm homogeneous. Germination remote-tubular.

Common name:—licuri, côco-de-quaresma, côco-de-quarta, coco-de-quarta-mirim.

Etymology:—This palm is named for the Lorenzoni family of the state of Espirito Santo, who first brought the differences of this palm to the attention of Harri Lorenzi and, after much persistence, finally convinced him that it was new.

Distribution and habitat:—This species occurs in northern Espírito Santo and southern Bahia, Brazil, on the top and steep sides of rock monoliths in thin soils. In Bahia, populations of this palm have been seen west of Guaratinga growing with bromeliads and other rock-loving plants. The main population occurs in Espirito Santo, but it extends northward into Bahia, in a disjunct manner, spreading from one monolith or inselberg to another.

It is not commonly collected because it is a rather inaccessible plant, growing only on steep slopes and the tops of the large granitic rock outcrops that characterize the Serra do Mar. Soil on these geological formations is very thin and almost non-existent, but the species is rarely found in deeper soils. *Syagrus lorenzoniorum* grows in a habitat of higher rainfall that might well be considered campo rupestre, but located within the Atlantic coastal rain forest of eastern Brazil. In Guaratinga, the lower slopes of these mountains were used to cultivate cacao.

Conservation:—This species grows only on inaccessible rock outcrops with little soil in areas of no agricultural value. It is not threatened. Perhaps its only threat would be fire. It is classified as least concern, LC.

Phenology:—This palm species likely flowers and fruits year around. The author has seen it with flowers and fruit maturing in February, and he has recorded it flowering with a few mature fruits in June. Fruits were also recorded in late spring (November) and the beginning of summer (December to February). The seeds germinate with relative ease in 2–3 months.

Uses:—The fruits have an edible mesocarp. The palm has some notable ornamental attributes, due to its medium size and the texture of it leaves and can be used in landscaping.

Notes:—This species has been confused with *S. picrophylla*, but there are clear differences between them. Both *S. picrophylla* and *S. lorenzoniorum* are rock-loving palms. *Syagrus lorenzoniorum* has a slightly swollen trunk and a long pendulous inflorescence with a narrow peduncular bract. Its fruit and endocarp are globose vs. ellipsoid in *S. picrophylla*, it has no or very little petiole (0–2 vs. ca. 13 cm) and ramenta on the underside of the leaflet veins. This palm is referred to as *Syagrus sp. nov.* 2 in *Palmeiras Brasileiras* (Lorenzi 2004).

Representative specimens:—BRAZIL. **Bahia:** Bahia, Guaratinga, 5 km a W da cidade, 350 m, –16.57, –39.57, 22 January 1989, *L.R. Noblick 4765* (CEPEC!, F!, K!); **Espirito Santo:** Linhares, 60 m, –19.39, –40.07, 18 December 2011, *D.A. Folli 6837* (CVRD); São Gabriel da Palha, na região de Corrego Comprido, no sítio de Pedro Castelão, 300 m, –19.03, –40.49, 12 February 2009, *H. Lorenzi et al. 6630* (HPL!); Santa Tereza, 7.6 km cidade/ Sao Roque. Rio 5 Novembro prox. igreja S.Marcos, –19.94, –40.60, 8 May 1987, *H.Q. Boudet Fernandes 2088* (CEPEC!, IPA!, MBL); Santa Teresa, Rio 5 de Novembro, alto da encosta voltada para N/NE, –19.94, –40.60, 23 July 1987, *H.Q. Boudet Fernandes 2175* (CEPEC, IPA!, RB); Santa Teresa, Rio Cinco de Novembro, ca. 5 km N of town on the road to Colatina, –19.83, –40.67, 450–500 m, 5 May 1992, *H. Q. Boudet Fernandez & L.R. Noblick 3081* (FTG!, K!, MBML!, NY!, VIES!); Santa Teresa, Vale do Canaã, –19.91, –40.60, 8 July 2005, *A.P. Fontana 1522* (MBML); Santa Teresa, Cachoeira do Strut, –19.83, –40.73, 23 September 2005, *L. Kollmann 8438* (MBML); Tiradente, nas proximidades da cidade, Sentido Valério, 26 January 2007, *R. Tsuji et al. 1567* (HPL!).

37. *Syagrus macrocarpa* Barbosa Rodrigues (1879: 46). Type:—BRAZIL. Rio de Janeiro: in forests of upper valley of Rio Parahyba in Rio de Janeiro (holotype destroyed). Lectotype (designated by Glassman [1972b: 213]):—Barbosa Rodrigues (1903a) volume 1, t. 85–86, 1903a

Cocos procopiana Glaz. ex Drude (1881: 412). *Calappa procopiana* (Glaz. ex Drude) Kuntze (1891: 982). Type:—BRAZIL. Rio de Janeiro: cult. Horto Publico, Rio de Janeiro, *Glaziou 9015* (holotype C, isotypes K!, P!).

Cocos getuliana Bondar (1941: 35). *Syagrus getuliana* (Bondar) Glassman (1963: 260). Lectotype (designated by Glassman [1987: 93]):—BRAZIL. Espirito Santo: São Mateus, 1941, *G. Bondar s.n.* (F! [F-620823]), cf. Glassman (1972b: 91).

Figure 54 plate, Figure 49 map.

Medium-sized, solitary palm. **Stem** ca. 4–10 m × 10–20 cm, columnar, erect, smooth. **Leaves** 15–20; *sheathing leaf base* ca. 80–90 × 14–18 cm; *pseudopetiole* 75–135 cm long; *petiole* 17–25(–43) × 2.5 cm, 0.8–1.0 cm thick; *rachis* 122–133 cm long; *leaflets* slightly lighter on the abaxial surface, 90–153 along one side, in clusters of 3–5(–8), inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, a few small to many ramenta along the abaxial midvein; basal leaflets 42–57 × 0.6–0.8 cm, middle leaflets 29–70 × (0.8–)2.3–3 cm, apical leaflets 11–23 × 0.1–0.7 cm with an asymmetric tip. **Inflorescence** erect to pendulous, unilaterally branched; *prophyll* 30–46 × ca. 5 cm; *peduncular bract* 70–120 cm, expanded portion 37–75 × 10–29 cm, including a 1–1.5(–4) cm beak, 11–31 cm perimeter, 3–4 mm thickness, narrow, woody, sulcate, exterior with waxy coating; *peduncle* ca. 30–60 × 1.5–2.8(–3.5) cm, ca. 1.3 cm thick, elliptical in cross-section, tomentose; *inflorescence axis* 42–80 cm long; *rachis* 25–50 cm long, glabrous; *rachillae* 23–80, glabrous, 10–25 cm long at the apex, 15–43 cm long at the base; *staminate flowers* ca. 9 mm long at the apex, 10–16 × 3–7 mm at the base, green to yellow, sepals 1–2 × 1.5–2 mm, glabrous, no visible nerves, petals 7 mm long at the apex, 10–16 × 1.5–4.5 mm at the base with acute tips, glabrous, nerves indistinct, stamens 4–5 mm long, anthers 2.5–4.5 mm long, filaments 2–3 mm long, pistillode less than 0.5 mm long; basal *pistillate flowers* pyramidal to elongate conical, 22–30(–35) × 7–15 mm, yellow, glabrous, sepals 22–31 × 6–9(–12) mm, glabrous, no venation, strongly keeled, petals 17–29 × 6–9(–12) mm, glabrous with prominently raised veins, valvate tips ca. ½ of the petal length, ca. 3–4.5 mm long, pistil 12–13 × 4–5 mm, tomentose at the very base, stigmas less than 5–7(–9) mm long, glabrous, staminodal ring ca. 2 mm high, 6-dentate. **Fruit** narrowly ellipsoid, 6.5–9 × 3–45 cm, yellowish green when mature, mostly glabrous (occasionally white tomentose at apex), epicarp less than 0.5 mm thick, mesocarp 4–5 mm thick, succulent and fibrous; *endocarp* ca. (3.5–)4.5–6.5 × 1.8–2.6 cm, (4–)5–7 mm thick on the sides, 10–13 mm thick at the ends; *seed* narrowly ellipsoid, ca. 30–40(–60) × 10–15 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—maria-rosa, mari-rosa, baba-de-boi-grande, jurua, arioba, haryroba.

Etymology:—The specific epithet, *macrocarpa,* refers to the large fruits of this species, which are up to 9 cm long.

Distribution and habitat:—Espírito Santo, Rio de Janeiro and Minas Gerais, Brazil, rare to occasional in the transitional zone of the Atlantic forest to ca. 900 m. It is found from the states of Rio de Janeiro and Espirito Santo (i.e. São Mateus) to as far north as Turmelina, Minas Gerais.

Conservation:—This species is widely distributed, but never in large numbers. It often occurs as widely scattered palms and is difficult to germinate and slow growing. Its habitats are usually rocky and cleared and burned for pasture. The frequent burning is the enemy of the seedlings, so there is little recruitment. There has been a slow but consistent reduction in the wild populations. Gilson Essenfelder (pers. comm.), palm enthusiast and resident to the area where this species is native, remarked that he would be surprised if one could count more than 5,000 plants all over the state and vicinity. Based on the low or sporadic frequency of its occurrence in the wild, the continued destruction of its habitat and its low germination potential, this palm is classified as vulnerable, VU A2c; B2ab(iii,v); C1.

Phenology:—This species fruits sparsely in summer. Seeds germinate in 4–6 months, but the rate of germination is low.

Uses:—The fruit mesocarp and seed are edible. The plant is ornamental, with the potential for cultivation in tropical regions. It is used in urban landscaping in regions where it is native.

Notes:—Resembles a miniature *S. romanzoffiana* but with a smaller inflorescence (80 vs. 167 cm), larger fruits (6–9 vs. 3 cm), larger female flowers (2.0 vs. 0.7 cm), and plumose leaves with under curled leaflets. There is clinal variation in the fruit endocarps of *S. macrocarpa* that occurs over its range along a north-south line. There are three distinct longitudinal ridges on the endocarps in the northern portion of its range in Espirito Santo and central Minas Gerais, which are easily seen in a fruit cross-section. These ridges become reduced and less noticeable on the basal part of the endocarps in the populations farther south near Juiz de Fora, Minas Gerais and in Rio de Janeiro, until they are only visible near the apex of the endocarp. This variation led to the separate description of *Syagrus getuliana* in Espirito Santo near São Mateus by Bondar (1941).

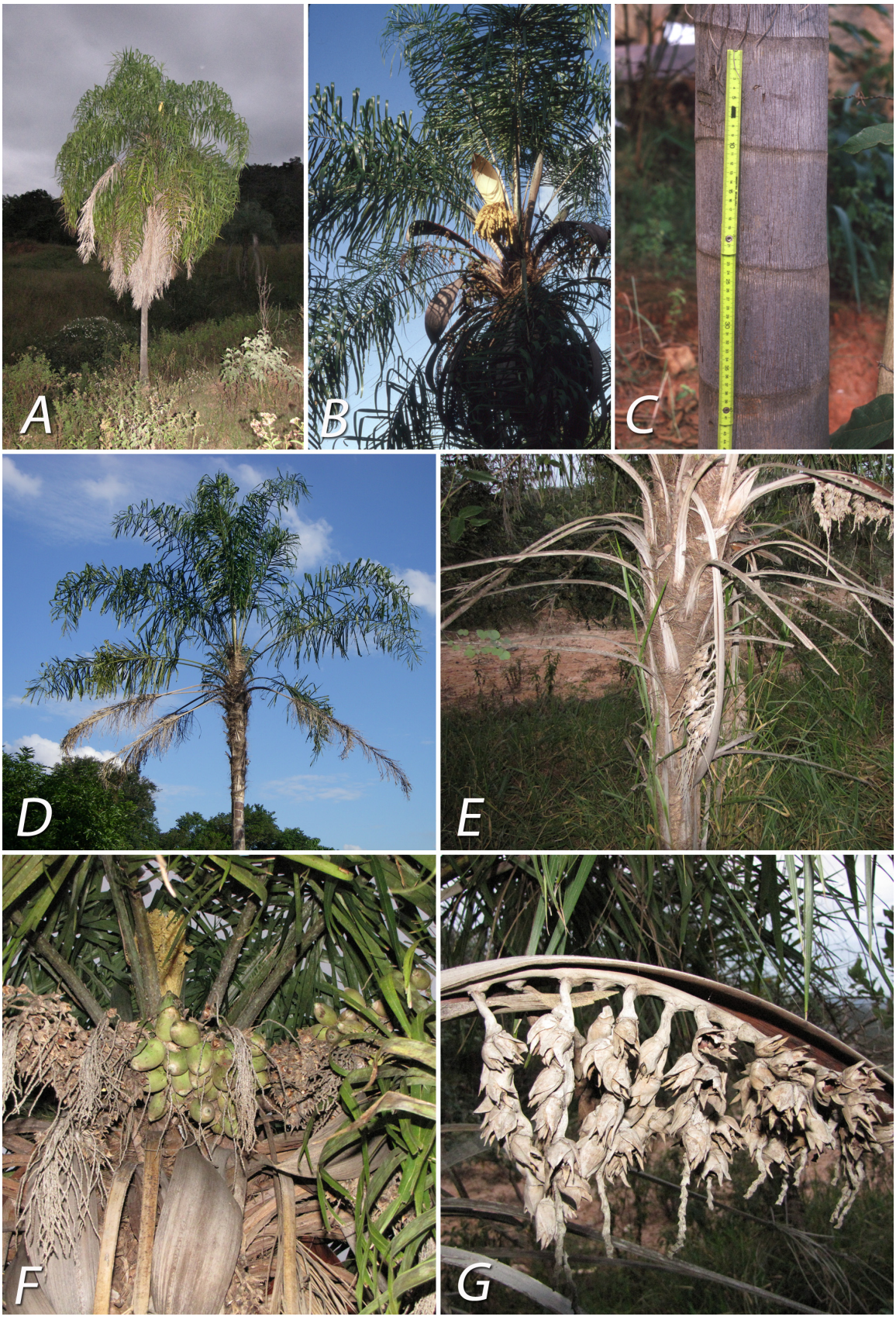

FIGURE 54. *Syagrus macrocarpa*. A. Habit near Turmelina, Minas Gerais. B. Crown with newly open inflorescence near Juiz de Fora, Minas Gerais (*Noblick & Duarte 4857*). C. Stem. D. Crown. E. Young palm with persistent leaf sheaths. F. Immature infructescence. G. Inflorescence with old pistillate flowers. Scale is in centimeters.

Representative specimens:—BRAZIL. **Espírito Santo:** Aracruz, Jucupemba, ca. 2 km da divisa, beira da BR 101, lado esquerdo, indo para o norte, 50 m, –19.82, –40.27, 3 November 1989, *H.Q. Boudet Fernandes 2885* (CVRD, MBML!, NY, RB); Aracruz, Jucupemba, km 170 da BR 101 norte, ca. 200 m da rodovia, ca. –19.55, –40.22, 125 m, 23 February 1990, *H.Q. Boudet Fernandes 2894* (MBML!, VIES); Linhares, Próxima de Rio do Norte, ca. 2 km da divisa municípal. Lado esquerdo da BR 101 indo para o N, 50 m, –19.39, –40.07, 3 November 1989, *H.Q. Boudet Fernandes 2886* (MBML!, NY), *2887* (MBML!, RB); **Minas Gerais:** *Martius s.n.* (M); Governador Valadares, KM 5, –18.85, –41.95, 14 February 1992, *G.F.E. Abrahão s.n.* (MBML!); Governador Valadares, Cultivated at the edge of town [but native to the region], 150–300 m, –18.85, –41.95, 15 March 1992, *L.R. Noblick & G. Abrahão 4841* (BHCB!, FTG! MBM!, NY!); Governador Valadares, native to the area (Serra de Ibituruna etc.) but this species cultivated in town, 150–300 m, –18.85, –41.95, 16 March 1992, *L.R. Noblick & G. Abrahão 4842* (BHCB! FTG!); Juíz de Fora, Parque Mariano Procópio, –21.76, –43.35, 26 June 1986, *H.Q. Boudet Fernandes 2001* (MBML!); Juíz de Fora, Parque Mariano Procópio, –21.76, –43.35, 30 July 1986, *H.Q. Boudet Fernandes 2008* (MBML!, MO); Juiz de Fora, Parque Mariano Procopio, –21.76, –43.35, 1952, *P. Campos Porto s.n.* (RB! [RB-79194]); Juiz de Fora, October 1867, *A.F.M. Glaziou 2145* (P!); Juiz de Fora, Muséu Mariano Procopio located within the city limits, 650–750 m, –21.75, –43.33, 3 April 1992, *L.R. Noblick & G. Duarte 4857* (CESJ!, F!, FTG!, IPA!, NY!, US!); Nanuque, –17.84, –40.35, 11 November 2007, *D.A. Folli 5766* (CVRD); Turmalina, 20 January 2010, *H. Lorenzi & F.C. Campos 6801* (HPL!); **Rio de Janeiro:** Alberto Torres, December 1937, *M. Burret 16607* (RB!); Três Rios, –22.12, –43.21, 27 July 1986, *H.Q. Boudet Fernandes 2000* (MBML!); Rio de Janeiro, 22 April 1877, *A.F.M. Glaziou 9015* (K!, P!) [isotype of *Cocos procopiana* Glaz. ex Drude].

38. *Syagrus mendanhensis* Glassman (1968a: 298). Type:—BRAZIL. Minas Gerais: Mendanha, 24 September 1936, *W.A. Archer 4086* (holotype BH!, isotype US! [US-1705631, 1705632])

Figure 55 plate, Figure 49 map.

Small, solitary to clustering palm to less than 1 m tall. **Stem** ca. 0–0.4 m × ca. 10 cm, nearly acaulescent with a mostly short, subterranean stem. **Leaves** 4–8; *sheathing leaf base* ca. 18–25 × 1–2 cm; *pseudopetiole* 17–50 cm long; *petiole* 12–15 × 0.7–1 cm, 0.4–0.8 cm thick; *rachis* 42–85(–102) cm long; *leaflets* slightly lighter on the abaxial surface, 13–31 along one side, in clusters of 2–4 (occasionally single), inserted at various angles, giving the leaf a plumose appearance, no to few ramenta scales or tomentum present where the leaflets are inserted on the rachis and occasionally along the abaxial midvein; basal leaflets 29–46 × 0.1–0.6 cm, middle leaflets 29–66 × 0.8–1.3(–1.8) cm, apical leaflets 12–50 × 0.1–0.5 cm with an asymmetric tip. **Inflorescence** erect, unilaterally branched; *prophyll* 8–35 × 2–6 cm, glabrous; *peduncular bract* 45–87 cm long, expanded portion 18–53 × 1.5–6.5 cm, including a 1–3 cm beak, 3–7.5(–8.5) cm perimeter, 1–3 mm thickness, narrow, woody, sulcate, exterior thick tomentose; *peduncle* ca. 22–49 cm × 4–10 mm, 3–7 mm thick, elliptical in cross-section, tomentose; *inflorescence axis* 14–35 cm long; *rachis* 3–16 cm long; *rachillae* 4–14, with lepidote indument, 7–20 cm long at the apex, 10–25 cm long at the base; *staminate flowers* 8–11 mm long at the apex, 11–13 × 3.5–5 mm at the base, green to yellow, sepals 1.5–2 × 1.5–3 mm, glabrous, no visible venation, petals 7–10 mm long at the apex, 12–13 × 2–4 mm at the base with acute tips, glabrous, nerves indistinct, stamens 5–8 mm long, anthers 4.7–6.5 mm long, filaments 1.5–4 mm long, pistillode less than 1 mm long but longer than 0.5 mm, *pistillate flowers* elongate conical, 11–12 × 5 mm at the apex, 12–14 × 5–6 mm at the base, yellow, sepals 11–13 × 5–6 mm, slightly keeled, nearly glabrous to tomentose at the base, petals 10–12 × 3.5–5 mm, nearly glabrous to brown tomentose near the base with raised nerves, valvate tips ½–2/3 the length of the petal, ca. 5–7 mm long, pistil 7.5–8.5 × ca. 3 mm, mostly glabrous, but tomentose at the base, stigmas 4–5.5 mm long, glabrous, staminodal ring ca. 1 mm high, 6-dentate. **Fruit** ellipsoid to ovoid, 2.8–3.2 × ca. 1 cm, yellowish green when mature, tomentose at the tip with scaly lepidote scales on the rest of the fruit, epicarp less than 0.5 mm thick, mesocarp ca. 2 mm thick, succulent and fibrous; *endocarp* ca. 2.5 × ca. 1 cm, 1–2 mm thick along the sides, 3–4 mm thick at the ends; *seed* more or less ellipsoid, not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—palmeirinha-da-serra.

Etymology:—The specific epithet, *mendanhensis,* refers to the town of Mendanha, Minas Gerais, Brazil, where the type specimen was collected.

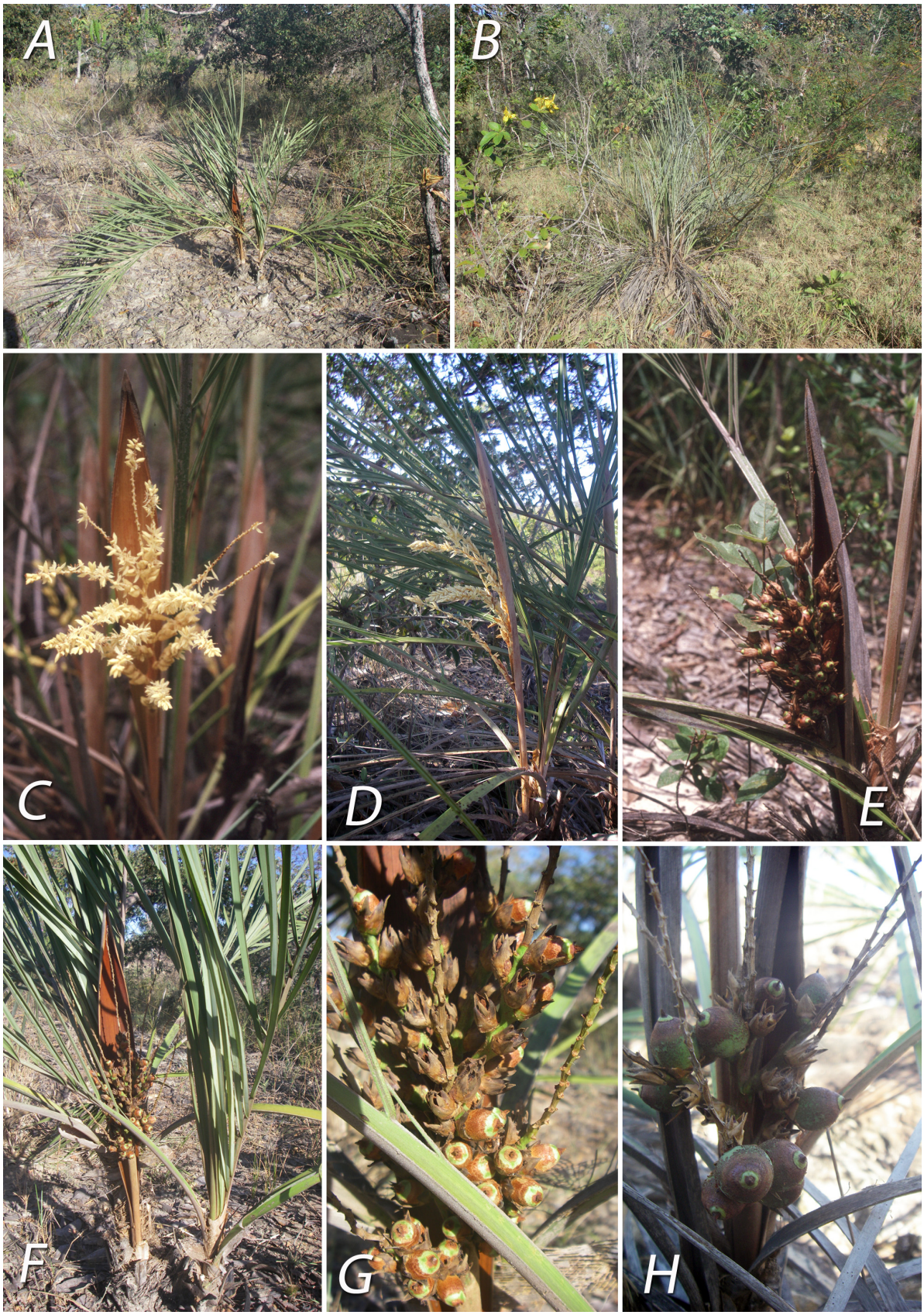

FIGURE 55. *Syagrus mendanhensis*. A. Habit near Mendanha, Minas Gerais (*Tsuji et al. 2708*). B. Clustering habit. C. Inflorescence frontal view (*Noblick 4844*). D. Inflorescence side view. E. Developing infructescence. F. Base of plants with developing infructescence. G. Close of infructescence showing straight rachillae. H. Mature fruits.

Distribution and habitat:—Endemic to the Brazilian state of Minas Gerais, in the Cadeia do Espinhaço, especially Mendanha, Couto de Magalhães de Minas and to near Tome. It grows in cerrados, in extremely sandy, and rocky soil. It grows in the rocky habits, as well as on the more valuable flatter areas with better soils

Conservation:—This palm is known only from localities within the region of Mendanha and is not growing within the boundaries of any protected reserve or park. In some areas of its range it appears to be rare, but in others it is more common. This palm produces few seeds, is difficult to germinate and is slow growing (Ricardo Pimenta, pers. comm.). Because its locality is restricted to areas around Mendanha, few palms occur in each locality, and its habitat continues to be converted to pasture, it is consider endangered, EN B1; C2a(i).

Phenology:—It fruits sparsely during the spring. Fruits are consumed rapidly by small animals, making it difficult to obtain viable seeds in the wild. The germination is low and occurs in 3–4 months. It tolerates transplanting as adults.

Uses:—This palm has ornamental and landscape possibilities. It tolerates both rocky and sandy soils.

Notes:—This species is often confused as dried specimens with *S. pleioclada*, but it has a distinctly different growth habit with stiff, erect leaflets, not pendulous and deflexed as in *S. pleioclada.* The inflorescence is also larger (14–35 vs. 8–14.5 cm) with straighter and longer rachillae (7–25 vs. 0.5–7 cm).

Representative specimens:—BRAZIL. **Minas Gerais**: Conto [Couto] de Magalhães de Minas, a 4 km da cidade rumo a Diamantina, 6 May 2004, *H. Lorenzi 4843* (HPL!); Couto de Magalhães de Minas, na estrada para Diamantina, –17.96, –43.41, *R. Tsuji et al. 1262* (HPL!, IAC); Diamantina, near Mendanha, 1 km S of the Rio Jequitinonha on BR-367, 400–500 m, –18.12, –43.50, 19 February 1992, *L.R. Noblick 4844* (BHCB!, F!, FTG!, K!, MO!, NY!, SP!, US!); Mendanha, 5 km SE of Mendanha, 1976*, S.F. Glassman 13003* (F!, FTG!); Mendanha, a 1 km do Rio Jequitinhanha, na BR 367 no sentido para Diamantina, 18 December 2003, *H. Lorenzi 4279* (HPL!); Mendanha, na rodovia para Diamantina, –18.13, –43.52, 6 May 2004, *H. Lorenzi 4839* (HPL!, IAC); Mendanha, na rodovia para Diamantina, 725 m, –18.13, –43.52, 30 July 2004, *H. Lorenzi 4912* (HPL!); Mendanha, 3 km N of Rio Jequitinonha on BR-367, 400–500 m, –18.12, –43.50, 19 March 1992, *L.R. Noblick 4846, 4847* (BHCB!, FTG!, NY!, US!); Mendanha, 4 km ao norte da cidade, Faz. Vaqueiros, 820 m, –18.12, –43.48, 21 June 2008, *R. Tsujiet al. 2708* (HPL!).

39. *Syagrus menzeliana* Noblick & Lorenzi (2014: 7). Type:—BRAZIL. Goiás: Chapada do Céu: Fazenda Campo Bom, near km 23 S of the city on GO-050, and S of Rio Prato, elevation ca. 804 m, –18.57, –52.63, 9 January 2014, *L.R. Noblick & H. Lorenzi 5631* (holotype ESA!, isotypes HPL!, UB!, RB!, SP!, K!, FTG!, NY!, MO!, US!)

Figure 56 plate, Figure 49 map.

Small solitary to clustering palm to 100–135 cm. **Stem** acaulescent. **Leaves** 3–5; *sheathing leaf base* ca. 18–22 cm long; *pseudopetiole* 13–32 cm long; *petiole* 11–30 × 0.5–1.1 cm, 0.3–0.6 cm thick; *rachis* 43–78 cm long; *leaflets* dark bluish-green, lighter on the abaxial surface, newer leaflets with a whitish waxy bloom on the abaxial surface, leaflets 10–29 along one side, in clusters of 2 or 3 or singly, inserted at various angles, giving the leaf a slight plumose appearance, ramenta scales or tomentum absent where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 11–15 × 0.2 cm, middle leaflets 11–25 × 1.0–1.3 cm, apical leaflets 8–26 × 0.2–0.8 cm with an asymmetric tip. **Inflorescence** erect, unilaterally branched; *prophyll* 8–16.5 × 1.5–2.0 cm; *peduncular bract* 21–34 cm, expanded portion 12–25 × 1.6–3.5 cm, including a 0–1.5 cm beak, 3.6–5.4 cm perimeter, 1–2 mm thickness, narrow, woody, sulcate, exterior with scattered scales; *peduncle* ca. 9–20 cm × 3–7 mm, elliptical in cross-section, lepidote; *inflorescence axis* 6.5–14 cm long; *rachis* 0–6 cm long; *rachillae* 1–5(–7), glabrous, 8–13.5 cm long at the apex, 7–13 cm long at the base; *staminate flowers* 7.0–7.2 mm long at the apex, 7.5–7.7 × 3.0–3.1 mm at the base, green to yellow, sepals 1.5–1.8 × 0.7–1.5 mm, glabrous, no visible nerves, petals 6.0–6.2 × 2.0–2.6 mm with acute tips, nerves indistinct, stamens 3.5–3.6 mm long, anthers 2.5–3.1 mm long, filaments 1.5–2.1 mm long, pistillode less than 1 mm long; *pistillate flowers* elongate conical, 10.5–11 × 5.5–5.8 mm at the apex, 14–15 × 8 mm at the base, yellow, glabrous, sepals 9.5–11.7 × 4.4–5.8 mm, glabrous, no visible venation, petals 8.7–12.5 × 4.4–6.6 mm, glabrous, obscurely nerved, valvate tips ½ or more of the length of the petals, ca. 5–6 mm long, pistil 7.3–11 × 3.6–5.5 mm, glabrous, stigmas less than 4.4 mm long, glabrous, staminodal ring ca. 1.5 mm high, truncate. **Fruit** nearly globose to ellipsoid, ca. 2.0–2.5 × 1.5 cm, yellow at the base, green in the middle and rusty at the apex with the very tip black, sometimes with a reddish ring around the tip (Fig. 5B) when

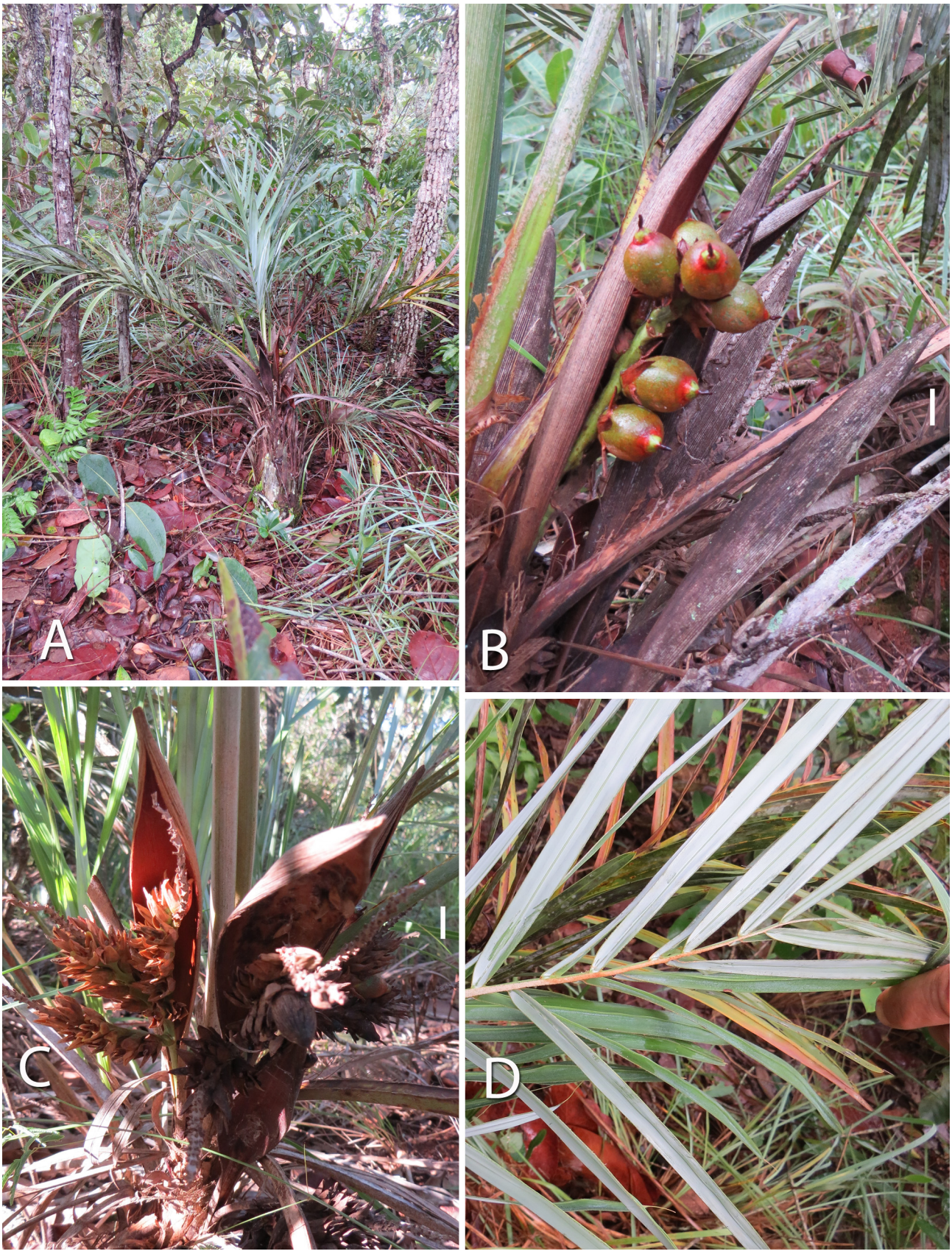

FIGURE 56. *Syagrus menzeliana*. A. Habit. B. Infructescence with reddish ring on the apex of maturing fruit. C. Inflorescence with pistillate flowers. D. Waxy bloom on abaxial side of leaf. White scale on B and C = ca. 1 cm. (*Noblick & Lorenzi 5631*).

maturing later becoming brown, often nearly glabrous and glossy on the upper more exposed portions of the fruit, sometimes lower parts covered with a mealy tomentum on the less exposed portions, epicarp less than 0.5 mm thick, mesocarp not measured, sweet, succulent and fibrous; *endocarp* not measured; *seed* ellipsoid not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—Not recorded.

Etymology:—The specific epithet, *menzeliana,* honors Gilmena (Jill) Menzel, a citizen of both the U.S.A. and Brazil, for her generous support of the Montgomery Botanical Center and the International Palm Society.

Distribution and habitat:—Southwestern Goiás, Brazil, in fragmented cerrado forest. Terrain is flat with deep sandy clay soils, highly prized by soybean farmers.

Conservation:—Known from only one locality, a cerrado fragment, but fairly common in this locality. The surrounding area has been converted to soybean agriculture. It has not yet been found within the boundaries of the Parque Nacional das Emas, which is ca. 30 km away. Since the area is so highly fragmented and so little of the natural vegetation has survived, this species is classified as critically endangered, CR A2c; B1ab(i,iii,iv).

Phenology:—Old inflorescences with some fruiting and only a few fresh flowers in January.

Uses:—None recorded.

Notes:—This species resembles a robust *S. loefgrenii* with similarly branched inflorescences of approximately the same size and a waxy bloom on the abaxial surface of its leaves. The stems of both species have a habit of leaning away from one other when in a cluster, especially in younger plants. However, *S. menzeliana* is more robust (100–135 vs. 50–80 cm tall) with a stronger, more upright stem as it gets older. Its leaflet anatomy differs by having thicker leaflets, larger veins and larger fiber bundles than *S. loefgrenii*. Maturing fruits often have a reddish ring around its apex, which the author has not observed in any other *Syagrus* species.

Specimen examined:—BRAZIL. **Goiás:** Chapadão do Céu, coletada na estrada para Chapadão do Sul, a cerca de 21 km da cidade de Chapadão do Céu, em vegetação de cerrado sobre solos arenosos, 800 m, –18.56, –52.63, 6 June 2011, *H. Lorenzi & A. Campos-Rocha 7120* (HPL!).

40. *Syagrus microphylla* Burret (1933: 111). Type:—BRAZIL. Bahia: Serra do Espinhaço, östlich Monte Chapéo, ca. 1100 m. Auf offenen Landflächen, zum Teil sehr charakteristisch [Serra do Espinhaço, eastern Monte Chapéo, ca. 1100 m. On open flat land, very characteristic to the area], April 1932, *E. Werdermann 3366* (holotype destroyed at B). Neotype (designated by Glassman [1977: 66]):—BRAZIL. Bahia: Serra do Tombador, 6 km S of town of Morro do Chapéu, 1100 m elevation, 18 February 1971, *H.S. Irwin, R.M. Harley, G.L. Smith 32470* (neotype UB!, isoneotypes MO!, NY!)

Figure 57 plate, Figure 49 map.

Small, solitary, sometimes appearing clustered, unarmed, palms usually less than 50 cm tall. **Stem** subterranean, appearing acaulescent. **Leaves** 5–12 in crown, spirally arranged, spreading; *sheathing leaf base* 10–15 cm long, fibrous; *pseudopetiole* 20–30(–50) cm long with nearly smooth margins, covered with a brownish tomentum, especially on the abaxial surface; *petiole* (2–)6–35 × 0.7–1 cm, glaucous waxy; *rachis* 29–62 cm long covered with a brownish indument; *leaflets* dark green to bluish-green adaxially, paler abaxially, glaucous on both surfaces, 18–36 along one side, irregularly distributed in clusters of 2 or 3(–4) in divergent planes; ramenta scales often present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 6.5–16 × 0.1–0.8 cm, middle leaflets 10–22 × (0.8–)1.2–2(–2.3) cm, apical leaflets 8–18 × 0.1–0.6 cm, mostly with acute to asymmetric tips. **Inflorescence** erect, spirally branched; *prophyll* 8–17 × 1–2.5 cm; *peduncular bract* ca. 30–68 cm long, expanded portion 9–40(–47) × (1.5–)2–3.5(–4) cm, bearing a 1–4 cm beak, woody, sulcate, exterior sometimes covered with brownish indument like many other parts of the inflorescence; *peduncle* ca. (5–)10–50(–55) cm × 4–6 mm; *inflorescence axis* 7–18 cm long; *rachis* 0.5–10 cm long; *rachillae* (2–)3–13, 4.5–16 cm long at the base, 3–10 cm long near the apex, rachillae bract usually absent or 1–5 mm long; *staminate flowers* 4–6 mm long at the apex, 5–6.8 × 2.5–4 mm at the base, pale yellow, sepals 0.5–2 × less than 1–2.5 mm, glabrous, no visible venation, petals 4–4.5 mm long at the apex, 5–6 × 1.5–3.2 mm at the base with acute tips, glabrous, nerves indistinct, stamens 2.5–4.5 mm long, anthers 2.4–3.5 mm long, filaments 1–2.5 mm long, pistillode greater than 1 mm; *pistillate flowers* rounded, 5–7 × 3–5.5 mm, yellow to orange, sepals 5–7 × 4–5 mm, glabrous with veins visible at the margins, not keeled, petals (3–)4–5 × 2–3 mm, glabrous, veins raised only near



FIGURE 57. *Syagrus microphylla*. A. Habit near Morro do Chapéu, Bahia. B. Leaf and inflorescence. C. Palm with silvery-bluish leaves and partially excavated stem to show procumbent trunk. Clodoaldo José de Morais holding an inflorescence and another leaf to show the variation in leaf size from a sunny exposed habitat to a shaded one among taller vegetation. (*Noblick & Clodoaldo 3508*).

the base of the petal, valvate tips ¼ to 2/5 the length of the petal, ca. 1–2 mm long, pistil 3–5 × 2–3 mm, nearly glabrous to thin tomentose, 1–1.5 mm long, staminodal ring ca. 1–1.5 mm high. **Fruit** 1.5–2.5 × 1–1.3 cm, persistent perianth (cupule) beige to brown, 12–13 mm wide, 5–8 mm deep, ring 2 mm in height, epicarp less than 0.5 mm thick, smooth fibrous with reddish to yellowish brown tomentum, light green with scattered tomentum when mature, 1 mm thick, mesocarp fibrous; *endocarp* slightly ellipsoid, 1.3–1.7 × 1.0–1.3 cm, 1–1.5 mm thick, bony, smooth on the interior, yellow-brown, trivittate, with no clusters of fibers; *seed* ellipsoid, 14–16 × 10 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—coquinho, ariri.

Etymology:—The specific epithet, *microphylla,* refers to the small leaves of this attractive acaulescent palm. However, this may be a misnomer. When growing in heavily shaded areas, this species produces larger leaves.

Distribution and habitat:—Endemic to the Brazilian state of Bahia, in the Chapada Diamantina region (Serra do Tombador), in the transition between caatinga and campo rupestre, at elevations above 800 m, generally in sandy gravelly soils, but it grows in very rocky habitats as well. It can also be found growing in the Serra do Tombador in the Municipio de Morro do Chapéu, usually at 900–1000 m elevation, and in the eastern part of the adjacent Municipio de Miguel Calmon, which is still part of the same high elevation plateau area. Also found in a series of high elevation disjunct cerrados, "gerais," in the Municipio de Sento Sé, about 150 km to the NW of Morro do Chapéu, and in campo rupestre to caatinga vegetation above 1000 m, usually in white sandy to gravely soils and even growing in reddish clays. Within western limits of the Municipio de Miguel Calmon, this palm grows in a relatively dry habitat with another acaulescent palm which is better adapted to tolerate such dryness, *S. vagans*. As of yet no hybrids have been found between the two, but this is the only known locality where the ranges of these two species overlap, one a palm of the more mesic, high-elevation campo rupestre and the other palm a component of the caatinga.

Conservation:—This species is well protected within a large state park (Parque Estadual do Morro do Chapéu). It is a palm that produces an abundance of seeds, which germinate well. Many individuals grow in very rocky soils from which they are not easily extracted. They can grow in fairly dense populations. This palm is not under any threat and is classified as LC.

Phenology:—*Syagrus microphylla* flowers from August to March. This species fruits in October to April. It fruits sparsely in the summer (January–March). The germination is slow, and the rate of germination is low.

Uses:—This palm would make an excellent ornamental. It is a very attractive palm and when grown in full sun, it accumulates more waxes on its leaves and takes on a very beautiful blue-green color (Fig. 57A). It is also small and would easily fit into most gardens. The water from the young coconuts has been used medicinally, as a treatment for eye irritation.

Notes:—This is an attractive, small, acaulescent palm with silvery, glaucous blue foliage. *Syagrus microphylla* was originally described by Burret from a specimen collected by Werdermann near Morro de Chapéu in 1932, but the holotype was destroyed during the Second World War. The species was rediscovered in 1971, by Irwin, Harley and Smith, whose collection has now become the neotype. Morro do Chapéu appears to be the most popular place to collect this species, because the palm is common and the city is very accessible, lying along a major east-west highway. The species is just as abundant in the Serra do Curral Feio, Serra do Alegre and Serra do Pau d'Arco and all the associated sierras in the eastern side of the Municipio de Sento Sé. It is also found in the Serra do Tombador, west of Jacobina.

This palm is easily distinguished by its small leaves with clustered pinnae, and a small inflorescence that is usually about the same height as the leaves, 3–9 rachillae, with 5–10 fruits per rachilla. In the infructescence of this species, the lower branches tend to be inclined towards the ground, not like most of the others that usually remain angled upward from the rachis, like *S. vagans*. Additional information on this species can be found in Glassman (1977).

Representative specimens:—BRAZIL. **Bahia:** Campo Formoso, Agua Preta, estrada Alagoinhas-Minas do Mimoso, 1050 m, 26 June 1983, *L. Coradin et al. 6073* (CEN!, K!, NY!); Delfino, Serra do Curral Frio, Estrada Delfino-Mimoso de Minas, 32 km de Delfino, 1248 m, –10.50, –41.31, 9 March 1997, *P. Gasson 6175* (ALCB, CEPEC, HUEFS!); Jacobina, ca. 20 km N de Jacobina, 355 m, –11.06, –40.67, 3 May 1999, *F. França et al. 2879* (HUEFS!); Miguel Calmon, ca. de 5 km oeste de Praça do Jatobá ou 31 km oeste de M. Calmon na estrada para Varzea Nova, região de Macauba, 800–900 m, –11.30, –40.83, 14 March 1986*, L.R. Noblick 4534* (ALCB!, CEPEC!, F!, FTG!, HUEFS!, RB!); Morro do Chapéu, 27 August 1986, *Bautista 416* (HRB!); Morro do Chapéu,

Estrada Morro do Chápel-Utinga, 1 km da entrada para o morrão, –11.55, –41.16, 11 November 1998, *D.S. Carneiro-Torres 25* (HUEFS!); Morro do Chapéu, Morro do da antena entrada pela estrada para Wagner, –11.38, –41.27, 1 March 1989, *T.B. Cavalcanti et al. 363* (CEN!); Morro do Chapéu, Morrão, 1300 m, –11.59, –41.21, 13 March 1996, *A.A. Conceição 2350* (ALCB!, CEPEC, HUEFS); Morro do Chapéu, Piemonte da Diamantina, 1200 m, –11.55, –41.15, 17 May 1975, *A.L. Costa & Barros s.n.* (ALCB!, HRB!); Morro do Chapéu, –11.55, –41.16, 26 September 1965, *A.P. Duarte 9603* (RB!); Morro do Chapéu, Parque Morro do Chapéu, estrada para o Barracão, 1074 m, –11.42, –41.21, 28 April 2006, *J.L. Ferreira et al. 23* (HUEFS); Morro do Chapéu, ca. 10 km L de Morro na BA 052, 984 m, –11.60, –41.06, 27 August 2006, *F. França 5534* (HUEFS); Morro do Chapéu, Morrão (Alto da antena), 1266 m, –11.58, –41.20, 5 May 2007, *M. Freitas 37* (HUEFS!); Morro do Chapéu, 1220 m, 30 November 1980, *A. Furlan et al. 291* (K!, SPF!); Morro do Chapéu, Serra Pé do Morro, 1293 m, –11.58, –41.20, 29 June 1996, *A.M. Giulietti 3213* (ALCB!, HUEFS); Morro do Chapéu, Serra do Tombador, 2 km SW of Morro do Chapéu, on road to Utinga, very local for radius of ca. 5 km, 20 August 1976*, S.F. Glassman 13018–13031* (BH!, CEN!, F!, FTG!, HRB!, IPA!, K!, MBM!, MICH!, MO!, NY!, RB!, SP!, UC!, US!); Morro do Chapéu, Summit of Morro do Chapéu, ca. 8 km SW of the town of Morro do Chapéu to the west of the road to Utinga, ca. 1000 m, –11.58, –41.20, 3 March 1977, *R.M. Harley 19340* (CEPEC!, K!, NY!); Morro do Chapéu, Same locality as proceeding, –11.58, –41.20, 30 May 1980, *R.M. Harley 22816* (CEPEC!, HBR!, MBM, MO!, K!, NY!, U); Morro do Chapéu, Serra do Tombador, –11.55, –41.16, 15 July 1979, *G. Hatschbach 42345* (F!, MBM!, NY!); Morro do Chapéu, Serra do Tombador, base of Morro do Chapéu, ca. 6 km S of town of Morro do Chapéu, 1100 m, –11.55, –41.16, 18 February 1971, *H.S. Irwin et al. 32470* (NY!, MO!, UB!); Morro do Chapéu, –11.98, –41.29, 3 September 1985*, J.L. de S. Lima & L.R. Noblick 128–139* (HTSA!, IPA!); Morro do Chapéu, Piemonte da Diamantina, –11.55, –41.15, 12 May 1957, *R.P. Lordêlo 57-343* (ALCB!); Morro do Chapéu, Parque Estadual de Morro do Chapéu—PEMC. Estrada nova do Prefeito, 1052 m, –11.41, –41.22, 12 October 2006, *E. Melo et al. 4475* (HUEFS!); Morro do Chapéu, na estrada para Bonito a 10 km de Morro do Chapéu, –11.55, –41.12, 5 February 2009, *H. Lorenzi 6600* (HPL!); Morro do Chapéu, 1–2 km sul da cidade na estrada para Utinga, 1000 m, –11.55, –41.15, 16 November 1984*, L.R. Noblick & Clodoaldo 3508* (F!, FTG!, GH!, HUEFS!, MO!, RB!, SP!); Morro do Chapéu ca. 1–3 km S of the city on the road towards Utinga, BR-426, –11.55, –41.15, 21 February 1992*, L.R. Noblick 4835* (FTG!, MO!); Morro do Chapéu, Morrão, Piemont da Chapada Diamantina, próximo às torres de telefonia, 1278 m, 28 May 2009, *M. Oliveira 4260* (HVASF); Morro do Chapéu, 50 km N depois de Fedegoso no direção de Varzea Nova, 28 August 1981, *R.P. Orlando 468* (HRB!); Morro do Chapéu, Estrada para o "Morrão" (Morro do Chapéu), ca. 13 km da rodovia para Utinga, arredores da antena, 1235 m, –11.09, –41.21, 28 January 2005, *J. Paula-Souza et al. 4796* (ESA!); Morro do Chapéu, Entrada da estrada para o "Morrão" (Morro do Chapéu), 1010 m, –11.56, –41.16, 28 January 2005, *J.F. Paula-Souza et al. 4928* (ESA!); Morro do Chapéu, estrada para o "Morrão" (Morro do Cthapéu), ca. 13 km da rodovia para Utinga, arredores da antena, 1235 m, –11.09, –41.21, 21 July 2006, *J.F. Paula-Souza, et al. 6285* (ESA!); Morro do Chapéu, BA-426, 33 km SW de Varzea Nova, –11.49, –41.13, 800 m, 8 November 1986, *L.P. de Queiroz et al. 1240* (HUEFS!); Morro do Chapéu, Dunas, –11.58, –41.22, 7 August 2003, *P.L. Ribeiro 12* (HUEFS!); Morro do Chapéu, rod. BA-426, km 6 no sentido M. do Chapéu/Jacobina. Fazenda do Sr. Joaquim Coutinho, margem esquerda da rod., 12 August 1979, *A.J. Ribeiro 37* (CEPEC!, K!); Morro do Chapéu, Dunas, 930 m, –11.50, –41.33, 5 May 2007, *L. Rodrigues 15* (HUEFS!); Morro do Chapéu, Estrada para Barracão, 1106 m, –11.42, –41.21, 11 November 2007, *F.B.L. Silva 50* (HUEFS!); Morro do Chapéu, Morro da Antena, 1100 m, –11.59, –41.21, 19 July 2001, *V.C. Souza et al. 26488* (ESA!); Piemonte da Diamantina, –11.52, –41.27, 24 April 2010, *M.L. Guedes 16959* (ALCB!); Piemonte da Diamantina, Morro do Chapéu, Caminho para o Morrão, –11.92, –41.12, 22 October 2011, *M.L. Guedes 19261* (ALCB!, HTSA); Piemonte da Diamantina, 903 m, 10 November 2007, *N. Roque 1706* (ALCB); Sento Sé, Serra das Almas, campo rupestre, 1193 m, 14 May 2010, *A.P. Fontana 6665* (HVASF); Sento Sé, Serra do Curral Feio, 1974, *R.M. Harley 16675* (BH!, color slide, K); Sento Sé, Serra do Curral Feio, –10.50, –41.58, 7 October 1988*, J.L. de S. Lima 91* (HTSA!); Sento Sé, Serra do Pau D' arco, –10.50, –41.58, 7 October 1988*, J.L. de S. Lima 92, 93* (HTSA!); Sento Sé, Serra dos Prazeres, 513 m, 27 January 2010, *M. Oliveira 4781* (HVASF); Serra do Alegre, 11 km S of Minas do Mimosa in the Serra das Almas, 1060 m, –10.34, –41.40, 7 October 1988*, L.R. Noblick & J.L. de S. Lima 4611* (AAU!, CEPEC!, F!, HTSA!); Serra do Alegre, 3 km S of Campo Largo in the Serra do Pau d'Arco, 1000–1010 m, –10.41, –41.40, 7 October 1988*, L.R. Noblick & J.L. de S. Lima 4612* (BAH!, BH!, CEPEC!, F!, FTG!, HTSA!, K!, NY!, US!); Umburanas, Serra do Campo Largo, 1014 m, 29 January 2010, *D. Araújo 1330* (HVASF); Umburanas, Serra da Empleitada, 960 m, –10.43, –41.40, 21 September 2006, *J.A. Siqueira Filho 1778* (HVASF, MBML); Utinga, 3 km Morro do Chapéu, –12.04, –41.25, 27 September 1985, *G. Fotius et al. 4183* (HTSA).

41. *Syagrus minor* Noblick & Lorenzi (2010b: 37). Type:—BRAZIL. Minas Gerais: Grande Sertão Veredas, collected on the road of the Parque [Nacional] do Grande Sertão Veredas, 890 m, –15.42, –45.87, 4 March 2009, *H. Lorenzi, R. Pimenta & R. Campos 6639* (holotype HPL!, isotypes BHCB!, NY!, K!, RB!, SP!)

Figure 58 plate, Figure 49 map.

Short, solitary palm 30–40 cm tall. **Stem** subterranean, appearing acaulescent, 3.0–3.5 cm in diameter. **Leaves** arched, 3–6 in the crown, *sheath* 2–11 cm long, *pseudopetiole* with fibrous or smooth margins 6–19 cm long, *petiole* 1.5–19 × 0.4–0.7 cm, 2–4 cm thick; *rachis* 14–46 cm long; *leaflets* 5–17 along each side of the rachis, distributed regularly or at times irregularly towards the base in clusters of 2 or rarely 3, inserted in nearly the same plane, lanceolate, dark-green, glabrous on both sides, with acute or rounded, asymmetrical apex, usually no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 6.5–20 × 0.1–0.5 cm, middle leaflets 14.5–30 × 0.6–1.2 cm, apical leaflets 10–21 × 0.3–0.7 cm. *INFLORESENCE* spicate, *prophyll* 2.7–9.0 × 0.7–1.3 cm; *peduncular bract* 10–31 cm long, the expanded part 5.6–19.0 × 0.8–2.5 cm, including a 0–2 cm beak, 1.5–3.0 cm perimeter, less than 1 mm thickness; *peduncle* (1–)5–16 cm × 3–4 mm; *inflorescence axis* 4–12 cm long; *rachis* absent, *rachilla* 1, 4–12 cm long; *staminate flowers* 7–8 × 3.5–4.0 mm, sepals 1.5 × 1.0 mm, glabrous, petals 6–7 × 2.0–2.5 mm with acute tips, nerves slightly raised, stamens 4–5 mm long, anthers 3–4 mm long, filaments 1.5–2.0 mm long; *pistillate flowers* elongate pyramidal, 13–14 × 8–11 mm at the apex, 14–18 × 8–11 mm at the base, glabrous, sepals 9–11 × 7.5–9.0 mm, petals 9–13 × 5 mm, glabrous, pistil 9–10 × 3.5–4.0 mm, glabrous, stigmas ca. 4 mm long, glabrous, staminodal ring ca. 1 mm high, 6-dentate. **Fruit** ellipsoid to ovoid, 2–2.8 × 1.3–2 cm, epicarp less than 0.5 mm thick, mesocarp thickness not measured, sweet, succulent and fibrous; *endocarp* ellipsoid, ca. 1.7–2.5 × 1.1–1.3 cm, hard; *seed* ca. 0.8 cm in diameter with no interior cavity, endosperm homogeneous. Germination remote-tubular.

Common name:—palmeirinha-mirim.

Etymology:—The specific epithet, *minor,* refers to the small stature of this species.

Distribution and habitat:—Brazil, northwestern Minas Gerais in the Grande Sertão Veredas National Park in open cerrado vegetation. It is known along the northwestern border of Minas Gerais with Bahia. Since the park borders on Bahia, it is possible that this species occurs in the southwestern part of Bahia as well. Outside of the park the population continues for ca. 140 km east of Chapada Gaúcha, Minas Gerais in relatively undisturbed cerrados.

Conservation:—This species has a fairly large distribution along the northwestern border of Minas Gerais with Bahia. A large portion of the population is well protected within the confines of a national park (Grande Sertão Veredas). Outside of the park, this small acaulescent palm species is incompatible with the agricultural practices of soybean and *Brachiaria* grass seed growers. Since it is so well protected within a large national park and also still survives well in undisturbed cerrados between Chapada Gaúcha and Montalvania, Minas Gerais, the author does not consider this palm to be threatened, and therefore the species is classified as LC.

Phenology:—A few flowering specimens seen in June.

Uses:—Its fruits are easily accessed and consumed by animals. Its unusual small size would make it an interesting addition to any garden.

Notes:—This is possibly one of the smallest *Syagrus* species yet discovered. Other contenders for the smallest *Syagrus* are *S. emasensis*, *S. lilliputiana* and *S. procumbens.* However, *S. minor* is certainly an impressively small palm.

Representative specimens:—BRAZIL. **Minas Gerais:** Chapada Gaúcha, Parque Nacional Grande Sertão Veredas, 873 m, –15.41, –45.85, 10 June 2009, *L.R. Noblick & R. Campos 5538* (HPL!); Chapada Gaúcha, Parque Nacional de Grande Sertão Veredas on park road (Formosa/Chapada Gaúcha) just 16 km W of the intersection with the paved road that goes to Chapada Gaúcha. ca. 872 m, –15.41, –45.98, 28 January 2014, *L.R. Noblick & H. Lorenzi 5651* (ESA!, HPL!, BHCB!, FTG!, NY!); Chapada Gaúcha, 118 km E of the city on the road to Montalvania. ca. 691 m, –14.72, –44.82, 29 January 2014, *L.R. Noblick & H. Lorenzi 5657* (ESA!, BHCB!, FTG!); Chapada Gaúcha, 135 km E of the city on the road to Montalvania. ca. 672 m, –14.62, –44.70, 29 January 2014, *L.R. Noblick & H. Lorenzi 5658* (ESA!, FTG!).

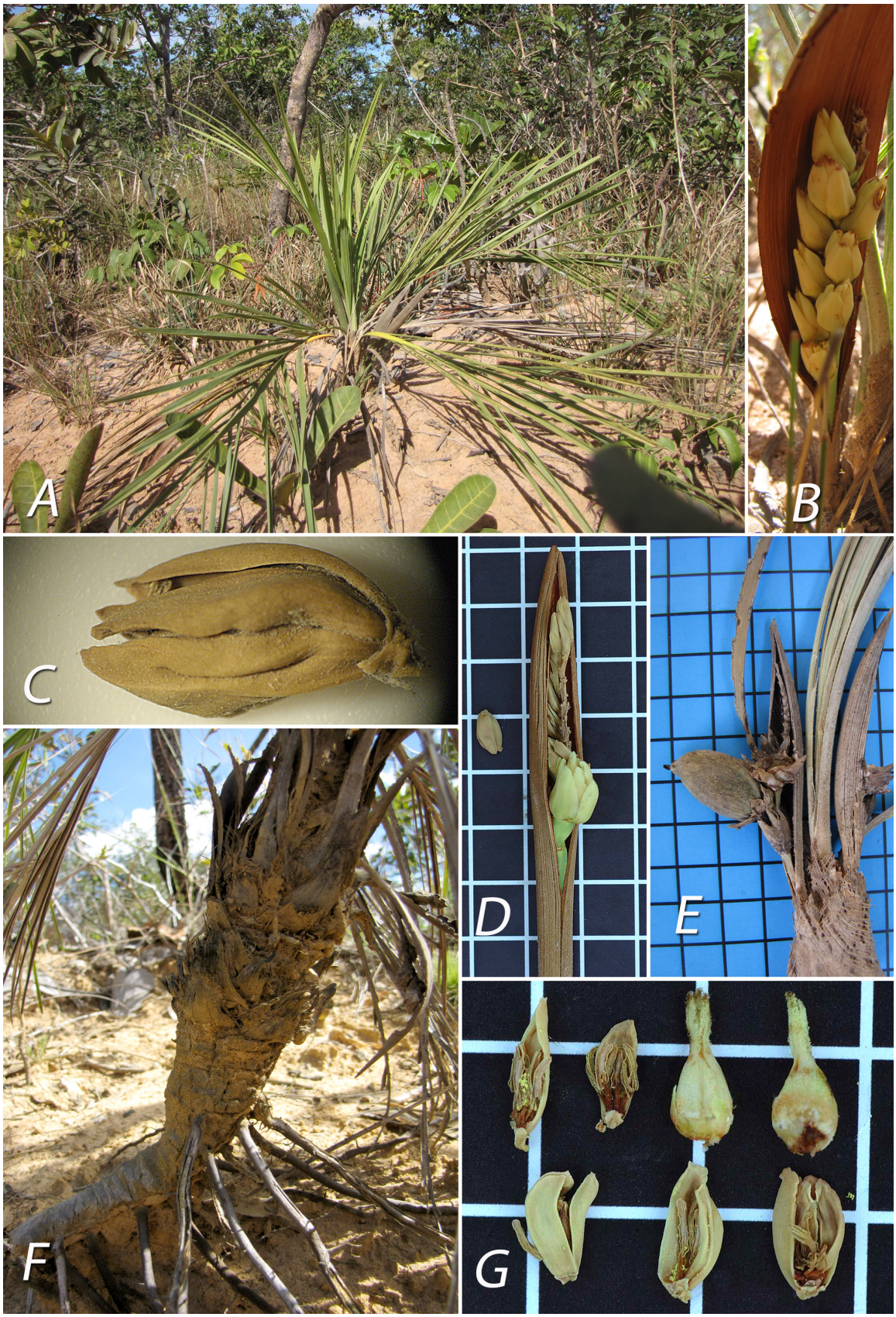

FIGURE 58. *Syagrus minor*. A. Small habit. B. Inflorescence with pistillate flowers. C. Four-parted staminate flower. D. Inflorescence. E. Infructescence. F. Underground stem. G. Above: two staminate flowers and two pistils; below: staminate flowers. All grids are in centimeters. (*Noblick & Campos 5538*).

42. *Syagrus oleracea* (Mart.) Beccari (1916: 467). *Cocos oleracea* Martius (1826: 117). *Calappa oleracea* (Mart.) Kuntze (1891: 982). Lectotype (designated by Dahlgren 1959, plates 393 and 394):—BRAZIL. Minas Gerais: Rio S. Francisco, *Martius 1595* (holotype M! [F neg. 18566, 18566a])

Cocos oleracea var. *platyphylla* Drude in Martius (1881: 417). *Syagrus oleracea* var. *platyphylla* (Drude) Beccari (1916: 467). Type:—BRAZIL. Rio de Janeiro: cult. Horto Publico, Rio de Janeiro, *A.F.M. Glaziou 8063* (holotype C!, isotype GH).

Syagrus gomesii Glassman (1968c: 22). Type:—BRAZIL. São Paulo: 3 km N of Pompeia, 4 July 1965*, S.F. Glassman & J.C. Gomes 8005* (holotype, F!).

Figure 59 plate, Figure 60 map.

Moderate, solitary, unarmed, palms. **Stem** (3–)5–15(–20) m × 14–30 cm, erect, columnar, gray, with leaf scar intervals often indistinct. **Leaves** 12–21 in crown, spirally arranged, spreading; *sheathing leaf base* 45–130 cm long, fibrous; *pseudopetiole* 80–158 cm long with fibrous margins; *petiole* (4–)12–16 × 3.0–4.5 cm, 1.0–1.5 cm thick; *rachis* (82–)185–380 cm long; *leaflets* glaucous green on the adaxial surface, dull green on the abaxial surface, (61–)96–161 along one side, irregularly distributed in clusters of 2–5 in divergent planes; ramenta scales or tomentum present where the leaflets are inserted on the rachis and sometimes along the abaxial midvein; basal leaflets 52–91 × 0.5–1.5 cm, middle leaflets (31–)50–100 × (1.3–)2.5–4.5(–5) cm, apical leaflets 19–56 × 0.6–1.3 cm, mostly with acuminate to asymmetric tips. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 43–62 × 4.5–8.5 cm; *peduncular bract* ca. (55–)84–172 cm long, expanded portion 53–108 × (5–)12–29 cm, bearing a 4–9(–11.5) cm beak, 3–4 mm thick, woody, mostly glabrous except for occasional indument at the tip, deeply sulcate, tan to light brown color; *peduncle* ca. 16–64 × 1.5–2.7 cm, glaucous; *inflorescence axis* 49–105 cm; *rachis* 40–93 cm long, waxy; *rachillae* (20–)40–87, (7–)24–55 cm long at the base, 13–19 cm long at the apex, glabrous to glaucous, rachillae bracts inconspicuous; *staminate flowers* (8–)10–14 cm long at the apex, 15–22 × 4–7 mm at the base, yellowish, the basal ones sometimes pedicellate, sepals 1–5 × (1–)2–5 mm glabrous, petals 8–14 mm long at the apex, 13–22 × 2.5–6 mm at the base with acuminate tips, glabrous, nerves not visible, stamens 7–9.5 mm long, anthers (4–)6–9 mm long, filaments 1.5–3.0 mm long, pistillode (<1–)ca. 2 mm long; *pistillate flowers* pyramidal, 13–27 × (5–)8–14 mm, sepals (7–)12–27 × 7–13(–17) mm, glabrous, green to yellowish, obscurely nerved, strongly keeled, petals (3–)12–18(–22) × 4–10(–15) mm, glabrous, obscurely nerved, valvate tips more than ½ to 3/5 the length of the petal, ca. 9 mm long, pistil 6.5–12(–16) × 2.5–5 mm, glabrous to short hairy at the base, stigmas 4–7 mm long, staminodal ring ca. (0.8–)1–2 mm high. **Fruit** (2.3–)4–7 × 2.4–3.5 cm, light greenish to yellow-green when mature, persistent perianth (cupule) green to tan, smooth or slightly nerved, 2–2.5 cm wide, 1–1.5 cm deep, ring 2–3 mm in height, smooth or faintly fibrous, epicarp less than 0.5 mm thick, mesocarp 1–3 mm thick, succulent and fibrous, mucilaginous; *endocarp* (3.7–)4.5–6.0 × 2.1–2.6 cm, bony to hard woody, fibrous, does not appear to be trivittate, 4–8 mm thick on the sides and 7–13 mm thick at the ends, with no clusters of fibers; *seeds* ellipsoid, 1.5–2.5 × 1.0–1.5 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—catolé, côco-catolé, côco-babão, coqueiro-guariroba, guariroba, gueriroba, gariroba, pati, pati-amargosa, coqueiro-amargoso, guahiro.

Etymology:—The specific epithet, *oleracea,* means pertaining to kitchen gardens, either as a pot-herb or vegetable. This epithet surely must refer to the edible heart (palmito) used in cooking (Bondar, 1964). Martius (1826) specifically mentioned that the palmito was edible (after boiling).

Distribution and habitat:—Paraguay, Bolivia and Brazil in semideciduous forests and cerrados. In Brazil, it is found from Bahia to Paraná: Bahia, Tocantins, Goiás, Minas Gerais, São Paulo, Espirito Santo, Rio de Janeiro and Paraná and west into Mato Grosso do Sul and Mato Grosso. In Bahia, it is found west of the Rio São Francisco. This palm grows in good soils, including fine sandy soils. It tends to grow in the seasonal semideciduous forests that act as a transitional zone between the arid caatinga environment and the more mesic cerrado in western Bahia. It does not seem to be as tolerant of arid conditions as *S. coronata*. It has been recorded for Bolivia (Moraes-Ramirez 2004; Moreno & Moreno 2006), but the author has concerns about Bolivia (see notes).

Conservation:—This palm species is widely distributed throughout the central and southern part of Brazil, reaching into Bolivia and Paraguay as well. It can be found within the borders of several national parks and reserves and therefore is under no threat. Outside of the park, it is widely cultivated. It is under no threat and is classified as least concern, LC.

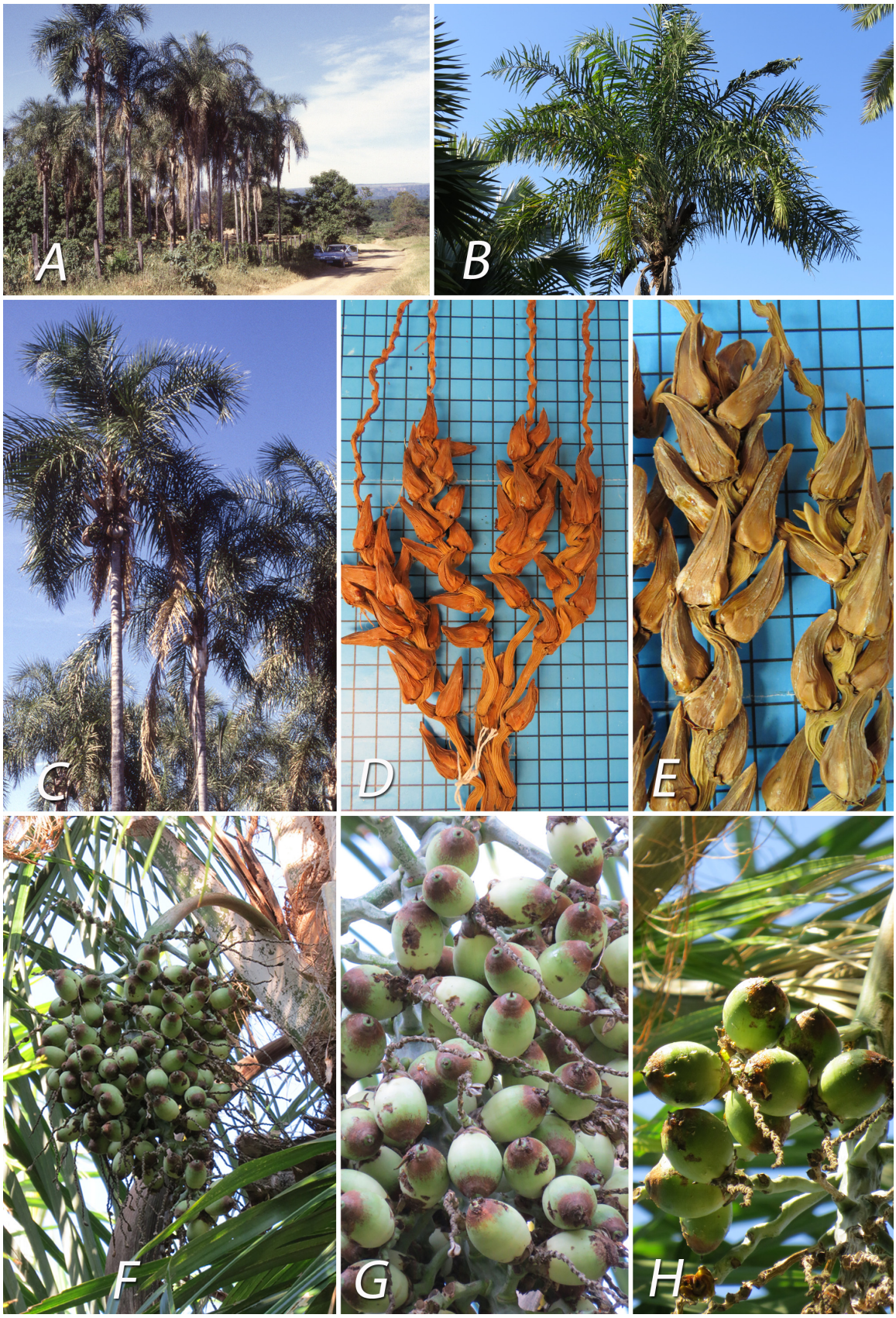

FIGURE 59. *Syagrus oleracea*. A. Population of the palm near Alvorado do Norte, Goiás (*Noblick 5084*). B. Crown of a specimen at MBC. C. Crowns of palms near Alvorado do Norte, Goiás. D. Apical pistillate flowers (*Noblick 4856*). E. Basal pistillate flowers (*Noblick 4856*). F. Infructescence. G. Close of infructescence. H. Close of fruits. Grid is in centimeters.

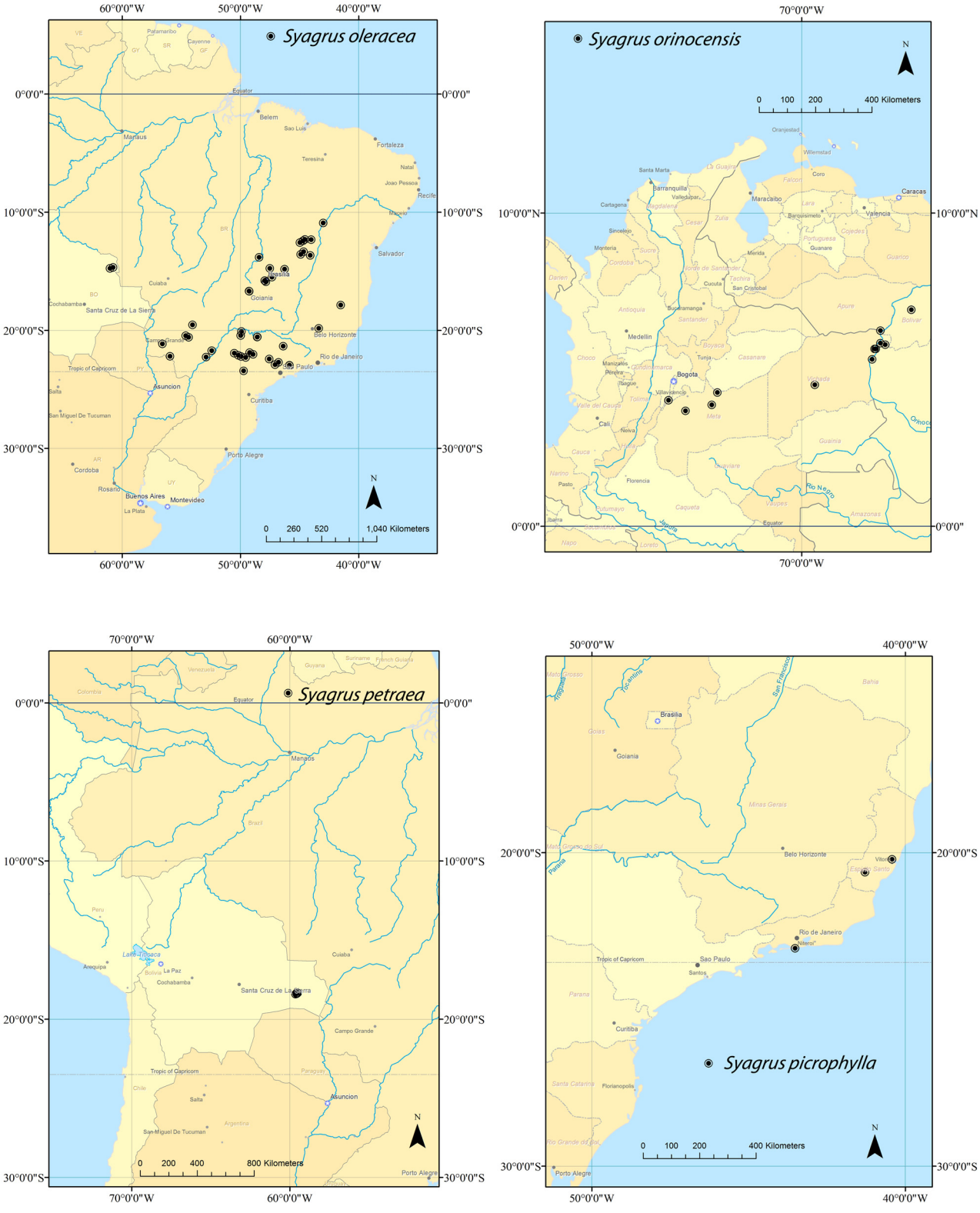

FIGURE 60. Distribution maps of *Syagrus oleracea, S. orinocensis, S. petraea,* and *S. picrophylla*.

Phenology:—This palm appears to flower and fruit year around. It probably has a peak of flowering and fruiting in the summer (December to February). It fruits abundantly during the spring. Seeds germinate in 2–3 months.

Uses:—This species is commonly planted as an ornamental and cultivated as a street tree, especially in western Bahia (Barreiras, Coribe, and Santana), and in Goiania, Goiás. Leaves are used to cover rustic shelters. The fleshy mesocarp is edible and occasionally used to feed cattle. An edible oil can be extracted from the seeds (Bondar, 1964, Medeiros-Costa, 1982). The palm heart is used in cooking in Minas Gerais, São Paulo and Goiás (Bondar, 1964). Although the heart of palm is bitter, it is still considered a delicacy on the regional menus of some states and is cultivated commercially. The mesocarp and the seed along with its extracted oil are edible. The palmito must be boiled sufficiently in several waters. and even so the bitterness is still strong. One local aficionado confirmed that, yes, it does have a bitter taste, but it is very good, an opinion that the author does not share.

Notes:—This species is similar to *S. romanzoffiana*, but leaflets are not pendulous, inflorescence is shorter, fruits are much larger, female flowers are large and pyramidal, and endocarp is smooth on the inside. *Syagrus oleracea* is a very variable species with a wide distribution. In the eastern part of its distribution in Bahia (near Wanderley), the trees have some characters that were reminiscent of *S. coronata*, like wider leaf sheath fibers, and a tendency for the leaves to be both spiraled and occasionally arranged in apparent rows; however, the fruits are unmistakably *S. oleracea*. Perhaps with further collections and work, the hybrid between these two may be encountered but not as it was originally thought to have occurred in Pernambuco, when Glassman (1970c) confused the hybrid of *S. coronata* × *S. cearensis* for the hybrid between *S. coronata* × *S. oleracea* and called it *S.* × *costae*. The real hybrid between *S. coronata* × *S. oleracea* will have to be given a different name. Although the populations are separated by a good distance in Bahia, insects can fly great distances. Moreover, the wind blows from east to west in this region, and pollen-bearing insects could be transported into this area during a strong west-moving storm. Initially notes recorded for western Bahia contained references to populations of *S. coronata*, but it seems clear now that *S. coronata* is found only east of the Rio São Francisco, and *S. oleracea* is found on the western side.

Syagrus oleracea differs from *S. coronata* in having larger fruits which are more oblong in shape, spiraled arrangement of leaves on the trunk instead of being arranged in five rows, and leaf sheaths with fibrous margins instead of the flat woody, spine-like fibers of *S. coronata*. It also has longer internodes.

Glassman (1987) himself reduced his species *S. gomesii* to synonymy under *S. oleracea*, when he realized that the species with which he honored his deceased collecting companion (Glassman 1967b) was only a senescent form of *S. oleracea* with taller older stems and shorter leaves.

Syagrus picrophylla is no longer considered a synonym of *S. oleracea* (cf. Glassman, 1987). *Syagrus picrophylla* grows only on the granitic outcrops near Rio de Janeiro or southern Espirito Santo and is distinct both morphologically and in its habitat preferences (see notes under *S. picrophylla*).

There is a palm growing in the Botanical Garden in Santa Cruz, Bolivia, labeled *Syagrus oleracea* that may be an undescribed species. Its infructescences continue to mature on the trunk after the subtending leaves are shed (like *S. vermicularis*). This is unknown in other specimens of *S. oleracea*. The image of this palm in Moreno & Moreno (2006) shows a palm with more erect leaves than is typical for *S. oleracea*. It needs further study. The author suspects that *S. oleracea* may not occur in Bolivia as reported by Moreno & Moreno (2006) and by Moraes (2004). All three of the specimens reported by Moraes (2004) have been assigned to other *Syagrus* species (*S. petraea* and *S. sancona*).

Representative specimens:—BOLIVIA, **Santa Cruz:** *L.R. Moreno 138, 298* (JBSC*); I.G. Vargas et al. 1543, 2798* (USZ); BRAZIL. **Bahia:** 1941, *Bondar s.n.* (F-620824!); Baianópolis, Ilha a 12 km de Inhumas, próximo ao Rio Angico, –12.56, –44.95, 15 October 1988*, J.L. de S. Lima 106a* (HTSA); Baianópolis, Rio Angico at a place called "Ilha" on the road to Inhumas, 710 m, –12.30, –44.53, 15 October 1988*, L.R. Noblick & J.L. de S. Lima 4627* (BAH!, CEPEC!, F!, HTSA!, K!, UC!); Côcos, ca. de 8 km ao sul da cidade seguindo a estrada Côcos/ Montalvânia-MG e entrando a direita ca. 1 km da cidade para o Rio Itaguarí, 500–600 m, –14.18, –44.53, 2 February 1986*, L.R. Noblick & J. Lobo 4525* (CEN!, CEPEC!, F!, FTG!, HUEFS!, NY!, RB!, SP!); Correntina, 12 km E of Correntina on BR 349 (Correntina/Santa Maria de Vitoria), 600 m, –13.33, –44.65, 22 October 1988*, L.R. Noblick & J.L. de S. Lima 4656* (AAU!, CEPEC!, F!, HTSA!, US!); Cotegipe, Wanderley, 21 km W of Posto Javi (intersection of BR 242 and BA 172), 700–750 m, –10.90, –42.98, 12 October 1988, *L.R. Noblick & J.L. de S. Lima 4615* (BAH!, CEPEC!, F!, FTG!, HTSA!); Cristópolis, –12.42, –44.70, 20 March 1985*, J.L. de S. Lima 75* (HTSA); Cristópolis, 25 October 1985*, J.L. de S. Lima s.n.* (HTSA); Santa Maria da Vitória, a 12 km de Correntina, –13.56, –44.89, 22 October 1988*, J.L. de S. Lima 131a* (HTSA); Santa Maria do Vitória, praça da cidade, March 1986*, J.L. de S. Lima s.n.* (CEPEC!, HTSA!, F!); Santana, Praça da Bandeira, –13.64, –44.08, 23

October 1988*, J.L. de S. Lima, J.L.S. 132a* (HTSA!); Santana, Praça de Bandeira in Santana, cultivated palms transplanted from the native forests of the region, 540 m, –13.33, –44.65, 22 October 1988*, L.R. Noblick & J.L. de S. Lima 4657* (BH!, CEPEC!, F!, HTSA!, K!, MO!); **Distrito Federal:** Brasília, BR 060 near "Entrada do Rancho Boa Vista 47", 800–1200 m, –15.48, –47.32, 30 April 1970, *R. Goodland 4355* (UB!); Brasília, Granja do Ipê, 1 km próximo da Escola Dona Nenen, 800–1200 m, –15.48, –47.32, 8 July 1970, *R. Goodland 4418* (UB!); Brasília, In Brasília, without date, *A.F.M. Glaziou 18588* (MO); Brasília, Fazenda Palmas. Próximo ao Rio das Palmas. APA de Cafuringa, –15.78, –47.93, 23 December 1998, *R.C. Martins 220* (UB!); Brasília, Estação Ecológica do Jardim Botânico de Brasília T-2, –15.78, –47.93, 10 March 1999, *R.C. Martins & F. Paulo 229* (UB!); Brasília, Borda da mata de Galeria, próximo ao Transecto 5, –15.88, –47.84, 10 June 2008, *R.C. Martins 933* (HEPH); Brasília, Mata parcialmente destruida, –15.78, –47.93, 10 December 1981, *B.A.S. Pereira 134* (UEC!); **Goiás:** Buriti de Goiás, Rua Buriti, no. 40, Casa da Maria do Perpétuo Socorro, 11 September 2011, *J.E. Dias 1* (BOTU); Campinaçu, Vale do rio. Rio Boa Nova. Reservatório em formação, 29 January 1998, *H.G.P. Santos & J.B. Pereira 510* (CEN); Campinaçu, Estradas após o córrego Boa Nova, –13.82, –48.42, 440 m, 21 March 1996, *B.M.T. Walter et al. 3277* (CEN); Goiânia, Campus of the Universidade Federal de Goiás, School of Agronomy, 700 m, –16.67, –49.27, 13 June 1992, *L.R. Noblick 4891* (FTG!, RB!, UFG!); São João Daliança, Margem do rio Roncador, á 2 km de São João D´Alian, 985 m, –14.75, –47.50, 8 March 1988, *A.O. Scariot & J.N. da Silveira 22* (CEN); Sitio d'Abadia, Mundo Novo, ca. 57 km NW of Sitio d'Abadia or ca. 17 km SE of Alvorado do Norte, 840 m, –14.81, –46.25, 2 February 1996, *L.R. Noblick 5084, 5085* (CEN!, FTG!, NY!); **Mato Grosso do Sul:** Antônio João, Fazenda Pérola do Vale, –22.19, –55.95, 14 February 2007, *K.R. Laitart 22* (CGMS); Bataguassu, Terreno aluvional mais elevado na várzea do rio Paraná, pastagem com algumas árvores remanescentes, –21.71, –52.42, 21 November 1992, *I. Cordeiro 1000* (SP!); Bonito, Trilha de acesso a gruta do lago Azul, –21.14, –56.59, 16 December 2000, *G.A. Damasceno-Junior 2106* (CGMS); Camapuã, Fazenda do Dário. 40 km após Camapuã, –19.53, –54.04, 31 May 1992, *U.M. Resende 722* (CGMS!); Campo Grande, estrada para Rochedo, –20.45, –54.62, 8 June 1981, *J.E. de Paula,1440* (UB!); Campo Grande, Apa do Guariroba, 509 m, –20.57, –54.37, 27 November 2012, *H.C. Vinci-Carlos 413* (CGMS); **Minas Gerais:** Monte Belo, Fazenda Lagoa. Instituto Sul Mineiro de Estudo e Preservação da Natureza. Mata de Ferradura. –21.33, –46.37, 15 October 1992, *H.Q. Boudet Fernandes 3094* (RB); Sao Gonçalo do Rio Abaixo, Peti-Cemig S. Gonçalo do Rio Abaixo, –19.83, –43.36, 5 January 2005, *Dora Jacob* (FUNED-POL); Teófilo Otoni, BR-116, km 159, trecho Teófilo Otoni-Itaobim, lado esquerdo da pista, –17.86, –41.51, 3 January 2009, *P. Leitman 73* (RB); Vazante, 650–700 m, –18.02, –43.83, 29 March 1992, *L.R. Noblick 4856* (BHCB!, MBM!, NY!); [no locality] 25 March 1877, *Simard 9010* (US); 2 August 1892, *Simard 20029* (US); **Paraná:** Carlópolis, 2 km norte de Carlópolis. Numa capoeira, –23.43, –49.72, 22 November 1962, *J.R. Mattos 10735* (HAS!, SP!); **São Paulo:** *A.F.M. Glaziou 13295* (C, F, FI, K, P); Entre Morro Grande e Leme, without date, *M.P. Kuhlmann 50071* (SP!); Amparo, Fazenda N. S. da Encarnação. Monte Alegre, –22.70, –46.76, 5 May 1942, *M.P. Kuhlmann 1157* (F!, SP!); Arealva, Fazenda São Joaquim, –22.02, –48.91, 6 February 2007, *P.R. Genovez 97* (BOTU); Barretos, Fazenda Nelore, Indo para Olímpia, a 8 km da entrada para Barretos. Pastagem, 600 m, –20.56, –48.57, 22 May 1997, *H.Q. Boudet Fernandes 3207* (MBML, SP); Campinas, Distrito de Sousas-Mata Ribeirão Cachoeira (Condomínio Colinas do Atibaia), –22.90, –47.06, 22 September 2000, *R. Cielo Filho 244* (UEC); Cardoso, Fazenda Marinheiro, –20.08, –49.91, 20 October 1965, *G. de Marinis 371* (HSJRP, UEC); Gália, –22.29, –49.55, June 1999, *M.R. Gorenstein 5034* (ESA!); Marília, 18 km E of Marília. Prop. Pedro Felipe, –22.21, –49.94, 4 July 1965, *S.F. Glassman 8003, 8004* (F!, SP!); Monteiro Lobato, Ouro Verde, estrada de Panorama ao Rio do Peixe, –22.96, –45.84, 7 September 1995, *L.C. Bernacci et al. 2161* (IAC, SP); Pompéia, Hacienda Gueivira. 3 km N of Pompeia. Prop. of Dr. Mario A. Bastos, –22.10, –50.17, 4 July 1965, *S.F. Glassman 8006* (SP!); Pontal do Paranapanema, próximo ao Rio Paraná. Ponto 48, –22.25, –52.90, 7 May 1982, *L.A. Dambrós 272* (RB!); Reginópolis, Fazenda São João da Boa Vista, –21.88, –49.22, 25 January 2007, *P.R. Genovez 95* (BOTU); Rio Claro, Entre Morro Grande e Leme. Beira da estrada, –22.41, –47.56, 19 May 1943, *M.P. Kuhlmann 838* (SP!); Rio Claro, Fazenda dos Caeures. 12 km E of Rio Claro, Prop. son of J. Ferguson, –22.41, –47.56, 2 July 1965, *S.F. Glassman & J.C. Gomes jr. 8001* (F!, MO, SP!); São Paulo, Tupã, Fazenda Vanuir, part of stand of 1000 trees, –21.93, –50.51, 5 July 1965, *S.F. Glassman 8009* (F!, SP!); São Paulo, Votuporanga, Vizinho da Estação Experimental do IAC, –20.42, –49.97, 29 November 1994, *L.C. Bernacci et al. 788* (IAC); PARAGUAY. Montes Limeira, *E. Hassler 11233* (G!).

43. *Syagrus orinocensis* (Spruce) Burret (1937: 695). *Cocos orinocensis* Spruce (1871: 161). *Calappa orinocensis* (Spruce) Kuntze (1891: 982). Lectotype (designated by Glassman [1969: 102]):—COLOMBIA. In rupibus secus Mayapures, *Spruce 49* (K!)

Syagrus allenii Glassman (168: 285) Type:—Meta, llanos de San Martin, 21 October 1945, *P.H. Allen 3352* (holotype MO!, isotype BH).

Figure 61 plate, Figure 60 map.

Moderately-sized, solitary (rarely clustering) palm. **Stem** ca. 3–12 m (–18 m, fide Spruce) × 7–15 cm, caulescent, smooth. **Leaves** 8–10; *sheathing leaf base* ca. 41–110 × ca. 9–10 cm; *pseudopetiole* 40–75 cm long; *petiole* 5–8 × 1.5–2.0 cm, 0.5–1.0 cm thick; *rachis* 147–250 cm long; *leaflets* slightly lighter on the abaxial surface, 60–107 along one side, in clusters of 2–4 or single, inserted at various angles, giving the leaf a plumose appearance, ramenta scales present where the leaflets are inserted on the rachis and on the basal portion of the leaflet along the abaxial midvein; basal leaflets 34–44 × 0.3–0.8 cm, middle leaflets 40–77 × 2–4 cm, apical leaflets 18–33 × 0.3–0.5 cm with acuminate or asymmetric oblique tips. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 22–48 × 4–6 cm; *peduncular bract* 75–122 cm long, expanded portion 40–76 × 9–10 cm, including a 1–2.5 cm beak, 11–15.5 cm perimeter, 2–4 mm thickness, narrow, woody, sulcate, exterior covered with a thin indument; *peduncle* ca. 35–65 × 1.2–2.0 cm, 0.8–1.2 cm thick, elliptical in cross-section, glabrous to thin indument; *inflorescence axis* 30–63 cm long; *rachis* 15–45 cm long, lower portion with thin indument, upper glabrous; *rachillae* 19–48, glabrous, 10–20 cm long at the apex, 28–45 cm long at the base; *staminate flowers* 5–9 mm long at the apex, 8–12 × 4.5–5 mm at the base, green to yellow, sepals 1–1.5 × less than 1 mm, glabrous, petals 7–10 × 2–4 mm with acute tips, nerves indistinct to slightly raised at the base, glabrous, stamens 5–7 mm long, anthers 5–6 mm long, filaments ca. 2 mm long, pistillode less than 1 mm long; basal *pistillate flowers* conical, 5–8 × 5–7 mm, yellow, glabrous, sepals 5–8 × 5–6 mm, glabrous, petals 5–7 × 4–6 mm, glabrous, valvate tips ca. 2/5 the length of the petal, ca. 2 mm long, pistil 3–5 × 2–3.5 mm, glabrous, stigmas less than 1–2 mm long, glabrous, staminodal ring ca. 1–2 mm high, 6-dentate. **Fruit** globose to ovoid, (2.5–) 3–4 × 1.9–2.2 cm, yellow when mature, mostly glabrous, not splitting at its tip, epicarp less than 1 mm thick, mesocarp 1–2 mm thick, succulent and fibrous; *endocarp* ca. 2.6–3.2 × 1.7–1.8 cm, 1–2 mm on the sides, 2.5–4 mm thick at the ends, the endocarp cavity slightly triangular in cross-section; *seed* ellipsoid, triangular in cross-section, ca. 1.6–1.9 × 1.2–1.4 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—cococito, coquito.

Etymology:—The specific epithet, *orinocensis,* refers to the Orinoco River, close to where this palm was first collected in the southern part of Venezuela, and south of which this palm is very common.

Distribution and habitat:—In southern Colombia and Venezuela it is common on rock outcrops near the Orinoco River. It is possibly found in Brazil bordering Venezuela and Colombia, on monolithic granite rock outcrops or massifs, in thin soils. However, there are no confirmed collections of it from that region. It is resistant to drought and grows in rocky crevices.

Conservation:—This species has a wide distribution and grows in inaccessible areas (rock outcrops) and in soils or habitats of little agricultural value. It produces an abundance of fruits, whose seeds germinate well. It is classified as least concern, LC.

Phenology:—*Syagrus orinocensis* has mature fruits early in May, and the seeds germinate quickly. Seeds germinate in 1 or 2 months.

Uses:—Stems are used for construction of buildings, and the fruits are eaten by humans and animals. The plant has potential as a landscape plant. Seedlings and older plants do not transplant well, but are a natural choice for use in tropical rock gardens.

Notes:—This is a solitary, rock-loving palm, often with thin trunks and flaccid leaflets. It should not be confused with *S. stenopetala*, which has clustering trunks and stiffer leaflets. Endocarp cavity is slightly triangular in cross-section (see notes for *S. stenopetala*).

Representative specimens:—COLOMBIA. **Amazonas**: Corregimiento de Araracuara, orilla derecha del río Caquetá, frente a la segunda isla cerca a la chagra de Horacio, 26 September 1987, *G.A. Galeano & H. Huitoto 1322* (NY); Amazonas. Corregimiento de Puerto Santander, trocha a la Chorrera, 28 September 1987, *G.A. Galeano & H. Huitoto 1330* (NY); **Meta:** North side of river near junction of Guejar and Zanza rivers, north end of cordillera Meta, Llanos de San Martin, 3.69, –73.71, 21 October 1945, *P.H. Allen 3352* (BH, MO!); Meta: Los



FIGURE 61. *Syagrus orinocensis*. A. Population near Puerto Ayacucho, Amazonas, Venezuela (*Noblick et al. 4946*). B. Crown with flexible leaves. C. Group of palms near Puerto Ayacucho. D. Author collecting an inflorescence. E. Habit of palm at MBC, note the swollen base of the stem. F. Infructescences and inflorescence. G. Receptive pistillate flowers. H. Mature fruits.

lanos, Rio Casanare, Esmeralda, 1938, *J. 43 3860* (COL); Meta: Rio Guayabero, 1939, *J. Cuatrecasas 7559* (COL); Meta: llanos orientales, 1941, *A. Dugand & R. Jaramillo 2907* (COL); Meta: Qenane R., near highway from Villavicencio to Puerto Lopez, 1941, *D. Fairchild 1062* (COL); Meta: between Acacias and San Martin, orillas del Rio Guuamae, 1959, *V.M. Patiño s.n.* (COL); La Marcarena, Rio Guayabero, 1959, *H.G. Barriga & R. Jaramillo 17061* (COL); Macarena, North side of river near junction of Guejar and Zanza rivers, north end of Cordillera Macarena, 500 m, 19 August 1950, *S.G. Smith 1460* (BH, COL, GH, MO!, NY!, US!); Mesa la Lindosa, S of San José del Guaviare, 1950, *J.M. Idrobo & R.E. Schultes 679* (COL); Mesetas. Inspección de Policía La Uribe, Vereda "La Reforma" ("El Salado"), sito "El Oso," 670 m, 4.03, –74.25, 10 August 1989, *J. Betancur 1315* (NY!); Puerto López. Llanos Orientales; al SE de Cabuyaro, alrededores de la Laguna de Yurimena [vicinity of Laguna de Yurimena], 175–200 m, 4.28, –72.69, 16 September 1958, *R. Jaramillo Mejía et al. 1258* (COL, NY!); San José del Guaviare, 1939, *J. Cuatrecasas 7487* (COL); San José del Guaviare, 3.8811, –72.8667, 12 November 1939, *J. Cuatrecasas, J. 7708, 7709* (F!); San Martin, Llanos Orientales, 35 km al Este de San Martín, al Norte del Caño Camoa, 12 September 1963, *J. Blydenstein 1688* (COL, MO!); **Vaupés:** Rio Cuduyari, 1944, *P.H. Allen 3277* (BH, MO); Vichada. Cano Urimica, Graviotas, 7 May 1978, *M.J. Balick 1192* (NY!); **Vichada:** ca. 25 km E of Cumaribo along the unimproved dirt road between Las Gaviotas and Santa Rita, 140 m, 4.518, –69.58, 28–29 December 1973, *G. Davidse 5295* (MO); Vichada, "Laja" outcrops behind Casuarito, across from Puerto Ayacucho, 100 m, 5.67, –67.67, 4 April 1984, *A.H. Gentry 46343* (MO); VENEZUELA. **Amazonas:** Apure, Distrito Pedro Camejo; Piedra de Murciélago, 6 airline km NW of Puerto Páez. 80–140 m, 6.25, –67.48, 26 February 1978, *G. Davidse 14549* (MO); Atures. Bosque Medio en peniplanicie en el sector "El Porvenir" a 54 km al S de Pto. Ayacucho por la carretera hacia Samariapo, 100 m, 5.33, –67.75, 20 January 1989, *N. Cuello A. 439* (NY); Atures: 23 km NE of Puerto Ayacucho along the road to El Burro, 80–150 m, 5.8500000, –67.48, 17 April 1978, *G. Davidse 15286* (BH!, MO); Atures, Rincones de Chacorro, aprox. 30 km al N de Puerto Ayacucho, al Este de la carretera hacia El burro. Sobre laja granítica en la ribera Sur del Caño Galipero, 80 m, 5.80, –67.33, 2 December 1979, *O. Huber 4748* (NY!, US); Puerto Ayacucho, 23 km N of Puerto Ayacucho on the road to Puerto Páez, 200–400 m, 5.67, –67.67, 22 June 1994, *L.R. Noblick et al. 4946* (FTG!); Puerto Ayacucho, 17 km S of Puerto Ayacucho on the road to Samariapo and 5 km W on the road to Pintado, 200–400 m, –5.50, –67.42, 22 June 1994, *L.R. Noblick, et al. 4948* (FTG!, PORT!); Puerto Ayacucho, July 1967, *J.G. Wessels Boer 1873* (F!, U); Puerto Ayacucho, between airport and Río Cataniapo, 5.67, –67.63, 25 July 1967, *J.G. Wessels Boer 1877* (NY, U); Puerto Ayacucho Dept, 1940, *L. Williams 13138* (F!, US, VEN). **Bolívar:** Cedeño. Vicinity of Panare village of Corozal, 6 km from Maniapure toward Caicara, 400 m, 6.92, –66.50, 18 May 1986, *B.M. Boom & S. Wentzel 6616* (NY!); Bolívar. Piedra Marimare, east bank of Rio Orinoco opposite head of Isla el Gallo, 100–200 m, 19 December 1956, *J.J. Wurdack 40852* (NY!, U); Sanariapo, 120 m, 4 July 1942, *L. Williams 16019* (US).

44. *Syagrus petraea* (Mart.) Beccari (1916: 467). *Cocos petraea* Mart. in Orbigny (1844: 100). *Calappa petraea* (Mart.) Kuntze (1891: 982). Type:—BOLIVIA. Chiquitos: Sierra de Santiago, without date, *A.D. d'Orbigny 21* (holotype P!)

Figure 62 plate, Figure 60 map.

Small, solitary to clustering palms, clustering by way of stolons. **Stem** short, subterranean, appearing acaulescent, 20–30 cm long, entire plant 30–80 (120) cm tall. **Leaves** 3–6 in crown, spirally arranged, spreading to ascending; *sheathing leaf base* 8–20 × 3 cm with fibrous margins; *pseudopetiole* 10–20 cm long with fibrous and/or smooth margins; *petiole* 2.4–12 × 0.3 cm; *rachis* 40–99(–125) cm long, with deciduous tomentum; *leaflets* lanceolate, silvery green, glabrous to white-waxy on both sides, but especially on the abaxial surface, with acute, bifid apiculate, symmetrical apex, 19–42 along one side, regularly or irregularly distributed in usually loose clusters of 2 or 3 in slightly divergent planes; no ramenta scales present where the leaflets are inserted on the rachis nor on the basal portion of the leaflet along the abaxial midvein, transverse veins inconspicuous; basal leaflets not measured, middle leaflets 18–43 × 0.6–1.1(–1.9) cm, apical leaflets not measured, mostly with acute, acuminate, asymmetric tips. **Inflorescence** spicate (rarely branched), *prophyll* 3.5–9(–12) × 2–3 cm, lanceolate, rounded abaxially, glabrous; *peduncular bract* ca. 9–33 cm long, expanded portion 5–15 × 3.7–6.0 cm, woody, thin, deeply sulcate, often with whitish-gray tomentum becoming glabrescent with age; *peduncle* 9–16 × (0.3–)0.4–0.8 cm; *inflorescence axis* 6–13 cm long; *rachis* absent; *rachilla* 1, 6–13 cm long; *staminate flowers* 9–12 mm long at the

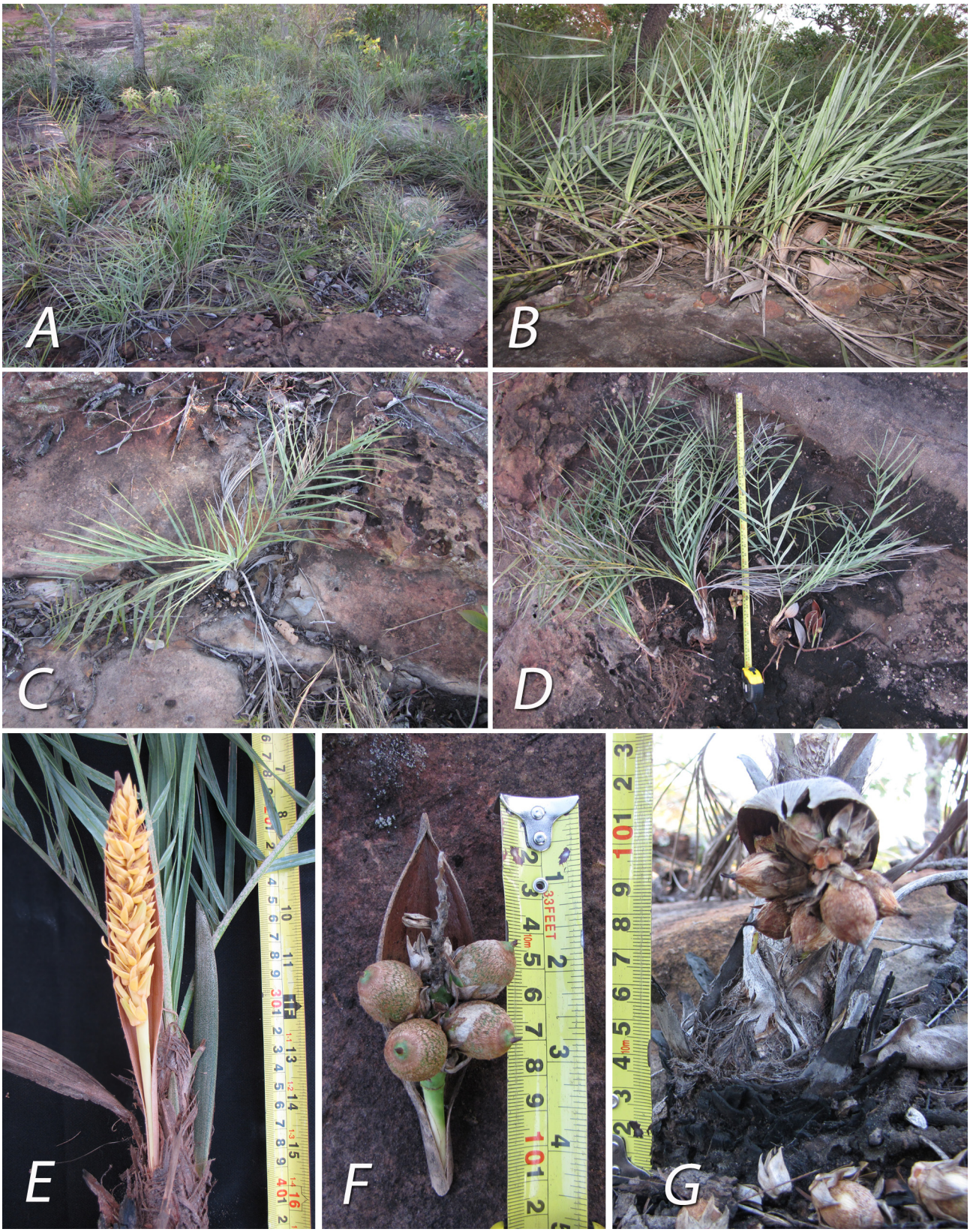

FIGURE 62. *Syagrus petraea*. A. Rocky habitat of palm near Santiago de Chiquitos, Santa Cruz, Bolivia (*Lorenzi et al. 6835*). B. Habit sometimes appearing clustered. C. Solitary plant with infructescence. D. Whole plants showing horizontal underground stem. E. Inflorescence. F. Infructescence. G. Infructescence with mature fruits, which are often green. Scale in centimeters and inches.

apex, 12–14 × 4–5 mm at the base, pale yellow, sepals 2 × less than 1 mm, coriaceous, petals 3–4 × 1.2 mm, light yellow, coriaceous, with acuminate tips, stamens 5.5–7 mm long, anthers 4–6 mm long with sagittate bases, filaments short, less than 2 mm, pistillode ca. 1 mm; *pistillate flowers* ca. 15 × 6 mm, yellow becoming light green, sepals 8–15 × 4–5 mm, petals ca. 13 × (2–)3 mm, pistil 5 × 2–3 mm with a furfuraceous lower half, stigmas not measured, staminodal ring ca. 1 mm high, undulate. **Fruit** ellipsoid to ovoid, 2.0–2.5 × 1.6–1.8 cm, orangish-brown or yellowish green or light yellow in younger fruits with a rusty integument, epicarp smooth to a slightly rough fibrous, less than 0.5 mm thick, mesocarp 1–2 mm thick, sweet, succulent and fibrous; *endocarp* ellipsoid, 1.7 × 1.2 cm, 1.5–2 mm thick on the sides, bony, light brown color, trivittate, cavity smooth, dark brown; *seed* ellipsoid, 1.3 × 0.7 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—coquillo, motacú-chí, itacuchi, palma-de-los-rocas (Bolivia); ariri, coco-de-vassoura, tucum-de-indio.

Etymology:—The specific epithet, *petraea,* refers to the rocky habitat of the original type collection of *Cocos petraea* collected from Bolivia by d'Orbigny. However, this species is certainly not restricted to this type of habitat.

Distribution and habitat:—Grows in eastern Bolivia (Santiago de Chiquitos), in rocky cerrados, in poor, rocky to sandy soils, often in the sand filled cracks between rocks. Seen only in the Serrania de Santiago, in Santiago de Chiqitos, Santa Cruz on slopes south of the cerros El Banquete and San Miserato and in zones of exposed rocky slabs between Santiago and Roboré, at 550–850 m with little vegetation.

Conservation:—This species is currently considered a Bolivian endemic that grows in the Santiago de Chiquitos region in the province of Santa Cruz. It is found in fairly large populations in the rocks of the Chapada, in soils of little agricultural value, although it will grow in deeper soils as well. Other than fires, which it can survive, no other threat exist, and therefore it is classified as least concern, LC.

Phenology:—Appears to flower and fruit year around, most specimens collected in flower in September and October, but few with mature fruits.

Uses:—Its fruits are avidly consumed by animals. It has a potential for landscaping.

Notes:—Several palm species, especially those with short subterranean stems and a spicate inflorescence, have long been thought to belong to one very variable and widely distributed species, *S. petraea*. However, on a trip to Bolivia to find *S. petraea* in its type locality I discovered that *S. petraea* is strictly a Bolivian endemic, which grows in one pre-Cambrian rock formation that terminates near the Brazilian frontier close to the pantanal and the Rio Paraguay. However, this same geological formation may continue in the Serra da Bodoquena in Brazil. Since that discovery, two species formerly synonymized under *S. petraea* were resurrected in Lorenzi *et al.* (2010) (i.e. *S. glazioviana, S. loefgrenii*), and several species of similar habit have been discovered and named (i.e. *S. allagopteroides, S. caerulescens, S. emasensis, S. evansiana, S. guimaraesensis, S. longipedunculata, S. minor, S. pleiocladoides, S. pompeoi, S. procumbens).* The distinctive leaflet anatomy of *S. petraea* distinguishes it from anything else in South America with one exception. More recent work on an anatomical key by the author suggests that *S. petraea* is most closely related to the *S. glazioviana* complex, although morphologically they are different.

Representative specimens:—BOLIVIA. **Santa Cruz:** Chiquitos, Cerro de Santiago, 4 km NE of Santiago [Santiago de Chiquitos], Transects 2–4, 800 m, –18.33, –59.50, 17 May 1991, *A.H. Gentry et al. 74016* (MO, USZ); Chiquitos 15 km al Este de Roboré yendo hacia Santiago de Chiquitos, 200 m, –18.41, –59.63, 12 November 1996, *Jardim & Mamani 3677* (AAU, MO, NY, USZ); Chiquitos, Santiago, Sierranía Santiago, 800 m, –18.35, –59.56, 29 December 2000, *L.R. Moreno et al. 245* (JBSC); Chiquitos, Santiago, Sierranía Santiago, 850 m, –18.34, –59.54, 29 December 2000, *L.R. Moreno et al. 246* (JBSC); Chiquitos, a 12 km de Roboré a Santiago, 500 m, –18.34, –59.66, 7 March 2010, *L.R. Moreno et al. 357* (JBSC!); Chiquitos, Santiago de Chiquitos, March 2010, *H. Lorenzi et al. 6835* (HPL!); Chiquitos, 3 km E de Santiago de Chiquitos, 700 m, –18.33, –59.57, 22 November 1989, *M. Saldias et al. 953* (MO, NY, USZ); Chiquitos, Santiago de Chiquitos, 800 m, –18.38, –59.56, 24 October 2010, *J.R.I. Wood & D. Villarroel 26931* (UB!, USZ!); Velasco, without locality, 250 m, July 1892, *Kuntze s.n.* (NY!);.

45. *Syagrus picrophylla* Barbosa Rodrigues (1879: 45). *Cocos picrophylla* (Barb.Rodr.) Barbosa Rodrigues (1882: 26). Type:—BRAZIL. Rio de Janeiro: (holotype destroyed). Lectotype (designated by Glassman [1972b: 93]):—Barbosa Rodrigues (1882) 26, t. 3, figs. 2a–b, 1882

Cocos catechucarpa Barbosa Rodrigues (1901: 41). *Syagrus catechucarpa* (Barb. Rodr.) Beccari (1916: 465). Lectotype (designated by Glassman [1972b: 89]):—BRAZIL. Rio de Janeiro: cultivated Jardim Botânico do Rio de Janeiro no. 113. Barbosa Rodrigues (1903a) volume 1, t. 80, 1903a.

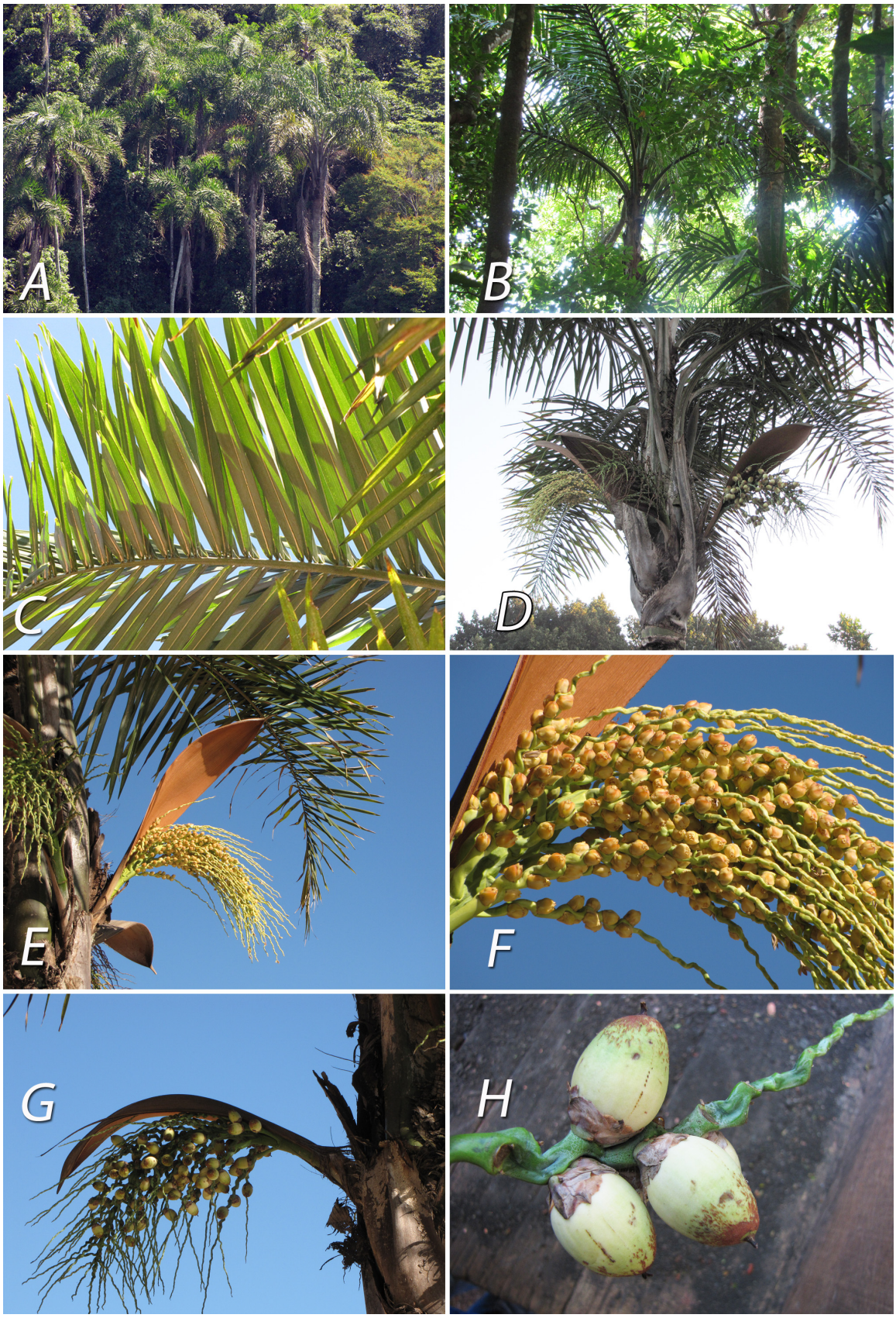

FIGURE 63. *Syagrus picrophylla*. A. Population in Parque Municipal da Prainha near Rio de Janerio, Rio de Janeiro. B. Crown in the forest canopy. C. Abaxial side of leaf. D. Leaf sheaths just below the crown. E. Inflorescence. F. Pistillate flowers. G. Infructescence. H. Fruits.

Figure 63 plate, Figure 60 map.

Moderate, solitary, unarmed, columnar palms. **Stem** 5–8 m × 12–20 cm, erect, columnar with a clear trunk, light to dark gray. **Leaves** 7–12 in crown, spirally arranged, spreading, 2–3 m long; *sheathing leaf base* 50–110 cm long with fibrous margins, green abaxially; *pseudopetiole* 51–74 cm long with fibrous margins; *petiole* 2–13 cm long, distinctly present; *rachis* 190–270 cm long; *leaflets* medium green adaxially, paler green abaxially, 133–160 along one side, irregularly distributed 2–6 in slightly divergent planes; ramenta scales or tomentum absent where the leaflets are inserted on the rachis, and none or only occasionally present along the abaxial midvein; basal leaflets 22–38 × 0.2–0.8 cm, middle leaflets 43–76 × 2.8–4 cm, apical leaflets 6–12 × 0.2–0.6 cm with mostly acuminate tips. **Inflorescence** erect to pendulous, branched; *prophyll* 43–67 cm long; *peduncular bract* ca. 93–131 cm long, expanded portion 56–78 × 12–20 cm, bearing a 1 cm beak, woody, sulcate, light orange to beige; *peduncle* ca. 36–78 × 1.5 cm; *inflorescence axis* 52–80 cm; *rachis* 40–60 cm long; *rachillae* 40–70, (5–)12–47 cm; *staminate flowers* 3.2–13.9 × 1.36–5.1 mm at the apex, 14–16.1 × 4.8–5.1 mm at the base, pale yellow, sepals 1.7–4.4 × 1.0–2.9 mm, petals 8.8–14.6 × 2.5–4.4 mm with attenuate tips, nerves indistinct, stamens 5.1–8.7 mm long, anthers 3.6–8.4 mm long, filaments 1.8–2.6 mm long, pistillode 0.3–1.0 mm; *pistillate flowers* 10.2–11.6 × 6.6–8.0 mm at the apex, 13.8–15 × 7.3–8.0 mm at the base, cream white, sepals 9.5–14.6 × 4.8–8 mm, petals 8–10.2 × 4.4–5.5 mm, pistil 7.3–10 × 3.5–4.4 mm, glabrous, stigmas 2.9–3.3 mm long, staminodal ring 0.5–1.1 mm high, dentate to undulate. **Fruit** ovoid, 3.0–4.0 × 2–2.6 cm, persistent perianth (cupule) tan to light gray with brownish margins and tip, 2–2.5 cm wide, 1.8–2 cm deep, ring 4 mm in height; *epicarp* ca. 0.5 mm thick, with smooth yellowish-green epicarp splitting irregularly at the tip when mature, showing the creme colored mesocarp, mesocarp 3–5 mm thick, crème to tan-colored, succulent and fibrous; *endocarp* bony, dark brown, trivittate on the interior and fibrous on exterior, 3–5 mm thick, with sparsely scattered clusters of fibers; *seeds* 16–20 × 14–18 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—côco-de-quaresma, côco-de-quarta, licuri, lent-coconut.

Etymology:—The specific epithet, *picrophylla,* means bitter leaves and probably refers to the bitter-tasting palmito or palm heart.

Distribution and habitat:—Rio de Janeiro and southern Espírito Santo in the Atlantic forest of Brazil, in well-drained soils, usually just below large granitic rock outcrops in rocky soils. In Bahia, populations of a palm formerly identified as this species are probably *S. lorenzoniorum*.

Conservation:—Because it grows in areas of no agricultural value, it is not be threatened by anything other than fires. It is well protected within at least one park near Rio de Janeiro, Rio de Janeiro (Parque Municipal Ecologico da Prainha), and is probably within several other areas in the mountains near the coast that are environmentally protected, as well as nearly inaccessible. Therefore this species is classified as least concern, LC.

Phenology:—This species fruits moderately during the spring and summer (October to March). The seeds germinate relatively easily in less than 4 months. Some plants have been seen in flower and with maturing fruit in February.

Uses:—This elegant palm is an ornamentally beautiful landscape plant. It is already being used in landscaping in some cities in its region of origin. Its fruits are edible.

Notes:—*Syagrus picrophylla* is distinguished from *S. lorenzoniorum* by a lack of ramenta on the lower leaflet midveins, its straight (not ventricose), columnar trunk, and a larger petiole (13 cm vs. less than 2 cm). Its infructescence is distinguished from *S. kellyana* by its straight green rachillae rather than crooked brown ones.

This palm was formerly relegated to synonymy under *S. oleracea* by Glassman (1968c). In 1879, Barbosa Rodrigues first described *Syagrus picrophylla*, but his description of *S. picrophylla* was very brief and many important diagnostic characters were left out (Glassman 1968c). Glassman mistakenly included *S. picrophylla* in synonymy with *S. oleracea*, based on the similarity of Barbosa Rodrigues' drawing (Barbosa Rodrigues, 1903a, t. 66) and an inability to distinguish the two taxa from the descriptions then available.

Bondar originally thought that *S. picrophylla*, which he considered a *Cocos*, was synonymous to *S. botryophora* (Bondar 1939e), but later treated them as separate species (Bondar 1964). He described the distribution of *C. picrophylla* as Rio de Janeiro and the suburbs of Vitoria, Espirito Santo and his photos show the habit and habitat of this species quite well (Bondar 1964). Specimens collected from Victoria, Espirito Santo do have large female flowers and fairly wide pinnae which led Glassman to believe that this species maybe conspecific with *S. oleracea.*

The distribution of *S. picrophylla* appears to run from Rio de Janeiro to the southern part of Espirito Santo. It

probably is not collected much because of the inaccessible nature of its habitat. The species tends to grow only on the strongly inclined slopes or tops of the large granitic rock outcrop formations that are so often characteristic of this part of Brazil and the Serra do Mar region. Soil on these formations is very thin and sometimes almost non-existent. The slopes of these formations are very steep and in many cases inaccessible to anyone except the most experienced rock climbers, nevertheless this palm species appears to thrive there and is rarely found in deeper soils.

Syagrus picrophylla can easily be distinguished from *S. oleracea* by several morphological differences, its habitat preferences and its distributional patterns (Table 1). *Syagrus oleracea* is a species that appears to grow in the transitional zones bordering on the cerrado regions in Bahia, Minas Gerais, Goiás, São Paulo to Paraguay, etc. *Syagrus picrophylla*, on the other hand, grows in coastal rocky habitats of much higher rainfall that might well be considered almost campo rupestre but located within or at least on the edge of the coastal rain forest region of eastern Brazil in the states of Rio de Janeiro and Espirito Santo.

TABLE 1. Differences between *Syagrus picrophylla* and *S. oleracea*.

Character	*S. picrophylla*	*S. oleracea*
Fruit size (L × W)	3.0–4.5 × 2.0–2.6	4.0–5.2 × 2.5–3.5
Fruit surface	Fibrous covered	Smooth & mostly glabrous
Fruit color	Cinnamon to orange brown	Green to greenish yellow
Fruit cup	Large persistent perianth covering much of the fruit	Small persistent perianth covering little of the fruit
Stem	Very smooth & self-cleaning	Rougher & with a few persistent leaf bases
Habitat	Coastal Rainforest zone, Rocky, Campo Rupestre; regular rainfall	Transitional zones bordering the Cerrado; periodic rainfall

Syagrus catechucarpa was designated as a *species confusum* by Glassman (1987). Beccari (1916) wrote that the description matches *Syagrus romanzoffiana*, but the lectotype painted by Barbosa Rodrigues (1903a) resembles *Jubaea spectabilis* [*J. chilensis*]. Glassman (1987) wrote that the fruits do not resemble any known species of *Syagrus* and that the leaves and flowers could belong to any number of *Syagrus* taxa. On the other hand, Govaerts *et al.* (2016) considered this a synonym of *Syagrus picrophylla*. The author agrees with Govaerts and disagrees with both Beccari and Glassman, because the fruits do resemble those of *Syagrus picrophylla* complex, which includes *S. lorenzoniorum* and *S. kellyana* as well as *S. picrophylla*, many of which split at their tips as illustrated by Barbosa Rodrigues (1903a). They also have persistent petals with abruptly terminating tips as drawn by Barbosa Rodrigues (1903a, t. 80). When these drawings are compared with the fruit images of Lorenzi *et al.* (2010: 342) for *Syagrus picrophylla*, they are a good match. Therefore, the author considers *S. catechucarpa* a synonym of *S. picrophylla*. Barbosa Rodrigues wrote that the origin of the specimen in the garden was unknown, but was presumed to be from Minas Gerais. The author suspects that the specimen actually came from the state of Rio de Janeiro, as *Syagrus picrophylla* is from that state.

Representative specimens:—BRAZIL. **Espirito Santo:** Castelo, na localidade de Estrela do Norte, 156 m, –20.62, –41.28, 13 February 2009, *H. Lorenzi 6632* (HPL!); Santa Leopoldina, na estrada para Cariacica, a 6 km desta, na Faz. Geribá de Alcino Miranda, 25 m, –20.20, –40.42, 13 February 2009, *H. Lorenzi et al. 6631* (HPL!); **Rio de Janeiro:** Rio de Janeiro, Parque Municipal da Prainha, fora da trilha para o Boa Vista, cerca de 300 metros para a direita, –23.05, –43.51, 29 January 2004, *P. Leitman 17* (MBM, RB); Rio de Janeiro, Parque Municipal Ecológico da Prainha, trilha para o morro Boa Vista, –23.05, –43.51, 16 January 2004, *R.C.C. Reis 605, 607* (RB); Rio de Janeiro (Parque Nacional Municipal da Prainha, depois do Cruzeiro em direção ao topo do morro, –23.05, –43.51, 24 October 2004, *P. Leitman 34* (RB); Sete Pontes, 27 March 1877, *A. F.M. Glaziou 9010* (NY!).

46. *Syagrus pimentae* Noblick *sp. nov.* Type:—BRAZIL. Mato Grosso: Rondonópolis, BR: 163, km: 90, Habitat: Cerrado; solo: argissolo vermelho-amarelo. Elevation ca. 220 m, –16.66, –54.68; 21 August 2010, *Ricardo Pimenta & Antonio Campos-Rocha s.n.* (holotype HPL! [HPL-13801], isotypes FTG!, K, RB)

Diagnosis:—Palm 0.8–1.2 m tall; stem short and subterranean; leaves spreading, silvery-bluish to silvery-greenish, leaflets evenly spaced and lying in more or less one plane, but in clusters of 2 or 3 at the base, with the two sides of the leaf forming a V-shape, similar in appearance to leaves of the genus *Butia*; leaflets have a dorsal-ventral asymmetric arrangement of the vascular tissue and fiber bundles (not mirrored as in *Butia*); peduncular bract deeply sulcate.

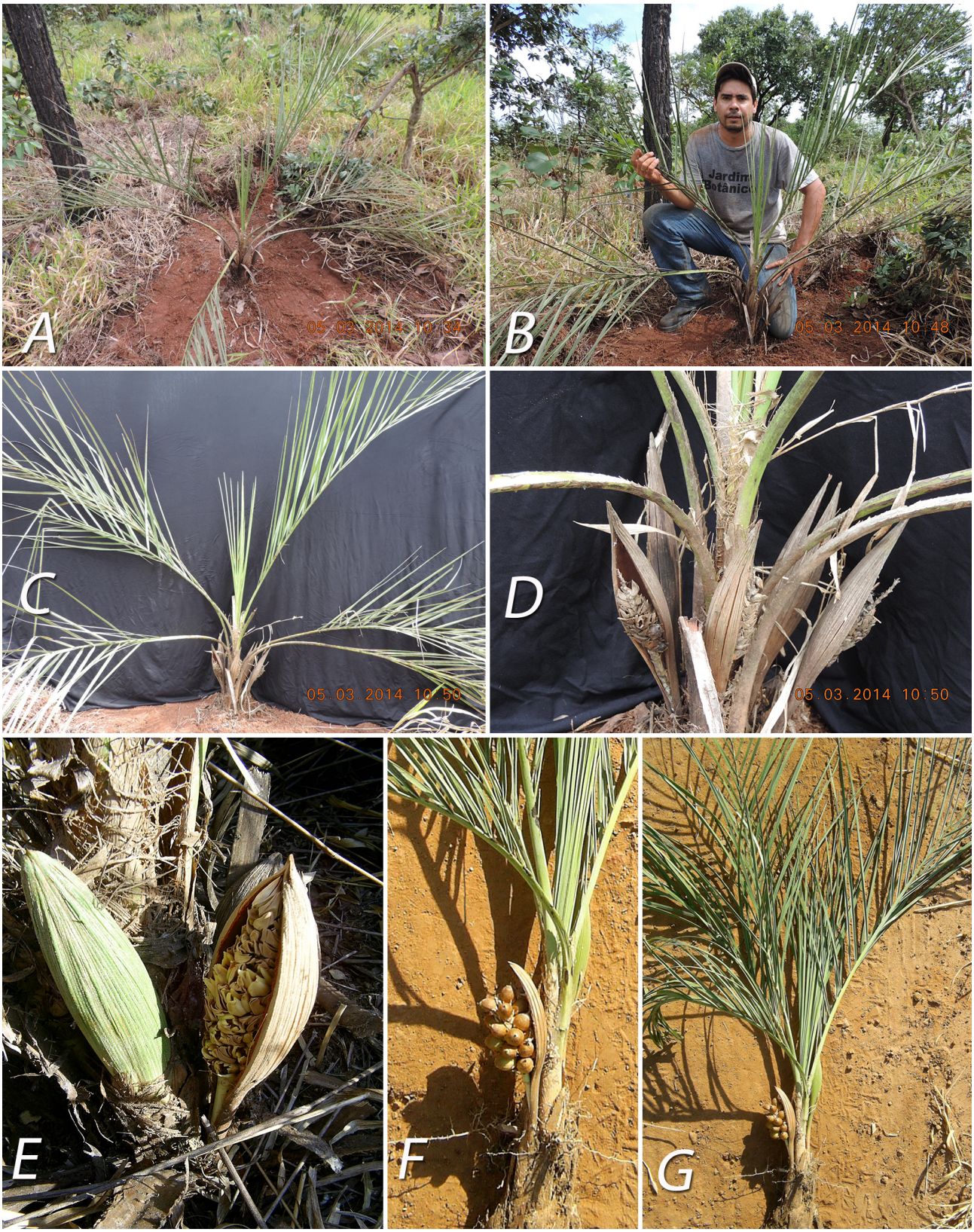

FIGURE 64. *Syagrus pimentae*. A. Habit. B. Palm with Ricardo Pimenta for scale. C. Palm showing Butia-like leaves with evenly spaced leaflets. D. Old inflorescences. E. Newly opened inflorescence. F. Infructescence. G. Whole plant with infructescence. (*Pimenta & Campos-Rocha s.n.* [holotype HPL]).

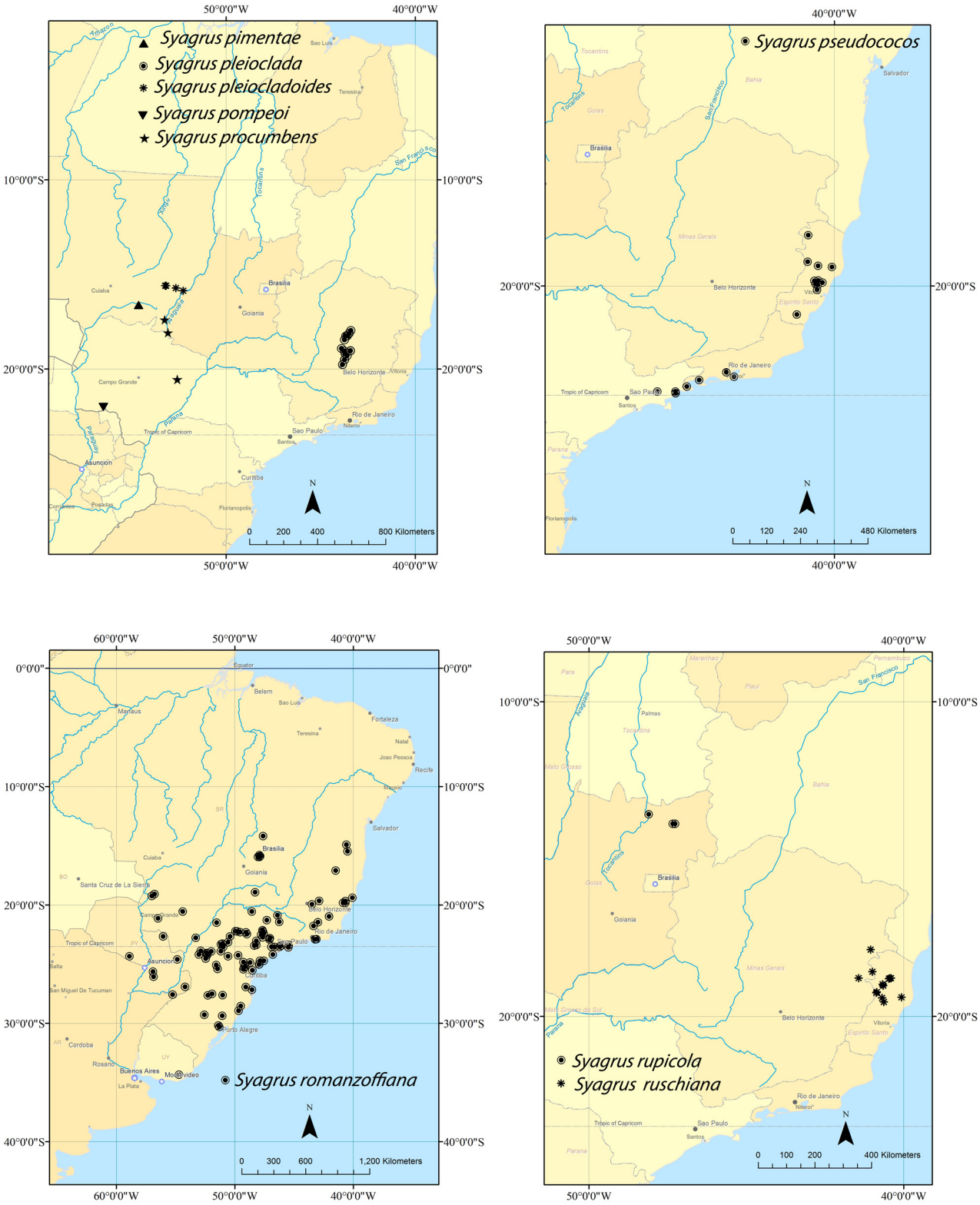

FIGURE 65. Distribution maps of *Syagrus pimentae, pleioclada, S. pleiocladoides, S. pompeoi, S. procumbens, S. pseudococos, S. romanzoffiana, S. rupicola,* and *S. ruschiana.*

Figure 64 plate, Figure 65 map.

Small solitary palm 0.8–1.20 m tall. **Stem** short, subterranean with a rhizome. L*EAVES* 5–8, usually spreading; *sheathing leaf base* ca. 21–24 × 1.2–1.4 cm with fibrous margins; *pseudopetiole* 14–40 cm long, *petiole* 5.5–17 × 0.8–1.3 cm, 0.5–0.7 cm thick; *rachis* 44–65 cm long, one side of the leaf forming a V shape with the other side similar to a *Butia* leaf; *leaflets* silvery bluish-green, slightly lighter on the abaxial surface, 16–22 along each side, mostly regularly arranged near the apex, but proximal leaflets irregular, clustered 2 or 3 near the base, no ramenta scales or tomentum present where the leaflets are inserted on the rachis nor any along the abaxial midvein; basal leaflets 28–44 × 0.1–0.3 cm, middle leaflets 38–58 × 0.8–1.1 cm, apical leaflets 26–35 × 0.1–0.2 cm with an acuminate tip. **Inflorescence** spicate, *prophyll* ca. 8.5–12 × 2.5–3.5 cm; fibrous; *peduncular bract* ca. 23–31 cm long, expanded portion 15–18.5 × 3.5–4.0 cm, 6.5–8.0 cm perimeter, 4 mm thickness, woody, sulcate, exterior with a few scattered scales; *peduncle* ca. 9.5–17 cm × 5–7 mm, glabrous; *inflorescence axis* 9–10 cm long; *rachis* absent; *rachilla* 1, glabrous, 9–10 cm long; *staminate flower* 10.2 mm at the apex, 11.3–15.0 mm at the base, green to yellow, sepals 1.3–1.5 × 1.0–1.5 mm, glabrous, no visible nerves, petals 8.4–9.5 mm at the apex, 8.8–12.6 mm at the base with acute tips, nerves indistinct, stamens 5.1–6.6 mm long, anthers 3.7–5.1 mm long, filaments 2.2 mm long, pistillode, ca. 0.7 mm long; *pistillate flowers* pyramidal, 12.4–13.2 mm long near the apex, 13.5–15.3 × 6.6–9.1 mm near the base, yellow, glabrous, sepals 9.5–13.2 × 3.7–6.6 mm, glabrous, no visible venation, petals 9.9–13.5 × 4.75–7.0 mm, glabrous, obscurely nerved, valvate tips 1/2 or more the length of the petals, ca. 5–8 mm long, pistil 5.8–7.3 mm long, glabrous, stigmas ca. 3 mm long, glabrous, staminodal ring ca. 0.7–1.1 mm high, truncate to undulate. Immature **Fruit** nearly globose, 2.0 × 1.6 cm, brownish, epicarp less than 0.5 mm thick, mesocarp not measured, succulent and fibrous; *endocarp* nearly globose, 1.6 × 1.4–1.5 cm, thickness not measured; *seed* ellipsoid not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—Not recorded.

Etymology:—The specific epithet, *pimentae,* honors Dr. Ricardo Soares Pimenta, the collector. He also discovered *S. pompeoi*. He has contributed to our knowledge of palm distributions, palm seed germination, and palm conservation in Brazil.

Distribution and habitat:—The population is restricted to a small area of open cerrado in the southern part of the state of Mato Grosso, Brazil, in the municipality of Rondonópolis. It grows in reddish yellow clay soils.

Conservation:—This is a rare species, threatened by the presence of agricultural development. Corn and soy production surrounds this population. It is also threatened by the expansion of the current roadway. This species is considered critically endangered, CR B1ab(i,ii,iii,v); C2a(i), D.

Phenology:—This palm begins flowering in May. Both flowers and maturing fruits have been seen in August and most have mature fruits by September and October.

Uses:—This is a beautiful palm with potential to become an ornamental landscape palm.

Notes:—This species has foliage that most closely resembles the genus *Butia*. It has the stiff silvery, bluish-green leaflets that are regularly arranged along a rachis with one side of the leaf forming a V with the other side. However, the inflorescence with its thick, strongly sulcate peduncular bract, the few clustered leaflets at its base, and its lack of a mirrored leaflet *Butia* anatomy confirm it to be a species of *Syagrus*.

Specimen examined:—Known only from the type specimen.

47. *Syagrus pleioclada* Burret (1933: 695). Type:—BRAZIL. Minas Gerais: Serra do Cipó, without date, *E. Werdermann 3916* (holotype B)

Figure 66 plate, Figure 65 map.

Short, solitary, unarmed palm ca. 1 m tall. **Stem** ca. 0.3–0.5 m × ca. 13 cm, short, caulescent, including persistent leaf bases to nearly acaulescent when young. **Leaves** 4–7; *sheathing leaf base* ca. 20–24 × 0.3 cm; *pseudopetiole* 39–50 cm long; *petiole* 0–6 × 0.8–1 cm, 0.3 cm thick; *rachis* 47–97 cm long; *leaflets* slightly lighter on the abaxial surface, strongly deflexed, 23–25 along one side, in clusters of 2 or 3, inserted at various angles, giving the leaf a slight plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 42–45 × 0.3–0.8 cm, middle leaflets 28–56 × 1.3–2.8 cm, apical leaflets 30–50 × 0.1–0.4 cm with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 14–25 × 1.5–3.5 cm; *peduncular bract* 34–61 cm long, expanded portion 11–25 × 3–8 cm, including a 1.5–4(–8.5) cm beak,

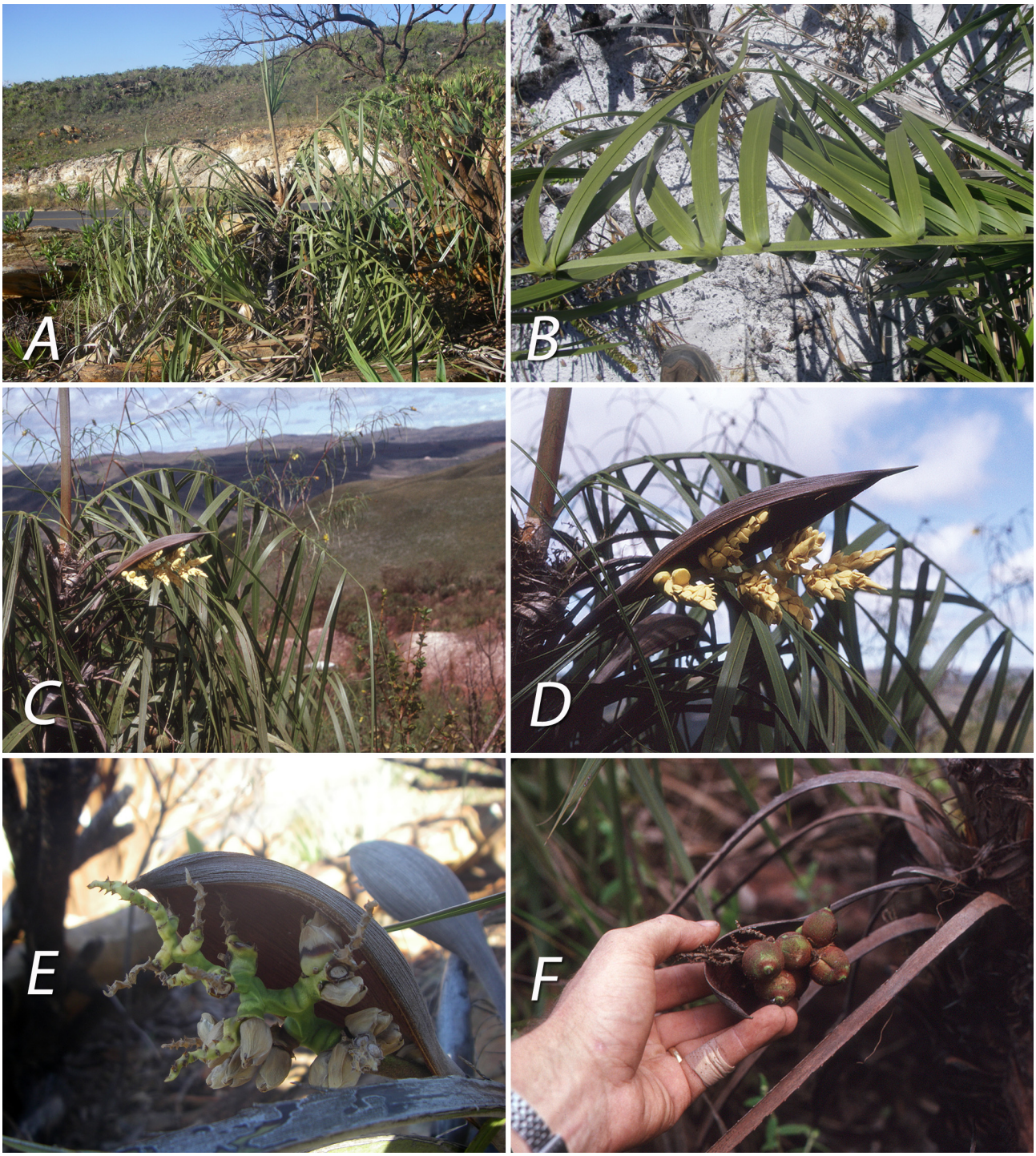

FIGURE 66. *Syagrus pleioclada*. A. Habit. B. Portion of the adaxial side of the leaf showing strongly deflexed leaflets. C. Palm with inflorescence and leaf with deflexed leaflets. D. Close of inflorescence. E. Inflorescence with pistillate flowers on characteristically short gnarled rachillae. F. Infructescence. (*Noblick 4853*).

5–10.5 cm perimeter, 1–2 mm thickness, narrow, woody, sulcate, covered externally with brownish tomentum that falls off with age; *peduncle* ca. 21–46 cm × 4–7 mm, 3–4 mm thick, elliptical in cross-section, covered with short dark brown indument; *inflorescence axis* 7–14.5 cm long; *rachis* 5–12.5 cm long; very short gnarled, nodose *rachillae* 8–21, glabrous, 0.5–3.5 cm long at the apex, 3–7 cm long at the base; *staminate flowers* 5–8 mm long at the apex, 7–10 × 4–5 mm at the base, green to yellow, sepals 1–2 × 4–5 mm, glabrous, with no visible nerves, petals 7–8 mm long at the apex, 9 × 3–4 mm at the base with acute tips, glabrous with nerves indistinct to obscurely nerved, stamens 3–4.5 mm long, anthers 3–4 mm long, filaments 2 mm long, pistillode less than 1 mm long; basal

pistillate flowers pyramidal, 8–11 × 6–8 mm, glabrous, yellow, sepals 10–11 × 6–8 mm, glabrous, veins visible at the margins, keeled, petals 9 × 3–5 mm, glabrous, with raised veins, valvate tips at least ½ of the length of the petal, ca. 5 mm long, pistil 5–6 × 2–3 mm, glabrous, stigmas 3.5–4.5 mm long, glabrous, staminodal ring ca. 1–1.5 mm high, 6-dentate. **Fruit** ellipsoid or ovoid, 2.2–3 × 1.5–2.1 cm, brownish when mature, covered with a dark brown dense tomentum, epicarp less than 0.5 mm thick, mesocarp 2–3 mm thick, succulent and fibrous; *endocarp* ca. 2.2–2.5 × 1.5 cm, 2–3 mm thick on its sides, (3–)6–7 mm thick at the ends; *seed* ellipsoid, ca. 1.3 × 1.1 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—coqueirinho, palmeirinha

Etymology:—The specific epithet, *pleioclada,* means more branches than usual. Perhaps Burret was surprised at the number of closely spaced rachillae on such a short inflorescence.

Distribution and habitat:—Endemic to the Brazilian state of Minas Gerais, in the Serra do Espinhaço from the Serra do Cipó northward to Diamantina, in campo rupestre or cerrado, generally in rocky, sandy soils.

Conservation:—This palm is protected within the boundaries of a national park (Serra do Cipó) and a reserve just south of Diamantina. Outside of the park the palm is resilient and grows in both sandy and very rocky areas in soils of little agricultural importance. It appears to be resistant to frequent burning. This species is classified as least concern, LC.

Phenology:—Fruits sparsely at the end of spring and at the beginning of summer (November–February).

Uses:—The fruits are eaten by rodents. The plant possesses a potential for cultivation in landscaping.

Notes:—A short-stemmed palm with strongly deflexed, clustered leaflets and an inflorescence with very short, distinctively gnarled rachillae.

Representative specimens:—BRAZIL. **Minas Gerais:** Chapéu do Sol, Serra do Cipó-3 km north of Chapeu do Sol, just below km 110, 13 August 1985, *P.C. Hutchison 8904* (UEC!); Conceição do Mato Dentro, 50 km S of the city near the Parque Nacional do Serra do Cipó, ca. 5 km N of Fazenda and Restaurant Chapéu do Sol, 1000–1300 m, –19.03, –43.42, 23 March 1992, *L.R. Noblick 4853* (BHCB!, FTG!, MBML!, MO!, NY!, US!); Conceição do Mato Dentro, Serra do Cipo, Rodovia Belo Horizonte-Conceição do Mato (MG 010), km 110 (antigo 115), –19.04, –43.43, without date, *D.C. Zappi et al. 10266* (SPF! 51838!); Diamantina, Estrada para Curvelo, a 10 km de Diamantina, –18.26, –43.68, 6 May 2004, *H. Lorenzi et al. 4838* (HPL!, IAC); Diamantina, RPPN Pau-de-Fruta, –18.25, –43.60, 17 March 2002, *Mota, R.C. da 1607* (BHCB); Diamantina, 3 September 1973, *J. Semir et al. 4350* (SPF!); Diamantina, nas margens da rodovia no km 597, lado esquerdo, sentido Serro, 1383 m, –18.26, –43.68, 21 June 2008, *R. Tsuji et al. 2710* (HPL!); Gouveia, Rod. BR 259, –18.45, –43.74, 21 January 1972, *G. Hatschbach 29090* (MBM!); Jaboticatubas, km 126 ao longo da rodovia Lagoa Santo—Conceição do Mato Dentro-Diamantina, 17 April 1972, *A.B. Joly et al. 1963* (SPF!); Jaboticatubas [Santa Ana do Riacho], –19.51, –43.75, 24 October 1974, *G. Hatschbach 35313* (F!, MBM!); Jaboticatubas, Conceição do Mato Dentro-Diamantina, –19.51, –43.75, 27 May 1972, *A.B. Joly 2208* (UEC!); Jaboticatubas, Serra do Cipó, –19.51, –43.75, 26 July 1979, *W. Mantovani 94* (SP!); Jaboticatubas, Fazenda da Serra do Cipó, 1400 m, –19.51, –43.74, 24 February 1996, *J. Mullins 3* (NY); Jaboticatubas, km 126 ao longo da rodovia Lagoa Santo—Conceição do Mato Dentro-Datas, between Rio Parauna and Datas, 1892, *A.F.M. Glaziou 20023* (K, P); Jaboticatubas, Serra do Cipo, 5 km N of Chapeu de Sol, 1100 m, 29 April 1952, *L.B. Smith 6699* (BH, US!); Palácio, Serra do Cipó, kilômetro 131, 4 December 1949, *A.P. Duarte 2018, 2019* (RB!); Pres. Juscelino Kubitschek, June 1990, *K.I. Horst 65* (MBML!); Santa Luzia, Serra do Cipo km 134, 15 April 1935, *H.L.M. Barreto & Brade 1206* (BHCB!, RB!); Santa Luzia, Serra do Cipo km 131, Palacio, 4 February 1938, *H.L.M. Barreto 8882* (BHCB!); Santa Luzia, –19.77, –43.85, without date, *H.L.M. Barreto 11382* (BHCB); Santa do Pirapama, Fazenda Inhams (Serra Mineira) Serra do Cipo, –18.92, –43.90, 20 March 1982, *J.R. Pirani et al. 7999* (SPF!); Santana do Pirapama. Serra do Cipó (Serra da Lapa). Distrito de São José da Cachoeira. Trilha da Captação da Fazenda Toucan Cipó.680, –19.01, –43.76, 17 February 2007, *V.C. Souza et al. 32540* (ESA!); Santana do Pirapama. Serra do Cipó (Serra da Lapa). Distrito de São José da Cachoeira. Trilha do João Carrinho, 756–1080, –43.74, –19.05, 18 February 2007, *V.C. Souza et al. 32688* (ESA!); Santana do Pirapama, Serra do Cipó, acesso pela Faz. Inhame. Trilha do João Carrinho, –19.05, –43.74, 25 February 2009, *D.C. Zappi 1582* (RB); Santana do Riacho, Cadeia do Espinhaço-Serra do Cipó, –19.17, –43.71, 2 July 1989, *H.F. Leitão Filho 21754* (UEC!); Santana do Riacho, Serra do Cipó, 5 May 2004, *H. Lorenzi 4832* (HPL!); Santana do Riacho, Serra do Cipó, 10 May 1974, *G. Martinelli 257* (RB!); Santana do Riacho, Serra do Cipó, entre km 103–104, –19.17, –43.71, 26 April 1978, *G. Martinelli 4325* (RB!); Santana do Riacho, Serra de Cipó, estrada Conceição do Mato Dentro-Chapéu do Sol, próximo 20 km 114, 1000 m, –19.17, –43.71, 16

December 1979, *G. Martinelli & G. Smith 6333* (MO!, RB); Santana do Riacho, km 105/6 ao longo da rodovia Belo Horizonte-Conceição do Mato Dentro, *S. Mayo et al. 7062* (SP!, SPF!); Santana do Riacho, na localidade Serra da Bandeira, 1160–1180 m, 17 February 1982, *W. Mantovani et al. 7791* (SPF 34519!); Santana do Riacho, Parque Nacional da Serra do Cipó, –19.17, –43.71, 28 March 1992, *M. Pereira & M. Lucca s.n.* (BHCB); Santana do Riacho, Serra do Cipó, –19.17, –43.71, 2 May 1993, *V.C. Souza & C.M. Sakuragui 3419* (ESA!); Santana do Riacho, –19.17, –43.71, 12 January 1996, *V.C. Souza et al. 10233* (ESA!); Santana do Riacho, Serra do Cipó, Rodovia Belo Horizonte-Conceição do Mato Dentro, próximo ao inicio da estrada da usina, 1050 m, –19.29, –43.60, 28 February 2002, *V.C. Souza et al. 28568* (ESA!); Santana do Riacho, Serra do Cipó, cerca de 1–2 km acima do Córrego Chapéu de Sol. –19.17, –43.71, 3 July 7 1996, *V.C. Souza et al. 11564* (ESA!); Santana do Riacho, 105/6 ao long da rodovia Belo Horizonte-Conceição do Mato Dentro, 20 March 1983, *M.G.L. Wanderley 567* (SPF!); Serra do Cipó, entre km 130–132, 5 April 1951, *G.A. Black & M. Magalhães 51-11877* (IAN!); Serra do Cipó, km 134. 15 April 1935, *A.C. Brade 14781* (RB); Serra do Cipó, km 118, 14 February 1963, *A.P. Duarte 7617* (RB!); Serra Cipó, 107 km N of Belo Horizonte, 1200 m, 10 July 1965, *S.F. Glassman 8037–8042* (F!, FTG!, MO, NY, RB, SP!); Serra do Cipó, 5 March 1958, *E.P. Heringer s.n.* (SP! SP-80005); Serra do Cipó, estrada que liga Cardeal Mota para Conceição do Mato Dentro, 29 July 2004, *H. Lorenzi 4909* (HPL!).

48. *Syagrus pleiocladoides* Noblick & Lorenzi (2010b: 37). Type:—BRAZIL. Mato Grosso: General Carneiro, on the road to Cuiabá—BR 070 at km 126.5, coordinates: –15.58, –53.17, elevation 493 m, 21 January 2009, *H. Lorenzi, R. Pimenta & R. Campos 6583* (holotype HPL!, isotypes FTG!, K!, NY!, RB!)

Figures 67–68 plates, Figure 65 map.

Short, solitary palm with an overall height of 50–70 cm. **Stem** generally solitary, short (ca. 20 cm) or subterranean, nearly acaulescent. **Leaves** nearly 1 m long, 4–9; *sheath* 2.5–5.0 cm long; *pseudopetiole* with fibrous margins, 14–26 cm long; *petiole* nearly absent to 8–15 × 0.4–1.0 cm, 0.2–0.5 cm thick; *rachis* 43–81 cm long; *leaflets* 11–25 along each side of the rachis, linear, very pendulous, bright green, with long acuminate, asymmetrical apex, distributed mostly regularly except at the base where they are irregularly in pairs, inserted in one plane, leaflets strongly deflexed or pendulous; no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; 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, *prophyll* 8–13 × 0.8–1.8 cm; *peduncular bra*ct (6–)14–37 cm long, expanded part 6.5–12.0 × 0.8–4.2 cm, 1–2 mm thickness; *peduncle* ca. 10–20 cm long; *inflorescence axis* 3–14 cm long; rachis absent; *rachilla* 1, 3–14 cm long; *staminate flowers* 8.5–12.0 × 4 mm, sepals fleshy 1 mm long or less, fleshy, petals 7–8 mm long at the apex, 7–11 × 3–4 mm at the base with acute tips, nerves indistinct, stamens 5–6 mm long, anthers 4.5–5.0 mm long, filaments 1.5–2.0 mm long; *pistillate flowers* pyramidal, 6 × 2.5–3.0 mm at the apex, 12–13 × 6 mm at the base, glabrous, sepals 10–12 × 4–5 mm, petals unnerved, 7.5–9.0 × 3.5–4.0 mm, valvate tips ca. 1/5 the length of the petals, 1.5–2.0 mm long, pistil 6 × 2.5–3.0 mm, glabrous, stigmas 3 mm long, glabrous, staminodal ring ca. 1 mm high, 6-dentate. **Fruit** ovoid, 2.0–2.3 × 1.3–1.5 cm, with a short apical beak, epicarp less than 0.5 mm thick, mesocarp, thickness not measured, succulent and fibrous; *endocarp* 1.9–2.2 × 1.2–1.3 cm, thickness not measured; *seed* ca. 1.1 cm in diameter with a small central cavity and homogeneous endosperm.

Common name:—coqueirinho-mirim.

Etymology:—The specific epithet, *pleiocladoides,* alludes to its close resemblance to *S. pleioclada* from Minas Gerais*,* which also has strongly pendulous and deflexed leaflets.

Distribution and habitat:—Mato Grosso and Goiás, Brazil, in open cerrado vegetation in rocky areas with sandy and median textured, well-drained soils, at 350–500 m elevation.

Conservation:—This species is fairly abundant and protected within the boundaries of an Indian reservation. Currently, it is classified as least concern, LC.

Phenology:—Fruiting in November.

Uses:—The fruits are eaten by rodents. The plant possesses potential for cultivation in gardens.

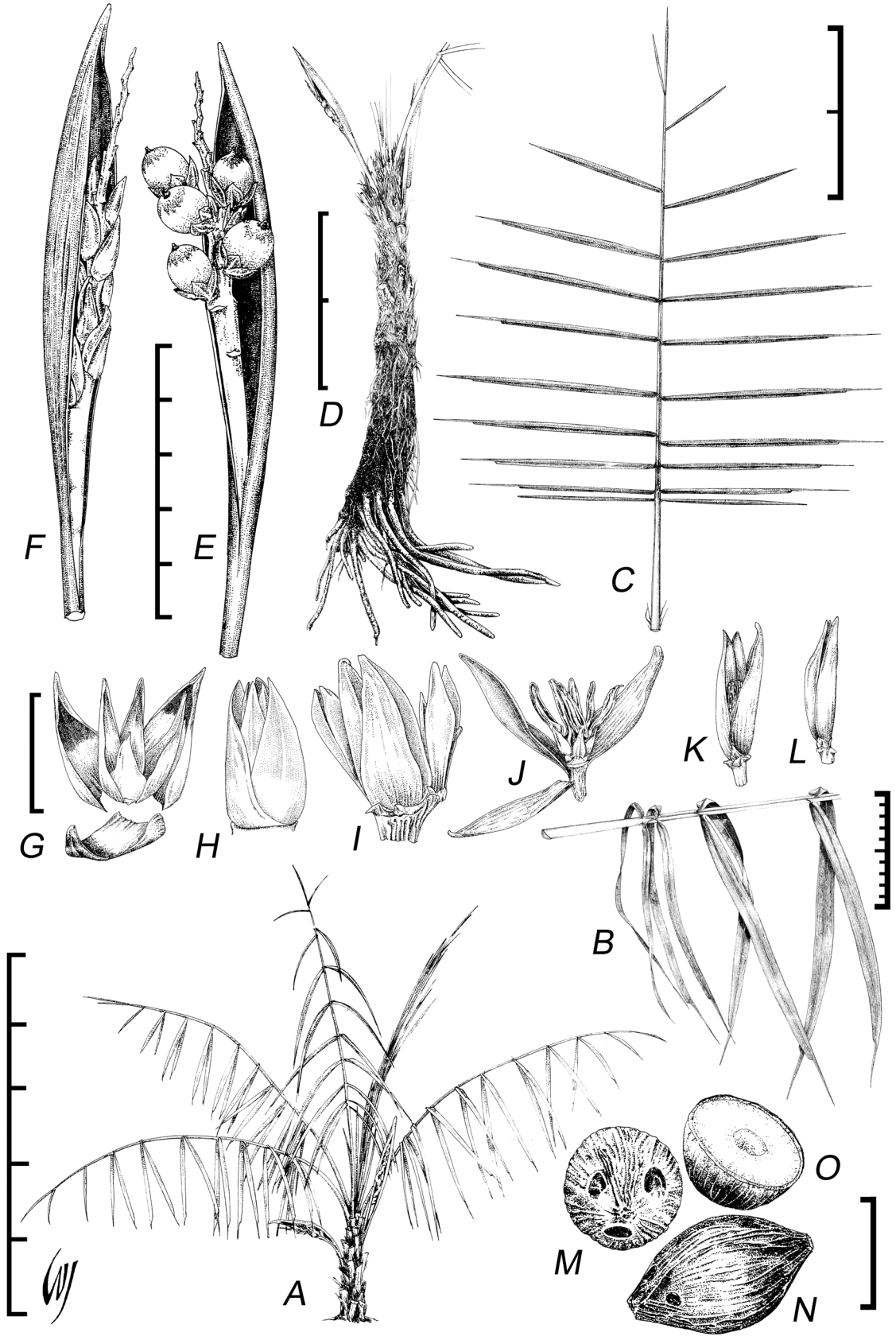

FIGURE 67. *Syagrus pleiocladoides*. A. Habit. B. Deflexed leaflets. C. Leaf. D. Underground stem. E. Infructescence. F. Inflorescence. G–H. Pistillate flowers. I. Triad with one pistillate flower flanked by two staminate flowers. J–L. Staminate flowers. M–O. Endocarp basal end showing pores, side view, and cross-section showing the interior cavity. A–D drawn from images taken by L. Noblick and H. Lorenzi, E–O drawn from *Lorenzi 6583*. All scales are in centimeters except A, C, and D which are in decimeters. Drawn by Wes Jurgens.

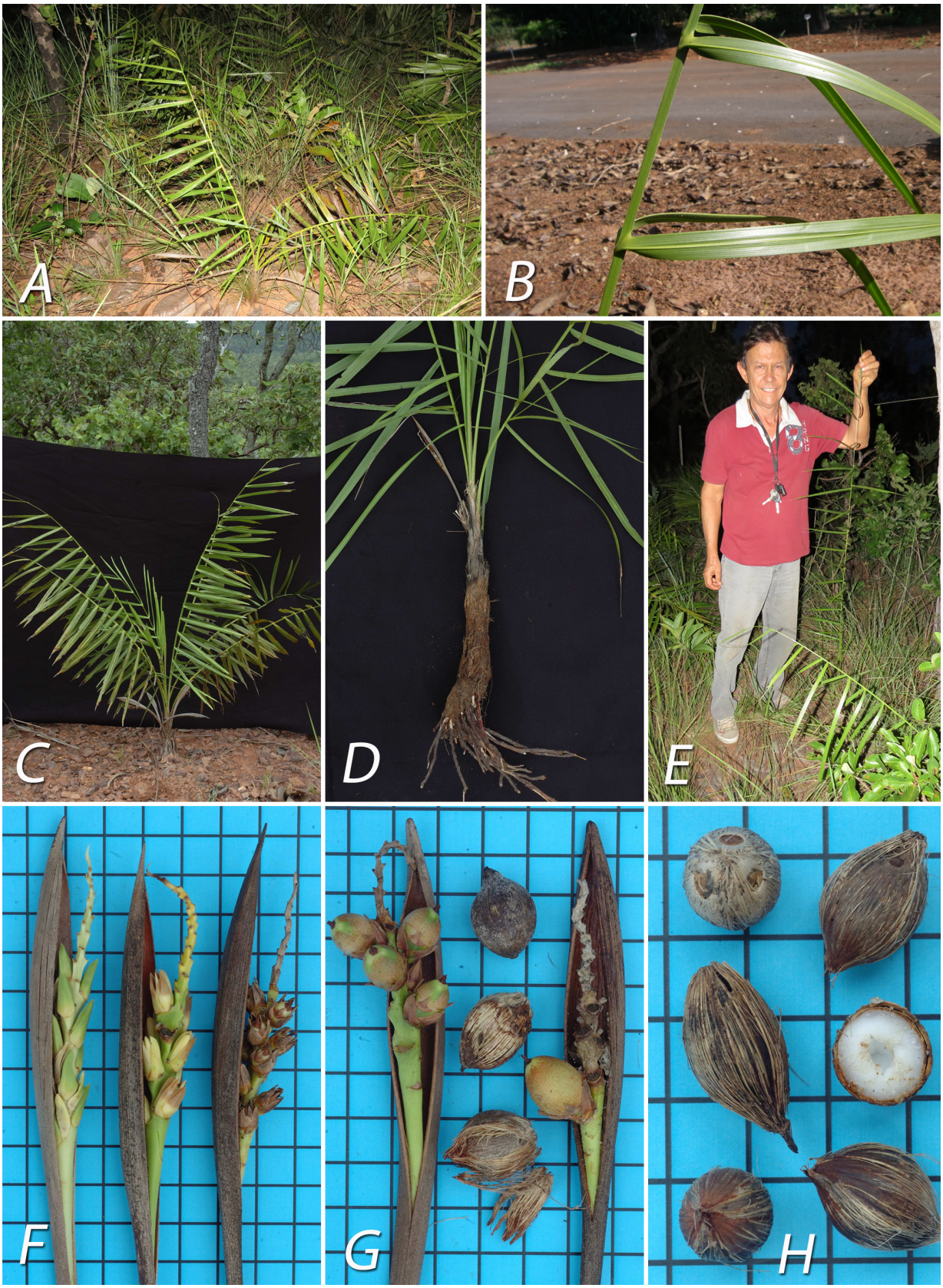

FIGURE 68. *Syagrus pleiocladoides*. A. Habit near General Carneiro, Mato Grosso (type locality). B. Deflexed leaflets. C. Palm in habitat with inflorescences. D. Underground stem. E. Leaf with Harri Lorenzi for scale. F. Inflorescences. G. Infructescence. H. Endocarps. Grids are in centimeters. Photos C, D, F–H by Harri Lorenzi.

Notes:—This is a nearly acaulescent palm with strongly deflexed leaflets like *S. pleioclada*, but differs from it in having mostly spicate inflorescences vs. branched inflorescences, straight rachillae vs. gnarled rachillae, a slenderer peduncular bract (2.8–4.2 vs. 5–10.5 cm), a nearly glabrous peduncular bract vs. a peduncular bract covered with brownish tomentum, regularly spaced leaflets vs. clustered leaflets, and finally distinctly different leaflet anatomies (Noblick 2013a). 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. 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.

Harri Lorenzi discovered *S. pleiocladoides* in Mato Grosso and successfully introduced it into his garden collections.

Representative specimens:—BRAZIL. **Mato Grosso:** Barra da Garça, nas proximidades do municipio do Garças, 598 m, –15.85, –52.27, 12 March 2004, *H. Lorenzi 4752* (HPL!); General Carneiro, saído de Barra do Garça, ca. 47.5 km do posto Ipiranga na rotatório de B. Garça, –15.72, –52.67, 25 November 2004, *R. Tsuji et al. 974* (HPL!); General Carneiro, no km 75, da estrada que liga Barra do Garças a General Carneiro (distante 48 km de Barra do Garças), no morro do disco voador, 23 September 2008, *H. Lorenzi & R. Pimenta 6518* (HPL!); General Carneiro, nas margens da BR 070, km 134, sentido Primavera do Oeste, nas terras indigenas Merurê, 486 m, –15.59, –53.22, *H. Lorenzi et al. 6787* (HPL!); Morro do Crista –Serra Azul-Barra do Garças, without date, *M. Macedo & A.R. Ferreira 6850* (UFMT!).

49. *Syagrus pompeoi* Soares & Pimenta (2013a: 418). Type:—BRAZIL. Mato Grosso do Sul: Bela Vista, BR 060, 10 km [N] from the city of Bela Vista, [205 m], [coordinates redacted], 7 June 2012, *K. Soares & R. Pimenta 14* (holotype HDCF [HDCF-6238])

Figure 69 plate, Figure 65 map.

Solitary palm 30–60 cm tall. *STEMS* subterranean, 4 cm at their base, nearly acaulescent. **Leaves** 3–6; *sheathing leaf base* ca. 4–18 × 2.6–3.5 cm with fibrous margins; *pseudopetiole* 3–9 cm long; *petiole* 1.5–8 × 0.3–0.7 cm, 0.2–0.3 cm thick; *rachis* 17–50 cm long; *leaflets* slightly lighter on the abaxial surface, 7–15 along one side, more or less regularly arranged, inserted in more or less one plane, coriaceous to membranaceous in texture, dark green, linear, moderately covered with a waxy coating with prominently visible raised transverse veins (visible on fresh and dried material) on the adaxial surface, with whitish waxy scales or lepidote on the adaxial leaflet surface on younger leaves, whitish ramenta scales or tomentum present where the leaflets are inserted on the rachis and along the abaxial midvein; basal leaflets 8.5–43 × 0.1–0.7 cm, middle leaflets 27–57 × 0.5–1.1 cm, apical leaflets 14–35 × 0.2–0.6 cm with an asymmetric tip. **Inflorescence** erect, spicate or rarely branched; *prophyll* lanceolate, 10–13 × 1.5 cm; *peduncular bract* (10–)15–26 cm long, expanded portion 7–11.5 × 2–2.8 cm, including a 0–6 cm beak, 3–3.8 cm perimeter, 1 mm or less thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 5–17 cm × 3–4 mm, elliptical in cross-section, tomentose; *inflorescence axis* 4.5–9 cm long; *rachis* usually absent; *rachillae* 1–3, glabrous, 4.5–9 cm long; *staminate flowers* 9–14 × 4–6 mm, yellow, sepals 1–1.5 × 1–1.6 mm, glabrous, no visible nerves, petals 9–13 × 3.3–3.5 mm with acute tips, nerves indistinct, stamens 3.5–5 mm long, anthers 3–4 mm long, filaments not measured, pistillode less than. 1 mm long; *pistillate flowers* pyramidal, elongate, 12–19 × 5–7 mm at the base, yellow, glabrous, sepals 12–18 × 5–10 mm, glabrous, slightly visible venation, petals 10–13 × 4–6 mm, glabrous, nerved, pistil 4–5 × 2–2.5 mm, glabrous, stigmas not measured, glabrous, staminodal ring not measured. **Fruit** more or less ellipsoid, 1.8–2.7 × 1.4–2.0 cm, yellow when mature, covered with a fine rusty tomentum, epicarp less than 0.5 mm thick, mesocarp, yellow, thickness not measured, succulent and fibrous; *endocarp* 1.4–2.5 × 0.9–1.4 cm, thickness not measured; *seed* ellipsoid to ovoid not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—None recorded.

Etymology:—The specific epithet, *pompeoi,* honors the Pompeo family of Limeira, São Paulo, in particular José Pompeo Junior, a grower and collector of palms, who for a long time has supported research (i.e. Ricardo Pimenta) on the identification and conservation of native palms.

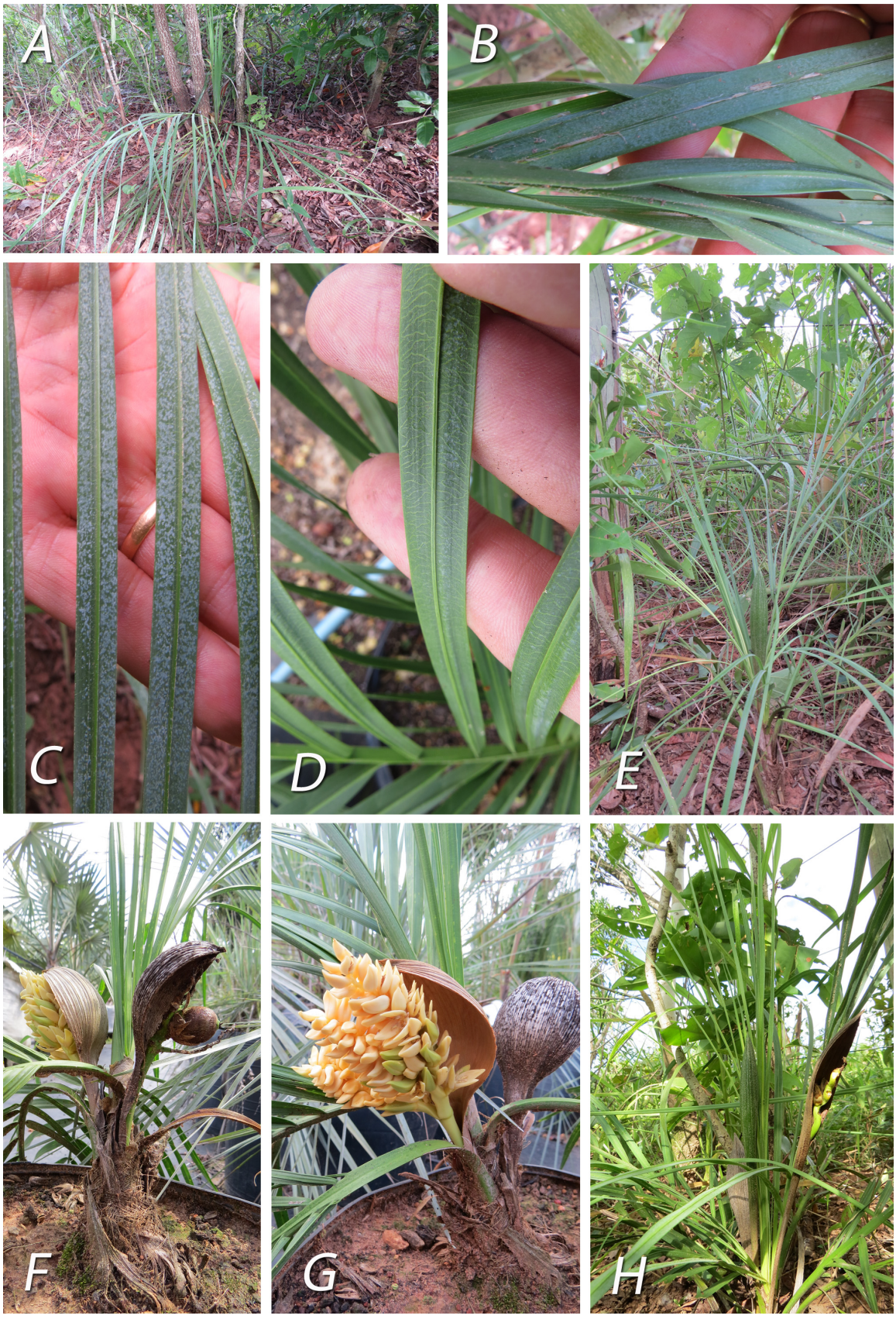

FIGURE 69. *Syagrus pompeoi*. A. Habit. B. Ramenta on abaxial side of leaflets. C. White waxy lepidote scales on abaxial side of young leaves. D. Raised cross-veins on adaxial side of leaf. E. Habit with new emerging spathe or peduncular bract. F. Inflorescence and infructescence. G. Inflorescence. H. Inflorescence with a new emerging inflorescence and one with a few pistillate flowers in habitat.

Distribution and habitat:—This species is known only from the type locality in Bela Vista in Mato Grosso do Sul, Brazil, where it grows in sandy, rocky soil.

Conservation:—This palm is very rare, threatened by cattle grazing, as well as by agriculture, road building and fire. After a prolonged search throughout the immediate vicinity, the author and Ricardo Pimenta were unable to locate any additional plants. With only one small location and with only a few reproductive individuals and a small number of seedlings left along the highway and in the fence line, this species is classified as critically endangered, CR B1+2ab(v); D.

Phenology:—Flowering at the end of winter (July to August) and in spring (September to November) and fruiting in summer (January to March).

Uses:—Cattle appear to readily feed on it, and it has horticultural potential.

Notes:—According to its authors, *Syagrus pompeoi* may be related to *Syagrus procumbens* by the following characters: both have a subterranean stem, similar arrangement and size of their leaves, and a spicate inflorescence. It differs from *S. procumbens* by its clustering vs. solitary habit, leaf rachis 33–50 vs. 2.5–20 (30) cm long, number of leaflets (8) 11–15 vs. (3) 5–8 (11), membranaceous leaflets with many visible transverse veins vs. coriaceous leaflets lacking visible transverse veins. There are also differences in the length of the peduncle, which is 10–18 vs.7–9.5 cm in *S. procumbens.* The peduncular bract is only lightly covered with a sparse indument when young, while in *S. procumbens* it is densely covered with tomentum.

The author disagrees with the original description's indication of a clustering habit for *S. pompeoi*. All the specimens observed and photographed in the wild by the author were solitary. The clustering habit is probably a misinterpretation of multiple individuals growing in close proximity with each other as was observed in *S. emasensis*.

Representative specimens:—BRAZIL. **Mato Grosso do Sul**: Bela Vista, 2008–2009, *A. Campos-Rocha & R. Pimenta 614* (paratype HPL!); Bela Vista, N on BR-060 (exact location redacted), elevation ca. 205 m, (coordinates redacted), 24 January 2014, *L.R. Noblick & R. Pimenta 5647* (paratypes ESA!, HPL!, FTG!, NY!).

50. *Syagrus procumbens* Noblick & Lorenzi (2010b: 39). Type:—BRAZIL. Mato Grosso do Sul: Agua Clara, collected near km 107, at an entrance to a side road that gives access to a cerrado, 33 km from Agua Clara, 370 m, –20.55, –52.58, 16 June 2008, *R. Tsuji, H. Lorenzi, L.R. Noblick and R. Ventura 2677* (holotype HPL!, isotypes R!, SP!, CGMS!, UB!, CTES!, NY!, FTG!, K!, AAU!)

Figures 70–71 plates, Figure 65 map.

Short, solitary palm to less than 50 cm tall. **Stem** subterranean appearing acaulescent. **Leaves** emerging as a semicircular leaflet fan when young, later, ca. 70 m long, 2–4 in the crown, the older ones lying procumbent on the ground, only the newest leaf erect, fan-like; *sheath* 9–16 cm long; *pseudopetiole* with fibrous margins, 2–9 cm long; *petiole* 0–6 × 0.5 cm, 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, asymmetrical apex, distributed mostly regularly, arranged in one plane with the two sides forming a shallow V; no ramenta scales or tomentum present where the leaflets are inserted on the rachis and along the abaxial midvein; basal leaflets 18–55 × 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 (rarely branched), 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 0–2 mm; *peduncle* 7.0–9.5 cm long; *inflorescence axis* 3.3–10.0 cm long; *rachis* absent; *rachilla* 1, 3.3–10.0 cm long; *staminate flowers* 4–13 × 4–6 mm, sepals 1–2 × 1.5–2.0 mm, petals 6–8 × 2.5–5.0 mm with acute tips, nerves indistinct, stamens 3.5–5.0 mm long, anthers 3–4 mm long, filaments 0.5–1.0 mm long; *pistillate flowers* elongate pyramidal, 8–19 × 4–9 mm, glabrous, sepals 8–13 × 4–9 mm, petals 9–13 × 5–8 mm, nerved, valvate tips ca. ½ to 2/3 the length of the petals, 6–7 mm long, pistil 4 × 2.0–2.5 mm, nearly glabrous, stigmas 2–3 mm long, glabrous, staminodal ring ca. 1.5–2.0 mm high, short dentate to nearly truncate. **Fruit** ellipsoid, 2.5 –3.3 × 1.8–2.2 cm, yellowish tinged when mature, epicarp covered with a fine reddish brown lepidote, less than 0.5 mm thick, mesocarp ca. 3 mm thick, succulent and fibrous (pulpy); *endocarp* 1.5–2.6 × 1.3–1.6 cm, ca. 0.5–2.0 mm thick; *seed* ca. 1.1 cm in diameter with an internal cavity, endosperm homogeneous. Germination remote-tubular.

Common name:—ariri-rasteiro.

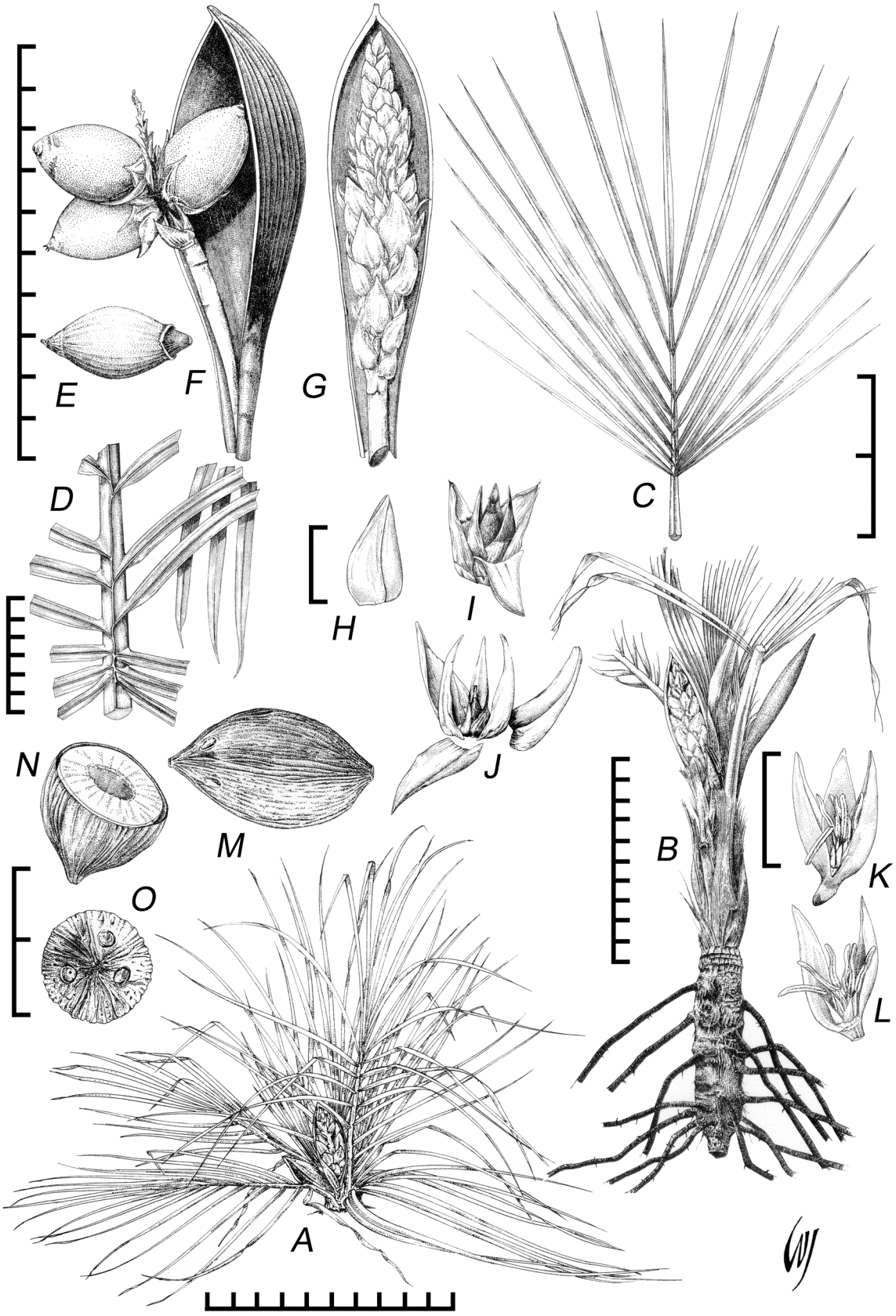

FIGURE 70. *Syagrus procumbens*. A. Habit. B. Underground stem. C. Leaf. D. Leaflets. E. Fruit. F. Infructescence. G. Inflorescence. H–J. Pistillate flowers. K–L. Staminate flowers. M–O. Endocarp side view, cross-section showing the interior cavity, side view, and basal end view showing the pores. A–D drawn from images taken by L. Noblick and H. Lorenzi, E–O drawn from *R. Tsuji et al. 2277*. All scales are in centimeters except C which is in decimeters. Drawn by Wes Jurgens.

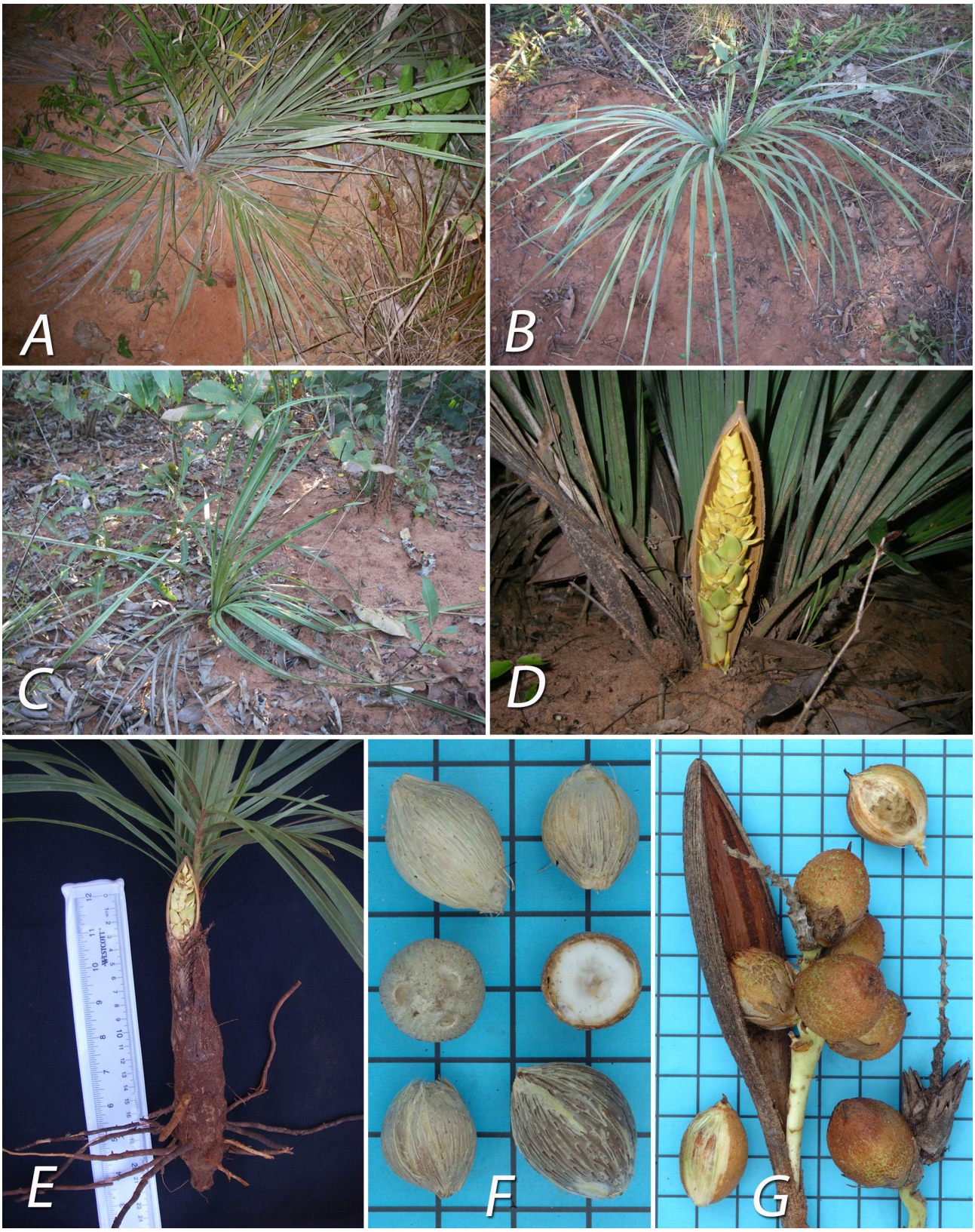

FIGURE 71. *Syagrus procumbens*. A. Habit showing how the older leaves are often procumbent, laying nearly flat on the ground. B. Habit with short rachis and long pendulous leaflets. C. Habit showing the fan-like orientation of the new emerging leaf. D. Spicate inflorescence. E. Short underground stem. F. Endocarps. G. Infructescence. Scale of E is in inches and centimeters. F and G grids are in centimeters. Photos F and G are by Harri Lorenzi.

Etymology:—The specific epithet, *procumbens,* means procumbent and refers to the manner in which the lower leaves tend to lay nearly flat against the ground.

Distribution and habitat:—Goiás and Mato Grosso do Sul, Brazil, in cerrado, generally in sandy soils.

Conservation:—This small acaulescent palm is doomed to extinction in the areas of soybean production, but it is well protected within the borders of a large national park in Goiás (Parque Nacional das Emas) and within a reserve set aside by a large cellulose company near Agua Clara, Mato Grosso do Sul. Therefore, it is classified as least concern, LC.

Phenology:—Fruiting in December.

Uses:—The fruits are eaten by rodents. The plant possesses potential for cultivation in gardens.

Notes:—This is an acaulescent palm with its lower leaves lying flat or procumbent on the ground, with long narrow leaflets inserted on a relatively short rachis (2.5–13 cm). The procumbent posture of the leaves is a distinctive character, and its leaflet anatomy helps to separate if from all other acaulescent *Syagrus* that have spicate inflorescences (Noblick 2013a).

Representative specimens:—BRAZIL. **Goiás:** Chapadão do Céu, no Parque Nacional das Emas, a beira de estrada de terra sentido Portaria do Jacuba, seguindo a partir de ponte sobre Rio Formoso, 8 June 2011, *A. Campos-Rocha & H. Lorenzi 753, 761* (HPL!); Mineiros, Parque Nacional das Emas, –18.08, –53.08, 10 May 1992, *L.R. Noblick and H. Ferreira 4868* (FTG!, UFG!); **Mato Grosso:** Alto Araquaia: ca. 9 km S of the city on MT-100, (a side dirt road) and 11 km S of the intersection for BR-364, ca. 748 m, –17.39, –53.25, *L.R. Noblick & H. Lorenzi 5634* (ESA!, HPL!, FTG!, NY!); **Mato Grosso do Sul:** Água Clara, em ramal da rodovia para Três Lagoas (km 10), –20.56, –52.59, 20 November 2009, *H. Lorenzi 6779* (HPL!); Água Clara, ca. 33 km do municipio de Água Clara (km 107), 11 December 2007, *R. Tsuji s.n.* (HPL!).

51. *Syagrus pseudococos* (Raddi) Glassman (1970b: 233). *Langsdorffia pseudococos* Raddi (1820: 347). *Barbosa pseudococos* (Raddi) Beccari (1887: 349). Lectotype (designated by Glassman [1987: 106]):—Raddi (1820) t. 1, 1820

Cocos mikaniana Martius (1826: 128). *Syagrus mikaniana* (Mart.) Martius (1844: 133). *Calappa mikaniana* (Mart.) Kuntze (1891: 982). Lectotype (designated by Glassman [1987: 106]):—BRAZIL. Rio de Janeiro: Martius (1845) volume 3, t. 166, fig. 1, 1845.

Figure 72 plate, Figure 65 map.

Moderate to large, solitary palm. **Stem** ca. 3.5–10 m × (10–)15–20(–25) cm. **Leaves** 3–22; *sheathing leaf base* ca. 24–32 cm wide at the base; *pseudopetiole* 80–120 cm long; *petiole* nearly absent–10 × 2.5–3.5 cm, 1.5 cm thick; *rachis* 165–250 cm long; *leaflets* slightly lighter on the abaxial surface, 93–115(–150) along one side, in clusters of 2 or 3, inserted at various angles, giving the leaf a plumose appearance, ramenta scales or wooly tomentum present where the leaflets are inserted on the rachis and also along the abaxial midvein; basal leaflets 48–54 × 0.4–0.6 cm, middle leaflets 31–65(–80) × 2.2–4 cm, apical leaflets 23–35 × 0.4–0.5 cm with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 39 × 5–6 cm; *peduncular bract* 74–79 cm long, expanded portion 45–50 × (10–)25–27 cm, including a 1–2 cm beak, (16.5) 40–43 cm perimeter, 9–12 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 35–70 × 3–3.5 cm, 2 cm thick, elliptical in cross-section; *inflorescence axis* 41–60(–90) cm long; *rachis* 20–50 cm long; *rachillae* 28–50, glabrous, 17–24 cm long at the apex, 32–44 cm long at the base; *staminate flowers* 14–15 mm long at the apex, 16–22 × (6–)8–10 mm at the base, green to yellow, sepals 2–5 × 3–5 mm, glabrous, with no visible nerves, petals 13–14 mm long at the apex, 16–22 × 5–6.5 mm at the base with acute tips, glabrous, to 1 mm thick, no visible nerves, stamens 11–13 mm long, anthers 9–12 mm long, filaments 3–4 mm long, pistillode 1–3.5 mm long; basal *pistillate flowers* rounded, 20–22(–32) × 15–20 mm yellow, glabrous, sepals 17–21 × 12–18 mm, glabrous, obscurely nerved, only the outermost sepal slightly keeled, the other two not keeled, petals 12–16 × 8–11 mm, glabrous, indistinct nerves, valvate tips nearly absent to less than 1/10 the length of the petal, ca. 1 mm long, pistil 8–11 × 7–8 mm, very tomentose, stigmas 3–4 mm long, glabrous, staminodal ring ca. 1 mm high, 6-dentate. **Fruit** ovoid, 6–6.8 × 3.8–4 cm, yellowish green when mature, mostly glabrous but tomentose at the apex, epicarp less than 0.5 mm thick, mesocarp 2–3 mm thick, succulent and fibrous; *endocarp* ca. 4.7–6 × 3.2–4 cm, 1–1.5 mm thick on its sides, ca. 9 mm thick at the apex; *seed* globose to ovoid, ca. 2.8 × 2.5 mm, endosperm ruminate. Germination remote-tubular.

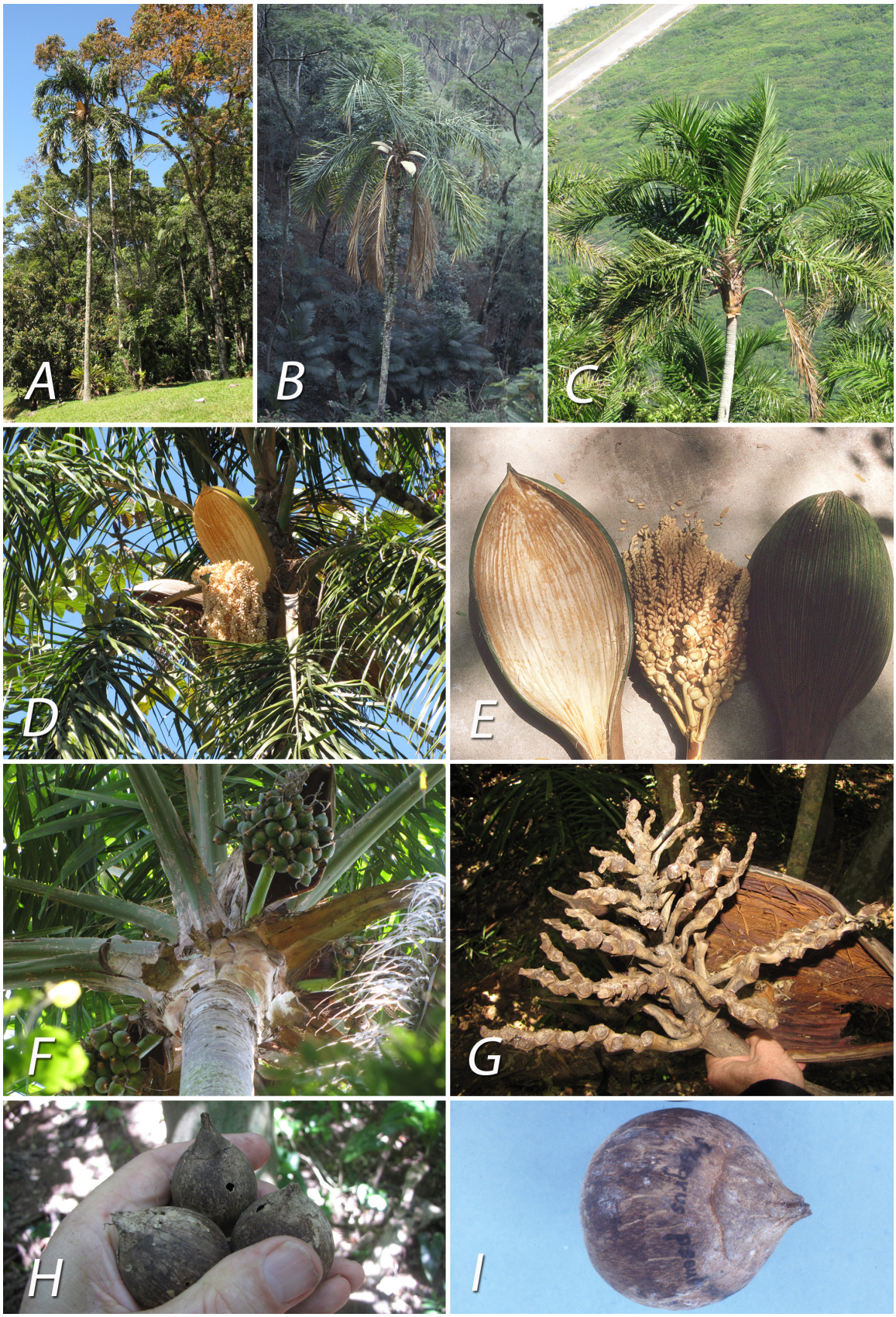

FIGURE 72. *Syagrus pseudococos*. A. Habit near Petropolis, Rio de Janeiro. B. Habit near Domingo Martins, Espirito Santo. C. Crown near Rio de Janeiro. D. Inflorescence. E. Inflorescence and thick peduncular bract. F. Leaf sheaths, infructescences, and self-cleaning stem. G. Old inflorescence with thick rachillae and thick bract. H. Old endocarps. I. Endocarp showing the characteristic apical "Chinese" cap.

Common name:—coco-amargoso, peririma, coco-verde, patioba, palma-blanca, gariroba, guariroba.

Etymology:—The specific epithet, *pseudococos,* means false coconut and is in reference to the similarity in appearance of this tree to the coconut, according to Raddi.

Distribution and habitat:—Espírito Santo, Rio de Janeiro and São Paulo, Brazil, in the coastal region of the Atlantic forest, generally in rocky soils on steep slopes.

Conservation:—Because of its wide distribution and habitat in rocky soils and steep slopes, this palm is classified as least concern, LC.

Phenology:—Fruits principally during summer (December–March).

Uses:—The mesocarp of the fruit is edible, and so are the seeds. The trunk is utilized locally in rural construction. The palm is ornamental and cultivated occasionally in landscaping.

Notes:—This palm has a very tall, smooth, clean stem, its nut is globose with a very distinctive, broad, conical structure at its apex, resembling a Chinese hat. It also has a fairly thick peduncular bract, similar to *S. botryophora*.

Representative specimens:—BRAZIL. **Espírito Santo:** Atílio Vivacqua, Base Serra da Aurora, –20.91, –41.20, 26 January 1994, *H.Q. Boudet Fernandes 3100* (MBML); Colatina, Miracema (Torre 41/1-LT 230 Kv Mascarenhas × Verona), 200 m, 6 November 2008, *A.M. Assis 1864* (MBML); Ecoporanga, Vale do Córrego Jequitibá, –18.37, –40.83, 8 March 1994, *H.Q. Boudet Fernandes 3145* (MBML); Ibiraçu, Estação Ecológica do Morro da Vargem, caminho do mirante 3, 300–470 m, –19.89, –40.38, 1 June 1990, *H.Q. Boudet Fernandes 2991* (ESA, MBML!, VIES); Linhares, Linha e Planta 1, –19.39, –40.07, 7 March 2001, *D.A. Folli 3824* (CVRD); Marilândia, Liberdade, Prop.: Deoclécio. Lorenccini, 250 m, –19.35, –40.52, 14 July 2006, *V. Demuner 2637* (MBML); Pancas, Estrada Pancas × V. Verde, –19.23, –40.85, 9 December 1988, *H.Q. Boudet Fernandes 2279* (MBML!); Santa Leopoldina, Bragança, propr.: Assunta Salvador, 400 m, –20.13, –40.55, 17 May 2006, *L.F.S. Magnago 998* (MBML); Santa Teresa, Nova Lombardia, –19.82, –40.51, 4 June 1985, *H.Q. Boudet Fernandes 1217* (MBML!); Santa Teresa, Museu de Biologia Mello Leitão, Parque, –19.94, –40.60, 21 June 1985, *H.Q. Boudet Fernandes 1280* (MBML!); Santa Teresa, Mata acima da Propriedade do Governo, –19.94, –40.60, 10 April 1986, *H.Q. Boudet Fernandes 1911* (MBML!, MO); Santa Teresa, Divisa com Santa Leopoldina, –19.94, –40.60, 23 April 1986, *H.Q. Boudet Fernandes 1936* (MBML!); Santa Teresa, Estação Biológica de Santa Lúcia, –19.97, –40.53, 24 November 1988, *H.Q. Boudet Fernandes 2645* (MBML!); Santa Teresa, Rio 5 de Novembro, 550–600 m, –19.84, –40.63, 5 March 1992, *H.Q. Boudet Fernandes & L.R. Noblick 3080* (F!, K!, MBML!, NY, US!, VIES!); Santa Teresa, Estação Biológica de Santa Lúcia, –19.97, –40.53, 29 June 1993, *L.D. Thomaz 1749* (MBML); **Rio de Janeiro:** *A.F.M. Glaziou 8048* (P!, U); Without date, *A.F.M. Glaziou 11633* (MO); Rio d'Ouro á la base da Lingua chez Meor, 24 August 1879, *A.F.M. Glaziou 11638* (P!); Angra dos Reis, Saco de Piraquara de Fora, –23.01, –44.32, 17 June 1999, *A.E.S. Oliveira 014* (RB); Nova Iguaçú, Jaceruba, –22.76, –43.45, 3 September 1978, *F. Oliveira 455* (NY); Parati, 1o. Distrito, Fazenda Olaria (propriedade do Sr. Gibrail); trilha em direção ao Theresopolis, 15 March 1876, *A.F.M. Glaziou 9009* (K!, P!); "Horto Flora Paraty" (Propriedade do Sr. Veloso). APA Cairuçu, –23.22, –44.71, 6 July 1992, *L.C. Giordano 1434* (RB); Parati, 2º distrito, Parati-Mirim, mata de encosta após a Ponta da Barra, –23.22, –44.71, 6 July 1992, *L.C. Giordano 1465* (RB); Rio de Janeiro, Parque Municipal da Prainha, trilha para o Cruzeiro, logo acima do "bosque da mirtáceas," próximo á formação rochosa, –22.90, –43.21, 10 June 2004, *P. Leitman 28* (RB); Rio de Janeiro, Parque Natural Municipal da Prainha, trilha do Boa Vista para o Cruzeiro, –22.90, –43.21, 23 February 2005, *P. Leitman 50* (MBM, RB); **São Paulo:** Paraibuna, ca. 25 km along the highway SE of Paraibuna, at km 172, –23.38, –45.66, 19 May 1961, *G. Eiten & L.T. Eiten 2786* (SP!); Ubatuba, Estação Experimental de Agronomia de Ubatuba, Cava da Escravidão, 10 m, –23.43, –45.07, 17 November 1998, *H.Q. Boudet Fernandes 3243* (MBML, SP); Ubatuba, Ponta Grossa, estrada do Farol, arredores do Farol, –23.43, –45.07, 18 November 1998, *H.Q. Boudet Fernandes 3249* (MBML, SP); Ubatuba, Estação Experimental do IAC, –23.43, –45.07, 8 March 2005, *H.Q. Boudet Fernandes 3385* (MBML); Ubatuba, Parque Estadual da Serra do March-Núcleo de Pissinguaba. (Secretaria do Meio Ambiente-Instituto Florestal), –23.43, –45.07, without date, *A.C. Marcato & M.P. Botânico, 361,* 362 (SPFW); Ubatuba, Fazenda Capricórnio, Núcleo Picinguaba/PESM, Parcela F, –23.38, –45.08, 13 October 2006, *E. Ramos et al. 396* (IAC).

52. *Syagrus romanzoffiana* (Cham.) Glassman (1968b: 382). *Cocos romanzoffiana* Chamisso (1822: 5). *Calappa romanzoffiana* (Cham.) Kuntze (1891: 982). *Arecastrum romanzoffianum* (Cham.) Beccari (1916: 447). Type:—BRAZIL. Santa Catarina: without date, *L.K.A. von Chamisso s.n.* (holotype LE, destroyed). Lectotype (designated by Glassman [1972b: 94]):—Chamisso (1822) t. 5 & 6, 1822 *Cocos australis* Martius (1844: 955). *Calappa australis*

(Mart.) Kuntze (1891: 982). *Arecastrum romanzoffianum* var. *australe* (Mart.) Beccari (1916: 459). Lectotype (designated by Glassman [1987: 99]):—PARAGUAY. Bonaire: Martius (1844) t. 30C, 1844.

Cocos plumosa Hooker f. (1860: 86). *Calappa plumosa* (Hook.) Kuntze (1891: 982).
Neotype (designated by Glassman [1987: 99]), collection made from same plant as the illustration and description, but 2 years after the original description):—ENGLAND. cult. Royal Botanic Gardens, Kew, Palm House, from the Spadix in the Museum, March 1862, *without collector, without number* (holotype K! [K-000697836, original Royal Botanic Gardens accession number 22 44/64]).
Cocos geriba Barbosa Rodrigues (1879: 43). Lectotype (designated by Glassman [1987: 99]):—BRAZIL. Minas Gerais: Barbosa Rodrigues (1882) t. 3, figs. 4–6, 1882.
Cocos datil Griseb. & Drude in Grisebach (1879: 283). *Calappa datil* (Drude & Griseb.) Kuntze (1891: 982). Lectotype (designated by Glassman [1987: 99]:—URUGUAY. Concepcion: Drude (1881) t. 93, 1881.
Cocos acrocomioides Drude in Martius (1881: 40). *Calappa acrocomioides* (Drude ex Mart.) Kuntze (1891: 982). Type:—BRAZIL. Mato Grosso [do Sul]: Rio Paraguay, Frontiére au bord du Rio de Miranda, affluente du Rio Paraguay, April–May 1845, *H.A. Weddell 3251* (holotype P!).
Cocos martiana Drude & Glaz. ex Drude in Martius (1881: 418). *Calappa martiana* (Drude & Glaz. ex Mart.) Kuntze (1891: 982). Lectotype (designated by Glassman, 1987, p. 99):—BRAZIL. Rio de Janeiro: cult. Passeio Publico, Rio de Janeiro, *A.F.M. Glaziou 8056* (lectotype P!, isolectotype C! [F neg. 21134]).
Cocos sapida Barbosa Rodrigues (1899: 12) Lectotype (designated by Stauffer *et al.* 2016, p. 110):—PARAGUAY: Barbosa Rodrigues (1899) t. 3, 1899.
Cocos arechavaletana Barbosa Rodrigues (1901: 43) Lectotype (designated by Glassman [1987: 99]):—URUGUAY. Montevideo, *J. Arechavaleta s.n.* (FI).
Arecastrum romanzoffianum var. *genuinum* Beccari (1916: 455). (invalid name)
Arecastrum romanzoffianum var. *genuinum minus* Beccari (1916: 456). Type:—FRANCE. cult. Hyeres, France, 1909, *Chabaud s.n.* (holotype FI).
Arecastrum romanzoffianum var. *botryophorum* (Mart.) Beccari (1916: 456). (misapplication of the name. See notes)
Arecastrum romanzoffianum var. *micropindo* Beccari (1916: 462). Type:—PARAGUAY. Rio Ibicuy, 1913, *Spegazzini s.n.* (holotype FI).

Figure 73 plate, Figure 65 map.

Large, solitary, unarmed, palms. **Stem** erect, columnar, 7–17 m × (14–)20–40(–50) cm, dark to light gray, with leaf scar intervals indistinct on older trunks. **Leaves** 7–25 in crown, spirally arranged, spreading; *sheathing leaf base* 50–84 cm long, fibrous; *pseudopetiole* 110–167 cm long with smooth to fibrous margins; *petiole* 0–10 × 3–4 cm; *rachis* 167–440 cm long; *leaflets* dark green above, paler beneath, 147–250(–340) along one side, irregularly distributed in clusters of 2–5(–7) in divergent planes; no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 24–96 × 0.2–1.3 cm, middle leaflets 60–116 × 1.9–4.3 cm, apical leaflets 20–80 × 0.1–2.5 cm, mostly with acuminate to asymmetrical tips. **Inflorescence** erect to pendulous, spirally branched; *prophyll* ca. 51 × ca. 10 cm; *peduncular bract* ca. 133–223 cm long, expanded portion 100–164 × 7–21(–28) cm, bearing a 6–10(–30) cm beak, perimeter 10–29 cm, 4–8 mm thickness, woody, sulcate; *peduncle* ca. 50–75 × 1.5–2 cm; *inflorescence axis* 81–167 cm long; *rachis* 40–110 cm long; *rachillae* 44–328, 34–77 cm long at the base, 15–45 cm long at the apex, rachillae bracts absent or up to 3 mm long; *staminate flowers* 6–10 mm long at the apex, 11–16 × 3–7 mm at the base, pale yellow, sepals 1–3.5 × 1–2.5 mm, glabrous, no visible nerves, petals 6.7–10 mm long at the tip, 8.5–13(–16) × 1.8–4 mm at the base with acute to acuminate tips, glabrous, no visible nerves but frequently with visible resinous punctate dots, stamens 4–9.5 mm long, anthers 3.4–8.8 mm long, filaments 2–3 mm long, pistillode ca. 1 mm long; *pistillate flowers* rounded to conical, 4.5–7 × 4–6 mm, yellow, sepals 4.2–6 × 4–5.4 mm, glabrous, not nerved to obscurely nerved, not keeled, petals 4 × 3 mm, valvate tips 1/3–1/2 the length of the petal, ca. 2 mm long, glabrous, distinctly veined, pistil 3–4 × 3–5 mm, white wooly tomentose, stigmas 1–2 mm long, staminodal ring less than 1 mm to 1.5 mm high. **Fruit** broadly ellipsoid to ovoid, 2–3(–4) × 1.2–1.8(–2.4) cm, persistent perianth (cupule) dark brown, 8–12 mm wide, 4–5 mm deep, ring 2–3 mm in height, epicarp smooth fibrous with small white wooly apex becoming glabrous, orange to reddish orange (or at times yellow) when mature, less than 1 mm thick, mesocarp 1–3 mm thick, white turning orange, fibrous mucilaginous; *endocarp* 1.9–2.5 × 1.5–1.8 cm, bony, cavity very irregular in shape, 2.5–5 mm on the sides, 5–8 mm thick at the ends, with no clusters of fibers; *seed* 0.8–1.2 × 0.6–1.1 cm, endosperm homogeneous, but intruded by the endocarpal wall, not easily separating from the endocarp cavity. Germination remote-tubular.

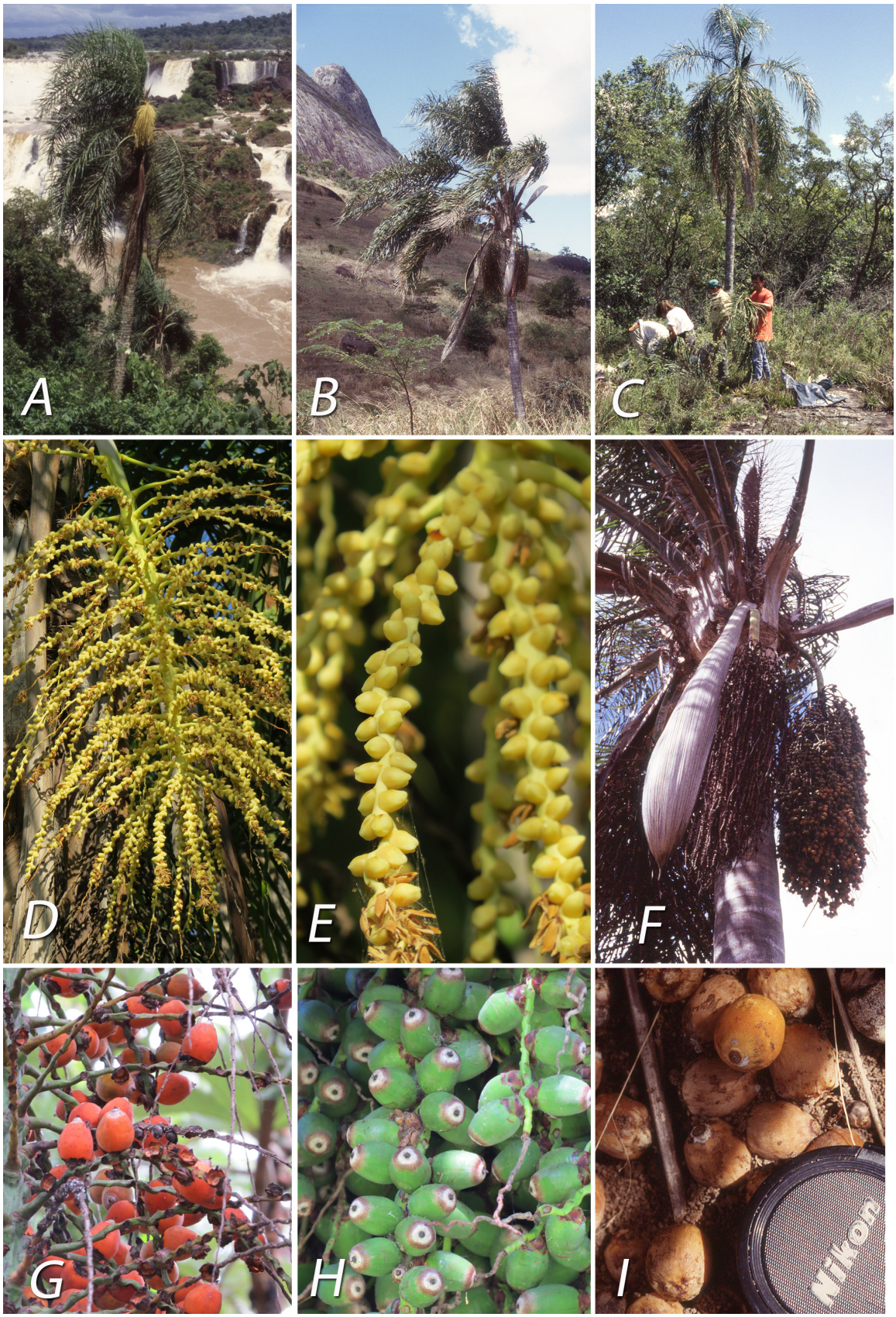

FIGURE 73. *Syagrus romanzoffiana*. A. Habit near Iguaçu Falls in Paraná. B. Habit near Padre Paraíso, Minas Gerais (*Noblick & Cline 5155*). C. Habit in Paraguay. D. Inflorescence. E. Pistillate flowers. F. Infructescence. G. Infructescence with reddish fruit. H. Immature fruits, note the white tomentose covered apices. I. Mature orange fruits.

Common name:—jeribá, jerivá, coqueiro, coqueiro-jerivá, geriba, gerivá, guariroba, baba-de-boi, côco-de-cachorro, brejauba, palmito-amargoso, coco-de-catarro, coco-babão, coco-de-sapo, imbury-de-cachorro (Brazil); pindó, pindó-de-missiones, palma del monte, palma chiriva, cheribau, datil (Argentina, Uruguay), queen palm (USA).

Etymology:—The specific epithet, *romanzoffiana,* is named for Prince Nicholas Romanzoff, who financed an around-the-world expedition in 1816–1817 on which Chamisso was a participant.

Distribution and habitat:—In Atlantic and semideciduous forests of the Paraná basin. Brazil, Paraguay, Uruguay and Argentina, and probably Bolivia where it was misidentified as *S. botryophora* by Martius (Glassman, 1987). In Brazil, it is found from Rio Grande do Sul to Bahia, which also includes the states of Mato Grosso, Mato Grosso do Sul, Goiás, Minas Gerais, Espirito Santo, Paraná, Santa Catarina, São Paulo, and Rio de Janeiro. In Bahia, found south of the Rio das Contas and in the mesophytic forests east of the high plateau area of the Municipio da Vitória da Conquista but not found in the wetter southern Bahian coastal rain forests. Growing in mesophytic forests in lateritic soils in Bahia, but in other states can be found in a variety of habitats that are swampy and within or at the margins of rain forest to restingas with rocky shorelines (Reitz 1974).

Conservation:—This is one of the most widely distributed palms in South America, many specimens are preserved within national parks, and many are cultivated. It also grows in a large variety of habitats. This species is classified as least concern, LC.

Phenology:—Flowering and fruiting year around with a flowering peak in spring and summer months, September to January with fruits maturing January to April. It fruits abundantly in summer. The seeds germinate in 3–6 months.

Uses:—Widely cultivated in landscapes in Brazil and throughout the world. It is one of the most common palms growing wild and in cultivation. Its fruit is edible. Leaves and mucilaginous pulp of the fruit provides forage for livestock (Bondar 1964). Smashed and broken seeds serve as poultry feed. The palm heart, palmito, is edible. The large peduncular bracts are utilized by artists and in decorations. The trees are also used to construct salt water piers because its wood is not attacked by destructive bore worms (Reitz 1974).

Notes:—This palm has plumose leaves with pendulous leaflets, a long inflorescence and is distinguished by the irregular (not smooth) endocarp cavity (or nut wall) that often penetrates deeply into the seed. This palm is easily identified by its large size with trunks up to 25 m high and up to 35–40 cm in diameter, large peduncular bracts (ca. 1.5 m long and to 28 cm wide), long inflorescences and infructescences (to ca. 1.7 m), small pistillate flowers (3–4 × 4–5 mm) and abundant small fruits (usually less than 2.5 cm long), the tips of which have a patch of white tomentum, a remnant of the tomentose ovary. Like *S. coronata*, this species hybridizes with a number of other *Syagrus* species including *S. coronata, S. flexuosa, S. oleracea,* and *S. glaucescens*.

Syagrus romanzoffiana is a polymorphic species. Barbosa Rodrigues (1903), Beccari (1916), and Glassman (1987) have discussed its variations. Barbosa Rodrigues (1879) described a "new" species, *Cocos geriba*, but then began to wonder how such a common palm could have gone undescribed for so long. He studied the living plants and their fruits throughout many of the Brazilian states and adjacent countries and decided that they were all one in the same species (Barbosa Rodrigues 1903). He concluded that it had already been described by Chamisso in 1822 from the island of Santa Catarina, but the description only applied to that morphotype found on the island and did not easily match the other more typical morphotypes found in Brazil and elsewhere. Barbosa Rodrigues made the first effort to synonymize the morphotypes under one species, *S. romanzoffiana,* including his own *C. geriba.* However, he failed to synonymize his *C. arechavaletana*, but Glassman did (1972b, 1987). Barbosa Rodrigues wrote that the polymorphism was due to differences in soils and elevation, among other factors for which he continued to search. He noted that the morphotypes of *S. romanzoffiana* go by various common names: geriba (Minas Gerais, São Paulo, and Mato Grosso), baba de boi (Rio de Janeiro), coco de cachorro (Santa Catarina), pindo (Rio Grande do Sul, Buenos Aries) and datil (Argentina). They varied in size from dwarfs to giants, small crowns to large, thin stems to very thick stems, and swollen trunks: at the base, in the middle or just below the crown. Swollen bases were observed in humid wetlands near Nioac, Mato Grosso. Ones with very tall, swollen trunks near the crown were observed in the sandy fields of Rio Grande do Sul, Montevideo (Uruguay), Buenos Aires (Argentina), Corrientes (Argentina) and Concepcion (Paraguay). Straight and tall stems that were uniformly thick throughout were found along the coast of São Paulo and Paranagua (Parana). On the coast of the Island of Santa Catarina, the stems were found to be swollen or bulging in the middle. In the mountains growing in rocky soils, the stems were thin and tortuous. Barbosa Rodrigues noted many other differences that included differences

in the texture of the leaflets, the lengths of the inflorescences, differences in the flowers, and in the size, shape and number of fruits. He also noted the irregular interior of the endocarp that is present in all of the morphotypes.

Based on some of Barbosa Rodrigues differences, Beccari (1916) attempted to describe several varieties (*austale*, *genuinum*, *genuinum minus*, *micropindo*, *botryophorum*, *ensifolium*). His varieties were mainly based on differences in size and shape of the fruits. Glassman (1987) dismissed these as falling within the range of species variation and placed them into synonymy with *Syagrus romanzoffiana*. Glassman interpreted Beccari's *Arecastrum romanzoffianum* var. *botryophorum* as an attempt to transfer *Syagrus botryophora* to *Arecastrum*. However, the author has concluded that Beccari just made a mistake when he included *Cocos botryophora* as a synonym under his variety *botryophorum*, because his description clearly described a morphotype of *Syagrus romanzoffiana* from Rio de Janeiro, which lies well outside the natural distribution of *Syagrus botryophora*. In other words, Beccari treated *C. botryophora* Mart. as a variety of *Arecastrum romanzoffianum* (now *Syagrus romanzoffiana*.). In doing so, Beccari (1916) excluded some elements of Martius' original description. It is clear that the taxon to which Beccari referred was a local morph of *S. romanzoffianum* known from Rio de Janeiro as baba de boi. Beccari misapplied *C. botryophora*, which is not a variety of *S. romanzoffianum*, but a species in its own right, now known as *S. botryophora*. This is simply a misapplication of a name. *Arecastrum romanzoffianum* var. *botryophorum* (Mart.) Becc. should be listed as a nomenclatural synonym of *S. romanzoffianum*, while *Cocos botryophora* remains the basionym for *S. botryophora*.

Glassman correctly synonymized Beccari's *Arecastrum romanzoffiana* var. *ensifolium* under S. *coronata* and the author has confirmed that a Paris specimen identified by Drude as *Cocos botryophora* var. *ensifolia* is definitely *Syagrus coronata*.

The internet is awash with names created by enthusiasts and nurserymen to designate certain morphotypes of *Syagrus romanzoffiana*. One of these is 'Litoralis' or 'Littoralis,' otherwise known as the silver queen, a name given to some that survived a major freeze in Florida by Carter Seeds. It is also available from the rarepalmseeds.com website under the same name. It is said to be a robust queen palm from Argentina, Uruguay and southern Brazil that will survive subfreezing temperatures to –9° C with no cold damage. This name has also been used to describe seeds believed to come from Santa Catarina and often referred to as the Santa Catarina queen. The name *Syagrus* 'Litoralis' also refers to this same morphotype for palms near the coast or shoreline of the Rio de la Plata between Argentina and Uruguay.

The name 'Stricta' refers to a particular morphotype located in a strip mall in Sunnyvale, California growing in a group of about a dozen queen palms. Whereas the leaves of the typical queen palm are gracefully spreading, in this one the leaves are erect, strongly ascending and cling tightly to the trunk (Tomsky 2008). The name 'Pendula' refers to a morphotype that is just the opposite of 'Stricta' observed in the south of Spain with long pendulous leaves and large pendulous infructescences (Padilla Lopez 2008).

Syagrus 'Abreojos' is believed to be a genetic mutation of *S. romanzoffiana*. This palm resembles a massive queen palm with a huge trunk, large petioles and with spectacular, dark green, plumose leaves. It was discovered in the 1970's by Robert 'Pogo' Bob de Jong as he was vacationing in Ponta Abreojos in Baja California, Mexico (Jong 2008), and about two hundred seeds from his tree in San Clemente, California were distributed, and some are believed to have been sent to Hawaii to become known as *Syagrus* sp. 'Ho'omaluhia' (Ouer 2013).

In summary, the author choses to follow Barbosa Rodrigues (1903) and Glassman (1987) in recognizing *S. romanzoffiana* as a polymorphic species, resulting from differences in soils and in elevation; but also from occasional hybridization and genetic integration with other *Syagrus* species.

Representative specimens:—ARGENTINA, **Corrientes:** Ituzaingo, San Carlos, 13 November 1971, *A. Krapovickas et al. 17946* (F!, P!); Ituzaingo, Ituzaingo, without date, *T. Meyer 6647* (U); Mburucuya, Estancia Santa Teresa, 29 September 1954, *T.M. Pederson 2817* (CTES!, G, P!, S); **Misiones:** 20 December 1970, *M.M. Arbo 252* (MBM); Guarani Traval Bacia el ayo. Paraíso, –26.92, –54.21, 16 March 1994, *S.G. Tressens et al. 4940* (CTES, UB!); Leandro N. Alem, Ruta Nac. 14.2 km de Cerro Azul, –27.57, –55.25, 9 April 1971, *V.R.I. Maruñak 185* (IAC!, MBM!, P!); Posada, 1907, *Spegazzini s.n.* (FI); Puerto Leon, 1914, *H.M. Curran 711* (US); Santo Tomé, Ea. Berttán (Infrán Cué), 23 km SW de Virasoro, 8 April 1992, *S.G. Tressens et al. 4017* (CTES!, MBM, UB!); BRAZIL. **Bahia:** 1940*, G. Bondar s.n.* (F-619773!); Barra da Choça, estrada que liga Barra da Choça à Faz. Roda d'Agua (Rio Catolé), 3–6 km E of Barra da Choça. Folha SD-24 (15-41b), ca. –14.90, –40.57, 22 November 1978, *S.A. Mori et al. 11324* (BH!, CEPEC!); Itapetinga, a 28 km a esquerda da Itapetinga/Itambé numa matinha, –15.45, –40.48, 17 October 1985, *J.L. de S. Lima & Sá 166* (F), *167–170* (HTSA!); **Distrito Federal:** Brasília,

Jardim Botânico de Brasília, JBB Viveiro 102 m, –15.87, –47.85, 7 January 1997, *R.C. Martins 202* (UB!); Brasília, Próximo a Brazlândia, –15.78, –47.93, 16 April 1999, *R.C. Martins 235* (FUEL, UB!); Brasília; Mata do Açudinho, cabeceira da mata, Fazenda Sucup, 1080 m, –15.92, –48.03, 8 August 1996, *A.B. Sampaio et al. 43* (UB!); Brasília; Fazenda Água Limpa-UnB. Mata de galeria do Córre, Mata de galeria do Córrego da Onça, 1050 m, –15.93, –47.90, 18 November 1994, *B.M.T. Walter & N.R. de Oliveira, 2291* (CEN); **Espírito Santo:** Itapemirim, Praia do Pontal, –19.80, –40.86, 29 January 1994, *H.Q. Boudet Fernandes 3121* (MBML); Linhares, Área do palmeto L.D Pl 25, –19.39, –40.07, 10 August 2000, *D.A. Folli 3666* (CVRD); São Mateus, campo, 9 July 1969*, S.F. Glassman & J.T. Medeiros-Costa 8742* (F!); São Roque do Canaã, (Santa Teresa) São Roque, arredores de São Dalmácio, –19.80, –40.66, 30 April 1986, *H.Q. Boudet Fernandes 1951* (MBML!); São Roque do Canaã, (Santa Teresa) Barra de Santa Júlia, –19.66, –40.67, 14 May 1986, *H.Q. Boudet Fernandes 1980* (MBML!); **Goiás:** Alto Paraiso de Goiás, Chapada dos Veadeiros, 1164 m, –14.17, –47.61, 13 December 2001, *L.H. Soares-Silva et al. 1158* (CESJ, UB!); Goiânia, no km 14 da rodovia Goiânia para Nerópolis a margem direita, 3 December 1968, *J.A. Rizzo & A. Barbosa 1675* (UFG!); Sitio de Buracão, 1894, *A.F.M. Glaziou 22258* (P!); **Mato Grosso do Sul:** Bonito, –21.12, –56.48, without date, *V.R.B. Maria s.n.* (ESA!); Campo Grande, Apa do Guariroba, margem do córrego Saltinho, 530 m, –20.56, –54.40, 27 November 2012, *H.C. Vinci-Carlos 411* (CGMS); Corumbá, Faz. Rancharia Nhecolandia Pantanal, –19.07, –56.78, 13 September 1988, *A. Pott 4389* (CPAP!); Ilha Mutum, Rio Paraná, 233 m, –22.76, –53.30, 29 March 2012, *M. Parolin* (HCF); Nhecolandia, Fazenda Ipanema, Pantanal, 7 December 1986, *C.N. da Cunha et al. 2036* (CPAP!); Paranaúa, 28 Apr1892, *A.F.M. Glaziou s.n* (NY!); **Minas Gerais:** Alegria, 1893, *A.F.M. Glaziou 20027* (K, P!); Alpinópolis, –20.86, –46.39, 1 January 1997, *L.V.B. Bufo et al. 210* (ESA!); Antônio Dias, 720 m, –19.65, –42.87, 18 July 1997, *L.R. Noblick 5149* (BHCB!); Barão de Cocais, Brucutu, –19.94, –43.48, 28 April 1994, *J.M.L. Gomes 2017* (MBML); Brasília, Caldas, March 1774, *A. Regnell* (paratypes of *Cocos martiana* F, NY, P! [P-01794939], U, US, S,); Descoberto, Reserva Biológica do Grama, –21.46, –42.97, 2 September 2001, *L.F.A. Fazza et al. 07* (CESJ); Juiz de Fora, Museu Mariano Procópio, –21.76, –43.35, 3 April 1987, *B.B.S. Coelho & L. Krieger 22691* (CESJ); Monte Belo, Fazenda Lagoa, 800 m, –21.42, –46.25, 8 September 1987, *A.H. Gentry, et al. 59183* (MO, UEC); Padre Paraíso, 600–800 m, –17.07, –41.48, 23 July 1997, *L.R. Noblick 5155* (BHCB!); Uberlândia, Sobradinho-Quintal, –18.92, –48.28, 3 August 2004, *J.M. Barbosa 99* (HUFU); **Paraná:** Antonina, 1879, *P. Schwacke 6510, 44588* (R); Adrianópolis, Parque Estadual das Lauráceas, 900 m, –24.86, –48.72, 10 February 2009, *M.L. Brotto 289* (UPCB); Água Amarela, 17 April 1973, *G. Hatschbach 31820* (MBM); Bocaiúva do Sul, –25.21, –49.12, 28 December 1994, *G. Hatschbach 61406* (MBM); Campo Mourão, Parque Estadual Lago Azul (PELA), 605 m, –24.11, –52.31, 16 February 2007, *M.G. Caxambu s.n.* (HCF); Campo Mourão, Capela do Calvário, –24.05, –52.38, 10 September 2005, *H.C.L. Geraldino* (HCF); Cerro Azul, Garaipos, –24.82, –49.26, 23 January 1980, *G. Hatschbach 42738* (MBM, NY, US!); Colombo, –25.28, –49.22, 9 November 2005, *R.F.S. Possette 666* (UPCB); Cornélio Procópio, Mata São Francisco, 526 m, –23.15, –50.57, 25 July 2012, *C.M.V. Cardoso 1998* (FUEL); Curitiba, Bairro Ahú, –25.43, –49.27, 16 December 2000, *Dunaiski Jr, A. 1643* (UPCB); Curitiba, –25.43, –49.27, 18 November 2002, *F. Mariano Neto 86* (MBM); Fênix, Parque Estadual de Vila Rica do Espírito Santo, –23.92, –51.98, 28 September 1998, *S.B. Mikich s.n.* (UPCB); Goioerê, Parque Municipal Antônio Sestak, –24.18, –53.03, 18 September 2007, *E.M. Silva s.n.* (HCF); Guarapuava, –25.40, –51.46, 11 November 2009, *F. Bone s.n.* (MBM); Ibiporã, Fazenda Doralice, –23.27, –51.05, 5 June 2007, *G.A.S.D. Santos 3* (FUEL); Jaguariaíva, Jacarehý, –24.25, –49.71, 11 August 1914, *P.K.H. Dusén 15359* (NY!, U); Londrina, Pq. Estadual Mata dos Godoy Margem esq. do rio, no pasto, –23.31, –51.16, 26 October 1994, *F. Chagas & Silva 1769* (FUEL); Londrina, Parque Municipal Arthur Thomas, –23.31, –51.16, 4 August 2007, *V.M. Cotarelli 9* (FUEL); Londrina, Fazenda Figueira Paiquerê, –23.54, –50.98, 27 June 2003, *M.C. Lovato 69* (FUEL); Luiziana, Estação Ecológica Luiziana, 666 m, –24.52, –52.46, 18 April 2012, *M.G. Caxambu s.n.* (HCF); Luiziana, RPPN Depositozinho-Propriedade da, 592 m, –24.21, –52.32, 16 March 2009, *E.L. Siqueira* (HCF); Paranaguá, –25.52, –48.51, 26 April 1996, *F. Prado 4* (ESA!); Tamarana, Recanto do Pinhão, –23.90, –51.17, 9 October 2009, *M. Ferreira Jr. 108* (FUEL); Telêmaco Borba, Fazenda Monte Alegre à beira do ribeirão Varanal, –24.33, –50.56, 2 June 2006, *T.I.N. de Azevedo 340* (FUEL); Tuneiras do Oeste, Fazenda Água do Índio, –23.87, –52.88, 26 February 2004, *M.G. Caxambu* (HCF); Turvo, Propriedade da família Rickli, 1025 m, –25.07, –51.57, 26 January 2011, *M.G. Caxambu 3379* (HCF, HUEFS!); **Rio de Janeiro:** *A.F.M. Glaziou 13294* (C, F, FI, K, P!, U); Apr 1884, *A.F.M. Glaziou 15560* (FI, K, P!); Quinta, 9 September 1885, *A.F.M. Glaziou 16482* (P!); 9 September 1889, *Simard* (US); Itaipuaçú. Pico Alto Moirão, 23 May 1983, *R.H.P. Andreata 553* (RB); Maricá e Niteroi Itaipuaçu, Alto Moirão, –22.90, –43.21, 23 May 1985, *R.H.P. Andreata 687, 690, 692, 693, 695, 699* (RB);

Maricá e Niterói, Itaipuaçu Alto Moirão, –22.90, –43.21, 20 September 1989, *R.H.P. Andreata 945* (RB!); Niteroi e Maricá, Itaipuaçu, Pico Alto do Moirão, –22.90, –43.21, 8 November 1985, *R.H.P. Andreata 729* (RB!); Niterói, Bairro de Itacoatiara, Parque Estadual da Serra da Tirirca, Pedra de Itacoatiara, –22.88, –43.10, 19 February 1999, *R.S. Oliveira 22* (RB); Porciúncula, cerca 2 km da cidade, a beira da estrada para a Fazenda da Angola, –20.96, –42.04 to –20.96, –42.04, 10 January 1984, *J.P.P. Carauta & H.Q.B. Fernandes 4540* (HBR!, MBML!, NY); Rio de Janeiro, Larangeiras, –22.90, –43.21, 18 July 1887, *A.F.M. Glaziou 17339* (NY!, P!, U); Rio de Janeiro, Parque Natural Municipal da Prainha, começo da trilha do Boa Vista, junto ao paredão rochoso, –22.90, –43.21, 23 February 2005, *P. Leitman s.n.* (RB); **Rio Grande do Sul:** Abdon Batista, Área de supressão para construção da UHE Garibaldi, –27.61, –51.02, 5 July 2011, *F.B. Guimarães 1392* (FLOR); Barra do Ribeiro, Área da Riocell, –30.29, –51.30, 26 April 2002, *R.A.G. Viani et al. s.n.* (ESA!); Blumenau, Nova Rússia, –26.92, –49.07, 18 December 2003, *F. Bosio* (FURB); Brusque, Azambuja, 10 m, 20 September 1947, *P.R. Reitz 1878* (HBR!, MO, US); Canoas para P. Alegre, *B. Rambo SJ s.n.* (PACA 41812!); Erechim, Parque Munic. Longines Malinowski, –27.63, –52.27, without date, *A. Bbutzke et al. s.n.* (HPBR); Farroupilha, Sub Est. Exp. Fruticaultural, 12 April 1957, *O.R. Camargo 1263* (PACA!); Gramado Xavier, –29.27, –52.58, 14 June 2001, *M. Rossato 85* (MBM); Guaíba, Fazenda São Maximiano –30.18, –51.39, 23 August 2009, *L.F. Lima & G.A. Dettke 634* (ICN); Kappesberg p. Montenegro, 25 August 1945, *E. Friderichs SJ s.n.* (PACA 29869!); Kappesberg p. Montenegro, 18 October 1945, *E. Friderichs SJ s.n.* (PACA 30702!); Nova Petrópolis, –29.36, –51.06, 24 February 1999, *M. Rossato & R. Wassum 1* (NY!); Porto Alegre, Maria da Gloria, 19 May 1932, *L. Rambo s.n.* (PACA!); Porto Belo, Ilha João da Cunha, –27.16, –48.55, without date, *Equipe de Campo* (MPUC); Santa Maria, Est. Exp. Silvicultura, 28 February 1956, *O.R. Camargo 6* (PACA!); Santa Cruz do Sul, Trombudo, 16 November 1985, *J.L. Waechter 2135, 2139* (ICN!); Santa Rosa, 360 m, 1 August 1970, *P.R. Reitz 7380, 7386, 7388, 7389, 7391* (HBR!); São Leopoldo, August 1942, *P.R. Reitz s.n.* (HBR!); Torrente Portela, no Parque Estadual do Turvo, 26 June 1977, *J.R. Mattos 17294* (HAS); Treviso, Cirenaica, 197 m, –28.51, –49.50, 27 January 2010, *M. Verdi 4019* (FURB); Turvo, –28.93, –49.68, 30 January 2008, *J.G. Cemin s.n.* (CRI); Vila Manresa p. P. Alegre, 19 May 1932 *B. Rambo SJ s.n.* (PACA 240!); **Santa Catarina:** 1884, *P. Schwacke 5022* (FI); Brusque, Azambuja, 40 m, 10 September 1947, *P.R. Reitz 1878* (HBR!); Capinzal, perto de campinzal, 21 December 1962, *P.R. Reitz & Klein 14358* (HBR!); Chapecó, perto da cidade, 450 m, 31 December 1963, *P.R. Reitz & Klein 16655* (HBR!); Itapiranga, São Ludgero, 250 m, 10 January 1964, *P.R. Reitz & Klein 16811* (HBR!); **São Paulo:** Agudos, Duratex, próximo a porteira de acesso a AMBEV, –22.46, –48.98, 15 November 2006, *P.R. Genovez 71* (BOTU); Analândia, Fazenda Pedra Vermelha, –22.12, –47.66, without date, *D.C. Cavalcanti 429* (HRCB); Angatuba, Estação Ecológica de Angatuba (IF), –23.42, –48.35, 21 August 1987, *R.B. Torres et al. 269* (IAC, UEC); Angatuba, Estação Ecológica de Angatuba (IF), –23.42, –48.35, 1 January 1988, *R.B. Torres & N. Figueiredo s.n.* (IAC); Antonina, Paraná ad Antonina, Serra de Santarem 14 December 1879, *P. Schwacke 2513* (RB!); Assis, –22.66, –50.41, 1 January 2002, *A.P. Savassi-Coutinho 663* (ESA!); Barretos, Fazenda Nelore, indo para Olímpia, a 8 km da entrada para Barretos, 600 m, –20.56, –48.57, 22 May 1997, *H.Q. Boudet Fernandez 3209* (MBML, NY); Bauru, Fazenda Monte Alegre, mata da Copaíba, –22.31, –49.06, 9 January 2002, *M.E.S Phaschoa 2749* (BOTU); Bauru, Jardim Botânico de Bauru, –22.31, –49.06, without date, *M.H.O. Pinheiro 581* (HRCB); Bauru, Jardim Botânico Municipal de Bauru, –22.31, –49.06, 27 January 1998, *M.H.O. Pinheiro 682* (IAC); Bofete, Fazenda Santa Terezinha (Eucatex) . Remanescente de Floresta Estacional Semidecidual, –23.03, –48.18, 12 July 2004, *R.A.G. Viani et al. 363* (ESA!); Cajuru, Fazenda Santa Carlota, –21.27, –47.30, 12 October 1985, *L.C. Bernacci 111* (UEC); Campinas, Reserva Santa Genebra, –22.91, –47.06, 3 July 1996, *L.C. Bernacci 2678, 2680* (IAC); Campinas, Praça João Lech Junior (Bosque dos Alemães), –22.90, –47.06, 18 August 2000, *R. Cielo Filho 182* (UEC); Campinas, Distrito de Sousas-Mata Ribeirão Cachoeira (Condomínio Colinas do Atibaia), –22.90, –47.06, 20 October 2000, *R. Cielo Filho 267* (UEC); Campinas, Bosque dos Jequitibás, –22.80, –47.04, 15 December 2005, *J.A.M.A. Gomes & J. Pena Filho 162* (IAC); Campinas, Parque do IAC, –22.91, –47.06, 1 October 1942, *J. Santoro s.n.* (MBML!); Campinas, Parque do IAC, –22.91, –47.06, 28 February 1945, *J. Santoro s.n.* (MBML!); Campinas, IAC, Avenida Barão de Itapura, Parque, –22.91, –47.06, 1 October 1942, *J. Santoro s.n.* (IAC); Campinas, Parque do IAC, –22.91, –47.06, 14 November 1945, *J. Santoro s.n.* (IAC); Campinas, EMEF Padre Francisco Silva, –22.90, –47.06, 20 March 2000, *T. Spinelli 263* (UEC); Campinas, IAC, AV. Barão de Itapura, parque, –22.91, –47.06, 28 February 1943, *J.M.F. Toledo s.n.* (IAC); Cananéia, Ilha Comprida. a ca. 100 m da praia, 3 m, –25.02, –47.95, 24 July 1997, *H.Q. Boudet Fernandes 3221* (MBML, SP); Cananéia, ao lado do Rod. que dá acesso á ilha, –25.01, –47.92, 21 April 1998, *M.G.C. Gondim Jr. 36* (ESA!); Cananéia, Parque Estadual da Ilha do Cardoso-Perto do laboratório, –25.01, –

47.92, 22 June 1989, *M. Kirizawa 2259* (SP!); Cananéia, Parque Estadual da Ilha do Cardoso-Restinga do Pereirinha. Árvore nº 981, –25.01, –47.92, 6 November 1990, *M. Sugiyama 926* (SP!); Caraguatatuba, Swampy forest behind beach, 10 m, –23.58, –45.47, 9 January 1985, *A.H. Gentry & E.M. Zardini 49363* (MO, NY); Charqueada, –22.51, –47.77, 12 May 1993, *K.D. Barreto et al. 461* (ESA!); Corumbataí, –22.22, –47.62, 28 October 1993, *K.D. Barreto et al. 1521* (ESA!); Dracena, Fazenda Rancho Alegre, –21.48, –51.53, 6 September 1995, *L.C. Bernacci et al. 2053* (IAC, SP); Gália, –22.29, –49.55, June 1999, *M.R. Gorenstein 5002* (ESA!); Guarei, Sarandi, –23.37, –48.18, August 1980, *Neves IPH-USP18* (UEC); Iguape, Estação Ecológica Juréia-Itatins-Serra da Juréia, margem do Rio Verde, –24.70, –47.55, 13 June 1991, *E.A. Anunciação 85* (SP!, SPF!); Itanhaém, –24.18, –46.78, 7 September 1996, *G.O. Joaquim et al. 26* (ESA!); Jandira, In precincts of the Oomoto Hakko-en, Fernando Pessoa, Jandira, 750 m, –23.53, –46.90, 6 July 1987, *S. Tsugaru B50* (NY!); Mogi das Cruzes, Parque Municipal da Serra do Itapeti-Coletada na beira de estrada na zona de uso intensivo, –23.52, –46.19, 9 January 1994, *P.L.B. Tomasulo 353* (SP); Natividade da Serra, Bairro rural Puruba, –23.37, –45.44, 29 June 2005, *M.A.C. Pilla* (BOTU); Nazaré Paulista, ca. 21 km W of Igaratá off Dom Pedro highway between Campinas and Jararei. Forest at camping facility, Represa Atabainha Lake, 700 m, –23.42, –46.08, 5 January 1985, *A.H. Gentry & E.M. Zardini 49236* (MO!, NY, RB!); Nova Odessa, *H. Lorenzi et al. 5047* (HPL!); Pariquera-Açu, –24.71, –47.88, 20 April 1998, *M.G.C. Gondim Jr. 27* (ESA!); Pariquera-Açu, –24.71, –47.88, 2 June 1996, *N.M. Ivanauskas & F.F. Mazine 825* (ESA!); Pedreira, Fazenda Bela Vista, –22.74, –46.90, 20 August 1998, *L.F. Yamamoto 252* (UEC); Piracicaba, –22.72, –47.64, 5 November 1993, *Cirlene et al. 14* (ESA!); Piracicaba, –22.72, –47.64, 28 March 1998, *M.G.C. Gondim Jr. 19* (ESA!); Piracicaba, –22.7253, –47.6492, 11 December 1938, *Paolieri s.n.* (IAC); Rio Claro, Fazenda dos Caeures. 12 km E of Rio Claro. Prop. Jorge Ferguson, –22.41, –47.56, 2 July 1965*, S.F. Glassman 8000* (SP!); São Paulo, Instituto de Botânca. Árvore derrubada do Setor de Mudas. SPw, –23.54, –46.63, 22 August 1990, *E.S. Alves 5* (SP!); São Paulo, Instituto de Botânica, Jardim de Ornamentais. Em solo argiloso, –23.54, –46.63, 11 March 1996, *M.P. Botânico 1* (SP); São Paulo, Jardim Botânico. Nativa. Planta viva nº 42, –23.54, –46.63, 3 February 1934, *O. Handro s.n.* (SP!); São Paulo, Parque Estadual das Fontes do Ipiranga-Reserva Biológica. Atrás do prédio da Divisão da Fitotaxonomia. Fotografada a planta, –23.54, –46.63, 5 July 1983, *M. Kirizawa 897* (SP!); São Paulo, Parque Estadual das Fontes do Ipiranga-Reserva Biológica, área do Jardim Botânico. Frequente na reserva, –23.54, –46.63, 17 April 1991, *M. Kirizawa 2437* (SP!); São Paulo, Ypiranga, –23.54, –46.63, January 1917, *H. Luederwaldt, s.n.* (SP! SP-24152); São Paulo, 19 September 2000, *G.O. Romão & A.R. Duarte 162* (ESA!); São Paulo, Parque Estadual do Jaraguá, 929 m, –23.45, –46.77, 26 February 2008, *F.M. Souza et al. 178* (SPSF); Tupã, 20 km N of Tupa, Fazenda Vanuir, 5 July 1965, *S.F. Glassman & J.C. Gomes Jr. 8008* (F!, MO, RB, SP!); Vera Cruz, 18 km E of Marilia, Fazenda Pedro Felipe, –22.22, –49.81, 4 July 1965, *S. F. Glassman & J.C. Gomes 8010* (F!, MBM, NY, SP!); PARAGUAY. Near Paraguay, 1874, *B. Balansa 2714* (P); du Cerro-Hu, prés de Paraguari, 24 April 1874, *B. Balansa 2715* (P!); 1881–1890, *Morong 233a* (NY); **Alto Paraná**: 60 km N de Pto. Pte. Stroessner, 6 February 1984, *E.L. Little Jr. 40158* (NY, PY, P!, US); Alto Paraná, Estancia Río Bonito, Forest 1 (along the entrance), 240 m, –25.65, –54.81, 29 August 1994, *E.M. Zardini & M. Vera 40709* (MO, P!, PY!); **Amambay**: Estancia Errante, ca. 52 km SW de Bella Vista, 24 August 1980, *A. Schinini & E. Bordas 20720* (CTES, MBM!, MO); Amambay: Parque Nacional de Cerro Cora, –22.65, –56.05, February 1982, *J.S. Solomon et al. 6839, 6870* (MO, PY); **Canindeyu**: 5 km N of the Rio Ytambey (border between the Departments of Canindeyu and Alto Parana) along the Super Carateira highway (Ciudad del Este\Salto del Guaira), ca. 348 m, –24.59, –54.86, 27 November 2002, *L.R. Noblick 5284 et al.* (FCQ!, FTG!, PY!); **Cordillera**: Corrilleira de Altos, August 1885–1895, *E. Hassler 704* (G, K, P!); Guaira: Villarica, August 1918, *P. Jorgensen 4183, 4184* (A, C, F, NY, S); Valenzuela, Estancia R.D. (formerly Cabana "El Aguila"), ca. 5 km from town, 155–186 m, –25.63, –56.91, 21 November 2002, *L.R. Noblick et al. 5269* (FCQ!, FTG!, PY!); **Paraguari**: Parque Nacional Ybycui, Arroyo Minas, –26.00, –56.50, October 1985, *A.H. Gentry et al. 51852* (MO, PY); Paraguari, Parque Nacional de Ybycui, ca. 4 km from the central administration buildings, 360 m, –26.05, –56.87, 13 February 1996, *L.R. Noblick et al. 5116* (FCQ!, FTG!, PY!); **Presidente Hayes**: Estancia Laura Maria, 21 km SE of the Rio Negro along the Trans-Chaco Highway (Asuncion\Poso Colorado), 90 m, –24.33, –58.90, 23 November 2002, *L.R. Noblick et al. 5272* (FCQ!, FTG!, PY!); URUGUAY. **Maldonado**: Sierra de Caripe, Sierra de Coronilla, Pousada de Laguna, Rt. 39 N to Kilometer marker ca. km 67.5 then E ca. 8 km towards Cerro Catedral to Pousada de La Laguna, ca. 272 m, –34.34, –54.71, 17 March 2006, *L.R. Noblick & E. Beare 5464* (FTG!, MVFA!); **Montevideo**: Atahualpa, *W.G.F. Herter 345* (U); **Rocha**: Palmares de Castillos, 1944, *H.H. Bartlett 21397* (GH).

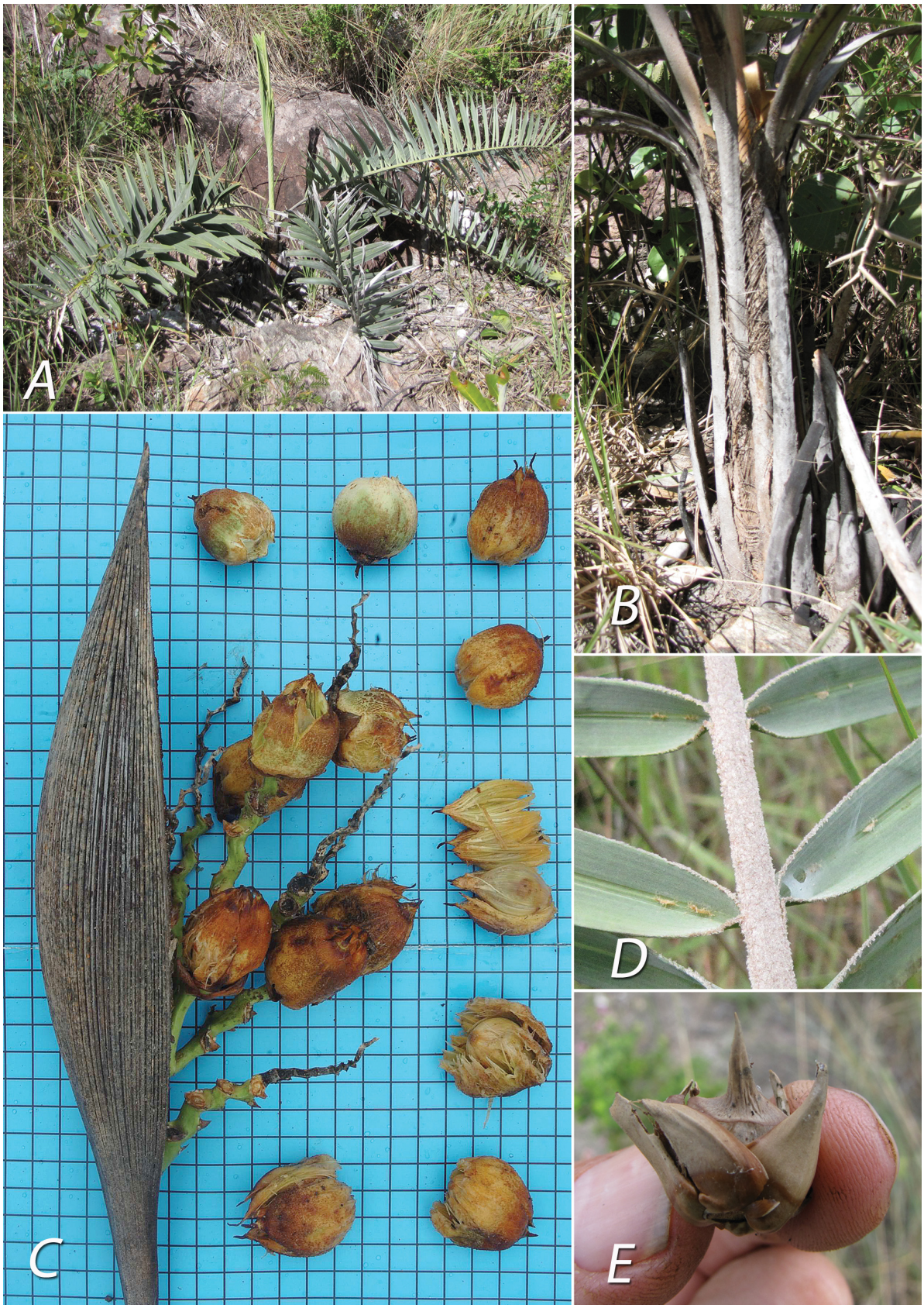

FIGURE 74. *Syagrus rupicola*. A. Habit. B. Above ground portion of the stem with persistent leaf sheaths. C. Infructescence showing the tendency of the fruit to split at their apices. D. Underside of leaflets showing the ramenta and tomentum along the rachis. E. Large old pistillate flower. Grid is in centimeters.

53. *Syagrus rupicola* Noblick & Lorenzi (2010b: 41). Type:—BRAZIL. Goiás: Teresina de Goiás, in the region of the Chapada dos Veadeiros, on the GO-118 highway towards Alto Paraíso de Goiás—km 215 (ca. 35 km from the town of Alto Paraíso), 1,140 m, –13.87, –47.34, 7 March 2009, *H. Lorenzi, R. Pimenta & R. Campos 6647* (holotype HPL!, isotypes FTG!, NY!, K!, RB!)

Figure 74 plate, Figure 65 map.

A short, robust solitary palm, slightly over 1 m tall. **Stem**, 10–20 cm long, short or subterranean, often appearing acaulescent. **Leaves** arched, with 3–6 in the crown, ca. 1 m long; *sheath* 17–35 cm with fibrous margins, *pseudopetiole* 36–55 cm long; *petiole* 16–30 cm long; rachis 70–120 cm 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, asymmetric, silver or bluish-green, slightly lighter on the lower surface, distributed irregularly in clusters of 2–5, inserted at different angles along the rachis, often patches of ramenta scales or tomentum present near the base along the abaxial midvein, especially where the leaflets are inserted on the rachis, basal leaflets 6–22 × 0.1–0.4 cm, middle leaflets 24–34 × 2–3 cm, apical leaflets 4.0–8.5 × 0.2–0.6 cm. **Inflorescence** erect, spicate to branched; *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; *peduncle* 30–40 cm long; *inflorescence axis* ca. 24 cm long; *rachis* absent to ca. 8 cm; *rachillae* 1–6, ca. 9–15 cm long; *staminate flowers* 13.1–13.9 × 3.7–4.0 mm at the apex, 18–19 × 4.4 mm at the base, green to yellow, sepals 1.5–3.1 × 1.9–2.6 mm, glabrous, faint visible nerves, petals 11.3–12.4 mm long at the apex, 16.1 × 3.6–4.4 mm at the base with acute tips, nerves indistinct, stamens 4.4–5.4 mm long, anthers 3.0–4.8 mm long, filaments 0.7–1.4 mm long, pistillode less than ca. 1 mm long, 0.4 mm, basal *pistillate flowers* pyramidal, 16–20 × 11–18 mm, glabrous, sepals 11–19 × 5.1–7.7 mm, petals 14.6–18 × 4.4–5.5 mm, upper 1/3–1/2 of petals valvate, ca. 5.8–9 mm long, glabrous, pistil 12.8–16.8 × 4.4–4.7 mm, glabrous to finely lepidote, stigmas 5 mm long, glabrous, staminodal ring ca. 1.5–2.5 mm high, 6-dentate. **Fruit** 3.5–3.9 × 2.5–3.4 cm, nearly globose, pale yellowish to reddish brown, epicarp covered with a fine reddish-brown lepidote indument, less than 0.5 mm thick, mesocarp thickness not measured, succulent and fibrous (pulpy), visibly splitting at the apices when mature; *seed* not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—palmeira-da-pedra.

Etymology:—The specific epithet, *rupicola,* means rock dweller and alludes to the rocky habitat of this species.

Distribution and habitat:—Occurs in the northern part of the state of Goiás, Brazil, in the Chapada dos Veadeiros region, in high elevation (above 1,000 m) campo rupestre or cerrado, generally in very rocky, well-drained soils.

Conservation:—Most of the distribution of this species is contained and protected within a national park (Parque Nacional da Chapada dos Veadeiros). The palm itself grows in very rocky places, making extraction very difficult and cultivation of such areas impossible. This species is classified as least concern, LC.

Phenology:—Fruiting in December.

Uses:—This species is a spectacular ornamental and should be successfully cultivated in rock gardens in full sun. It may grow in both tropical and subtropical regions, because it should be capable of tolerating weak freezes.

Notes:—This is a medium-sized to fairly large-sized, acaulescent to short-stemmed palm with beautiful bluish or silvery rigid-coriaceous leaves. It has large female flowers (16–20 mm long), and its fruits split at their apex, like several other rock-loving *Syagrus* species (i.e. *S. picrophylla, S. ruschiana*).

Representative specimens:—BRAZIL. **Goiás:** Cavalcante, beira da estrada entre Cavalcante e Engenho II, próxima a roça do Jorge, 16 January 2010, *R.C. Martins et al. 1063* (UB!); Cavalcante, Estrada entre Cavalcante e Engenho II, próxima a roça do Jorge, November 2011, *R.C. Martins et al. 1145, 1148, 1149* (UB!); Cavalcante; cerca de 4 km da vila Veneno, em direção ao Rio Sã, 25 January 2001, *G.P. Silva et al. 4653* (CEN); Cavalcante, Balsa do Rio Tocantins (Serra Branca), para Serra, 410 m, –13.57, –48.10, 23 May 2001, *G.P. Silva et al. 5070* (CEN).

54. *Syagrus ruschiana* (Bondar) Glassman (1963: 261). *Cocos ruschiana* Bondar (1941: 45)

Arikuryroba ruschiana (Bondar) Toledo (1944: 6). Lectotype (designated by Glassman [1987: 42]):—BRAZIL. Espirito Santo: Colatina and S. Mateus, 1941*, G. Bondar s.n.* (F! [F-620822]).

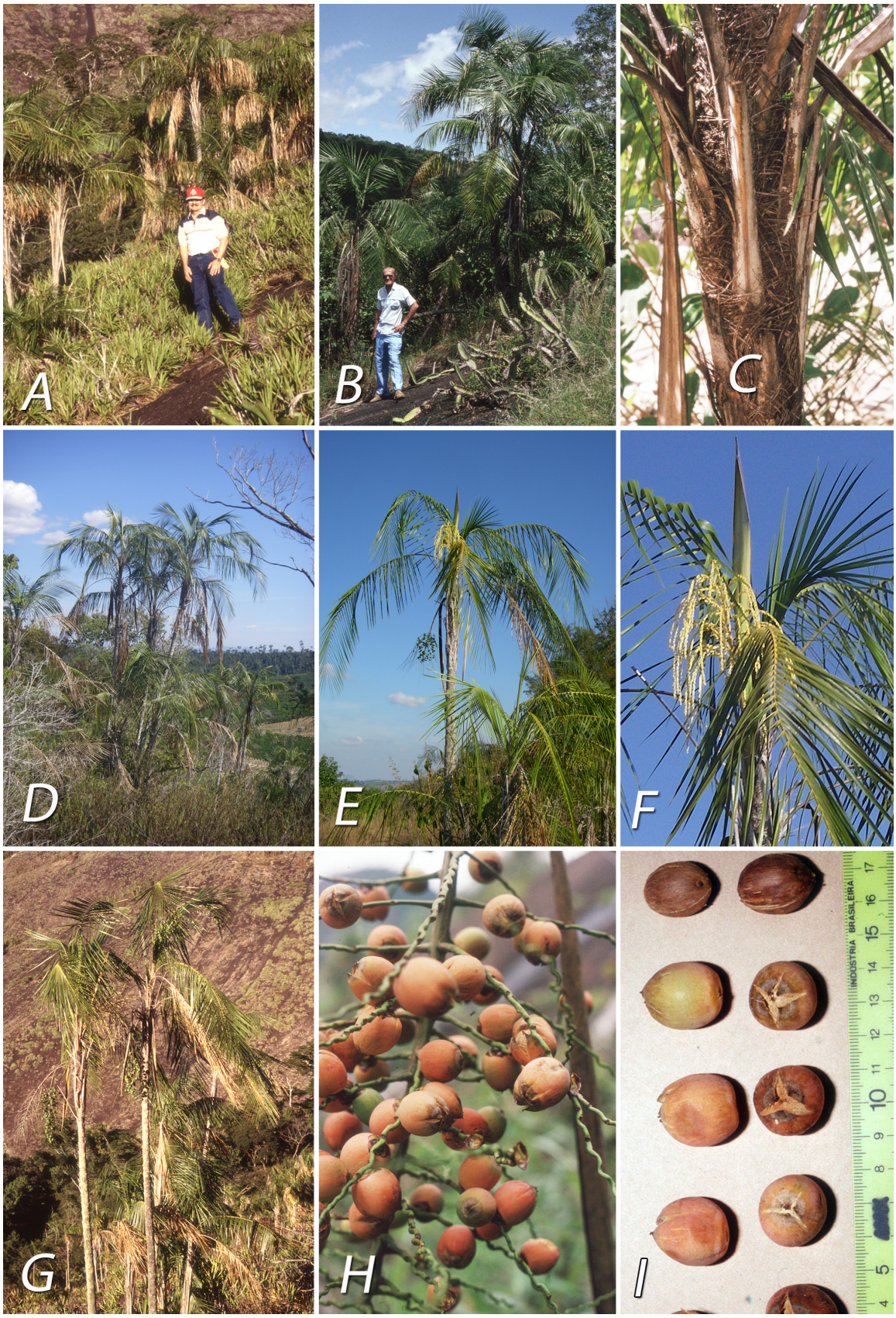

FIGURE 75. *Syagrus ruschiana*. A. Habit in Minas Gerais with Lester Cline. B. Habit with Gilson Essenfelder in Minas Gerais with cacti. C. Leaf sheaths below crown. D. Clustering specimen in Espirito Santo. E. Flaccid crown with inflorescence in Espirito Santo. F. Inflorescence. G. Habit in very rocky habitat. H. Infructescence. I. Fruits showing spitting tips.

Figure 75 plate, Figure 65 map.

Medium-sized, clustering to rarely solitary palm. **Stem** ca. 2–8 m × 4–12 cm, caulescent, erect or arching, often with persistent leaf bases. **Leaves** 7–12; *sheathing leaf base* ca. 30–36 × 7–8 cm; *pseudopetiole* 90–140 cm long; *petiole* 18–30 × ca. 1.5 cm, 0.9–1.0 cm thick; *rachis* 128–200 cm long; *leaflets* slightly lighter on the abaxial surface, 48–58 along one side, evenly spaced along the rachis, ramenta scales or tomentum present where the leaflets are inserted on the rachis and also along the abaxial midvein; basal leaflets 39–45 × 0.1–0.8, middle leaflets 50–53 × 2.4–3.5 cm, apical leaflets 23–30 ×0.5–1.0 cm with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 27–35 × 2.5–4.5 cm; *peduncular bract* 72–135 cm long, expanded portion 65–91(–110) × 2–5 cm, including a 0–2.5 cm beak, 4–7 cm perimeter, 1 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument, especially on the proximal portion of the bract; *peduncle* ca. 44–74 cm × 7–10 mm, 6–7 mm thick, elliptical in cross-section, brown tomentose; *inflorescence axis* 52–82 cm long; *rachis* 26–61 cm long; *rachillae* 41–75, with scattered brown tomentum, 8–28 cm long at the apex, 25–61 cm long at the base; *staminate flowers* 3–5 mm long at the apex, 5–6(–9) × 2–5 mm at the base, green to yellow, sepals 1–2.5 × 1–2 mm, glabrous, no visible nerves, petals 4–5 mm long at the apex, ca. 5 × 1.5–2 mm at the base with acute tips, nerves visible at the base of the petal, stamens 3.7–3.8 mm long, anthers 3.4–3.5 mm long, filaments 1–1.5 mm long, pistillode 0.5–1 mm long; basal *pistillate flowers* rounded, 4–6 × 4–5 mm, yellow, glabrous, sepals 4–5 × 3–4 mm, glabrous with very visible veins, not keeled, petals 3–4 × 2–3 mm, glabrous, visibly veined, valvate tips 1/5–2/5 the length of the petal, ca. 1 mm long or less, pistil 2.5–3 × 2–2.5 mm, glabrous, stigmas ca. 1 mm long, glabrous, staminodal ring ca. 0.5–0.7 mm high, 6-dentate. **Fruit** ovoid to nearly globose, 2.5 × 2 cm, golden, orange-yellow when mature, glabrous for the most part, but with thin indument at apex, epicarp less than 1 mm thick, mesocarp 1–3 mm thick, succulent and fibrous; *endocarp* ca. 2.1–2.5 × 1.8–2 cm, 1–2 mm thick on all sides; *seed* nearly globose, ca. 1.4 × 1.3 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—coco-da-pedra, coco-de-pedra, colatina

Etymology:—The specific epithet, *ruschiana,* honors Dr. Enrico J. A. Ruschi, the Secretary of Agriculture of the state of Espírito Santo, who kindly facilitated Bondar's visit to the state of Espirito Santo in 1941. He was also the brother of Brazil's most esteemed naturalist and passionate conservationist, Augusto Ruschi.

Distribution and habitat:—Espírito Santo and Minas Gerais. Brazil, in the Atlantic Forest region, on rocky granitic mountains in very thin soils.

Conservation:—This species does not grow on valuable agricultural land, but rather in cracks in the rock and in thin organic soils of steep rock faces. Therefore, it is not threatened by anything but fire. It produces many seeds, which germinate well. There are many large populations in Espirito Santo and a few in Minas Gerais. It is classified as least concern, LC.

Phenology:—Fruits abundantly in spring and summer (October–March).

Uses:—Palm extremely ornamental by virtue of its graceful, shiny foliage and resistance to periodic dryness, making it possible to be cultivated with success in tropical regions.

Notes:—A rock-loving, clustering palm with evenly spaced, bluish-green, thick, coriaceous leaflets, and orange fruits whose epicarp and mesocarp frequently split at the apex at maturity. In his description, Bondar (1941) included four black and white images, did not list any specimens, and wrote that the endosperm was ruminate; but the author found the endosperm to be homogeneous. The mention of ruminate endosperm led Toledo (1944) to transfer *Cocos ruschiana* to *Arikuryroba,* but he did not designate a type. When Glassman (1972b) placed *Cocos ruschiana* in the genus *Syagrus*, he mentioned Bondar's images including a Bondar specimen, but he also did not designate a type. Only later, did Glassman (1987) officially designate Bondar's 1941 collection as the lectotype.

Representative specimens:—BRAZIL. **Espírito Santo:** Água Doce do Norte, Córrego Havaí, afloramento rochoso para torre de celular/rampa de voo livre, –18.58, –40.99, 27 April 2008, *A.P. Fontana 5056* (MBML); Águia Branca, Córrego do Trinta (CEIER), Prop.: Alex Sandro, –19.023, –40.65, 170 m, 25 April 2006, *V. Demuner 2195* (MBML); Águia Branca, Pedra da Bandeira, Santa Luzia, prop.: Ciro Ferreira, 170 m, –18.98, –40.67, 26 July 2006, *L.F.S. Magnago 1134* (MBML); Águia Branca, Santa Luzia, Prop. Ciro Ferreira, 170 m, –18.98, –40.67, 4 July 2007, *R.R. Vervloet 2776* (MBML); Baunelha, 13 km E of Colatina (5 km W of Baunelha), 1969*, S.F. Glassman & J.T. de Medeiros-Costa 8743* (F!); Caladina, estrada que liga Caladina-Domingos, 22 July 1998, *E.R. Salviani & H. Lorenzi 132* (HPL!); Colatina, –19.54, –40.63, 9 December 1988, *H.Q. Boudet Fernandes 2685* (MBML!); Colatina, margens do Rio Pancas, Rio Doce, 19 September 1930, *J.G. Kuhlmann 366* (RB!);

Colatina, Rio Pancas, Colatina, –19.54, –40.63, 8 December 1943, *J.G. Kuhlmann 6661* (RB!); Colatina; 14 km north of the turn off for Baixo Guando and Aimores on the ES-080 just north of the Policia militar post, 200–500 m, –19.41, –40.68, 3 August 1997, *L.R. Noblick 5169* (IPA!); Nova Venécia, Serra de Baixo, –18.78, –41.43, 7 September 1989, *H.Q. Boudet Fernandes 2796* (MBML!); Nova Venécia, a 3 km de Todos os Santos, lado esquerdo, into para Partista, 200 m, –18.78, –40.40, 8 September 1989, *H.Q. Boudet Fernandes et al. 2827* (MBML!); Nova Venécia, Serra de Baixo, beira da rodovia Nova Venécia-São Gabriel da Palha, propriedade do Sr. Valdemar. Área de Proteção Ambiental da Pedra do Elefante, 314 m, –18.80, –40.47, 9 May 2008, *C.N. de Fraga 2079* (MBML, RB, UPCB); Nova Venécia, Serra de Baixo, Pedra da Torre. Área de Proteção Ambiental da Pedra do Elefante, –18.78, –40.45, 18 February 2008, *P. Labiak 4685* (MBML, RB); Pancas, estrada Pancas, Vila Verde, cerca 2 km da Sede Municipal, –19.23, –40.85, 9 December 1988, *H.Q. Boudet Fernandes 2678* (IAC, MBML!); Pancas, 3 km NW of town on the road Pancas/Vila Verde, 250–400 m, –19.25, –40.87, 10 March 1992, *L.R. Noblick 4838* (K!, MBML!, NY!, VIES!); Pedra do Pancas, rio Pancas, além da Colonia, Colatina, November 1951, *J.G. Kuhlmann s.n.* (RB); Serra do Cristalino, Norte do Espírito Santo, 16 November 1953, *A.P. Duarte 4049* (RB!, US!); Linhares, Palmeto, –19.39, –40.07, 11 April 2000, *D.A. Folli 3600* (CVRD); São Gabriel, *E.R. Salviani et al. 132* (HPL!); **Minas Gerais:** Carlos Chagas, Rod. BR-418, km 112, 11 April 1984, *G. Hatschbach 47808* (MBM!); Teófilo Otoni, Margem da Rodovia Nanuque-Teófilo Otoni, 14 August 1965, *R.P. Belém 1628* (BH!, UB!); Teófilo Otoni, Margem da Rodovia Teófilo Otoni, Nanuque, 30 June 1968, *R.P. Belém 3789* (CEPEC!, NY!, US); Teófilo Otoni, na beira da BR 418, –17.87, –41.05, 8 February 2010, *H. Lorenzi et al. 6831* (HPL!).

55. *Syagrus sancona* (Kunth) Karsten (1857: 247). *Oreodoxa sancona* Kunth in Humboldt, Bonpland & Kunth (1816: 304). *Oenocarpus sancona* (Kunth) Sprengel (1825: 140). *Palma sancona* (Kunth) Kunth (1841: 182). *Cocos sancona* (Kunth) Hooker (1884: 72). *Calappa sancona* (Kunth) Kuntze (1891: 982). Lectotype (designated by Glassman [1969: 89]):—COLOMBIA. Cundinamarca: Guaduas (Bogotá), no date, *Karsten s.n.* (LE)

Platenia chiragua Karsten (1857: 250). *Syagrus chiragua* (H.Karst.) Wendland (1878: 257). *Cocos chiragua* (H.Karst.) Beccari (1887: 446). Neotype (designated by Bernal & Galeano [1989: 327]):—COLOMBIA. Norte de Santander: carretera Cicuta-Pamplona, 4 km al sur de la Donjuana, 950 m, 23 March 1987, *R. Bernal & G. Galeano 1359* (neotype COL; isoneotypes AAU, BH, HUA, K, NY).

Cocos argentea Engel (1865: 690). *Syagrus argentea* (Engel) Beccari (1916: 465). *Butia argentea* (Engel) Nehrling (1929: 1). Neotype (designated here):—COLOMBIA. without locality, without date, Engel s.n. (neotype LE [LE-00000906]).

Syagrus ecuadorensis Beccari (1916: 469). Type:—ECUADOR. [Manabi:] Zapullo, ca. 1897, *Eggers 15681* (holotype M, isotypes B, K!, L!, P!, US);

Syagrus tessmannii Burret (1933: 106). Type:—PERU. Middle Marañon, near Apaga, 1924, *Tessman 4811* (holotype B).

Figure 76 plate, Figure 77 map.

Large, solitary palm. **Stem** ca. 7–20(–30) m × (15–)20–30 cm (35 cm at base), erect, columnar, self-cleaning, light gray colored trunk. **Leaves** 8–17; *sheathing leaf base* ca. 76–79 × 30–50 cm; *pseudopetiole* (50–)75–100 cm long; *petiole* 0–15 × 3.5–4.5 cm, 2.0–2.2 cm thick; *rachis* (130–)210–310 cm long; *leaflets* slightly lighter on the abaxial surface, 130–188 along one side, in clusters of (2–)3–5(–6), inserted at various angles, giving the leaf a plumose appearance, ramenta scales or tomentum present where the leaflets are inserted on the rachis and also along the abaxial midvein; basal leaflets 41–70 × 0.3–1.1 cm, middle leaflets 55–100 × 3.5–5.5(–6.2) cm, apical leaflets 15–44 × 0.3–1.5 cm mostly with acuminate tips. **Inflorescence** pendulous, spirally branched; *prophyll* 50–80 cm long; *peduncular bract* 72–150 cm, expanded portion 60–118 × 11–25 cm, including a 2.5–9.5 cm beak, 20–30 cm perimeter, 3–5 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 25–50 × 2–3 cm, 1.0–1.5 cm thick, elliptical in cross-section, glabrous; *inflorescence axis* (61–)70–140 cm long; *rachis* 32–100 cm long; *rachillae* 78–180, glabrous, 12–31 cm long at the apex, 31–70 cm long at the base; *staminate flowers* lanceolate, ovate or obovate, 6–11 mm long at the apex, 9–13 × 4–7 mm at the base, green to yellow, sepals 1–2.5 × 2 mm, glabrous, with raised nerves, petals 5–10 mm long at the apex, 8–13 × 5–12 mm at the base with acute tips, stamens 4.5–7 mm long, anthers 4–7 mm long, filaments 1–3 mm long, pistillode 0.5–1 mm long; basal *pistillate flowers* conical, (5–)7–12 × (4–)6–8 mm, light yellow, glabrous, mostly strongly nerved or rugose, with blunt or rounded tips, sepals 6–9 × 5–8 mm, petals 7–9.5 × 4–7 mm, glabrous, pistil 4.5–6 × 3–4 mm, glabrous or waxy scaly, stigmas less than 2 mm long, glabrous, staminodal ring ca. 1 mm high, 6-dentate. **Fruit** ellipsoid, 3–3.5 × 1.5–2.3 cm, yellow, yellow-orange when mature, glabrous, epicarp less than 1 mm thick, mesocarp oily, 2–3 mm

thick, succulent and fibrous; *endocarp* ca. 2.2–3 × 1.5–2.2 cm, 1.5–2 mm thick on its sides, 2–3 mm thick at the ends; *seed* ellipsoid ca. 1.5–1.8 × 0.8–1.0 cm, endosperm homogeneous. Germination remote-tubular.

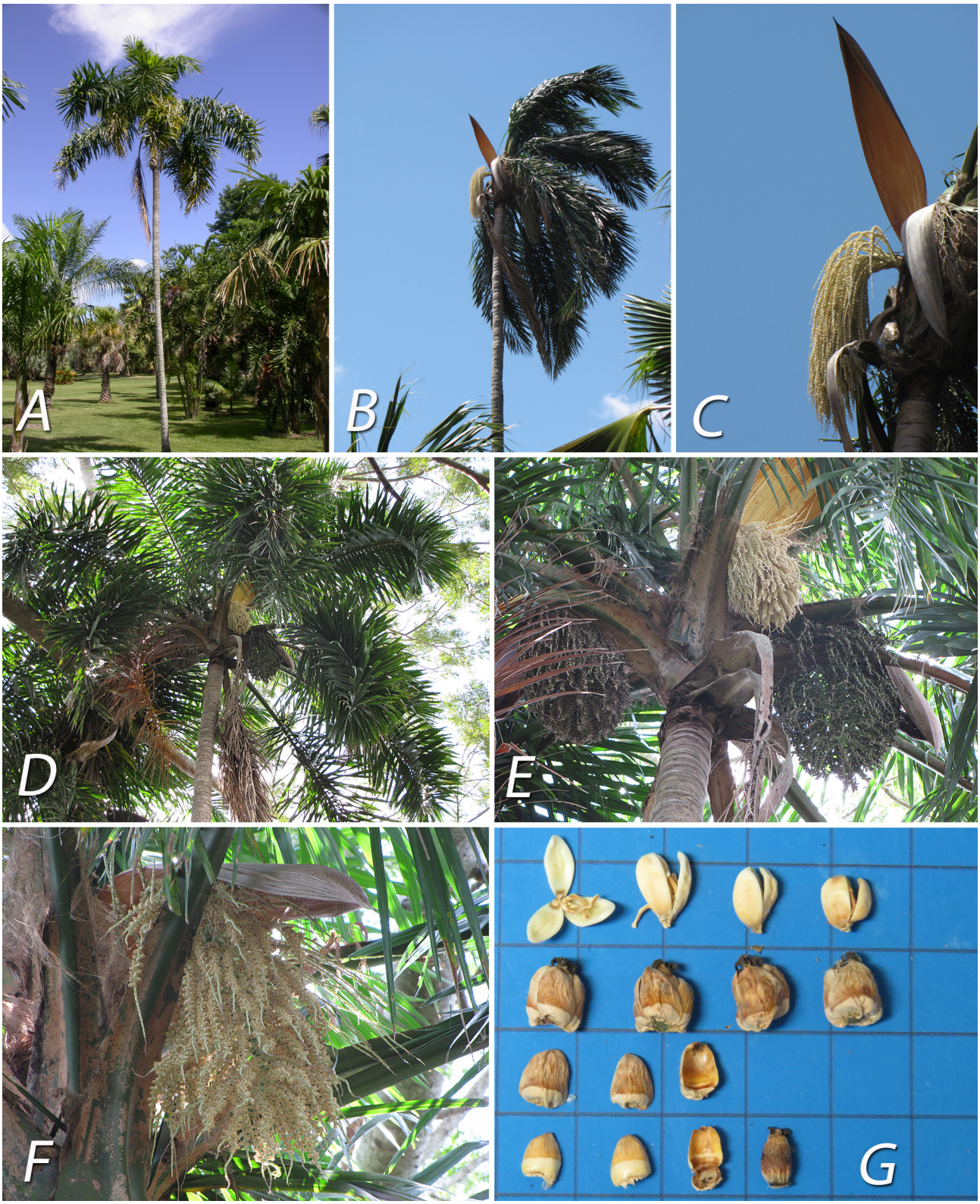

FIGURE 76. *Syagrus sancona*. A. Habit cultivated at MBC. B. Crown in Bolivia. C. Inflorescence with long numerous rachillae. D. Crown near Santa Cruz, Bolivia, showing plumose leaves. E. Inflorescences. F. Inflorescence with receptive pistillate flowers. G. Flowers, first row: staminate flowers; second: pistillate flowers; third: pistillate sepals; fourth row: pistillate petals and pistil. Grid is in centimeters.

Common name:—mapora, zancona, palma sancona, chonta, palma real, inchavi, catolé, pifaia, jaciarana, açairana, colombian fox-tail, south-american-foxtail-palm, sumuqué, ouricuri, tiba, sumuquich, mumuquich, yataí, quirache, guirache.

Etymology:—The specific epithet, *sancona,* may be a common name used in the region where Humboldt and Bonpland first collected this palm. Kuntze wrote in the original description "*Palma sancona incoloram,"* which translates as Sancona palm of the inhabitants.

Distribution and habitat:—In primary and secondary tropical forests and areas of pasture, always on terra firme. Grows in Acre and western Amazonas, Brazil. It occurs also in Colombia, Ecuador, Peru, and Bolivia in forests of the Andina region at elevations to 1200 m.

Conservation:—This species is widely distributed along the Andes. It is also frequently cultivated in the region, often used as a street tree in Bolivia. It is classified as least concern, LC.

Phenology:—This species fruits in spring (October–December).

Uses:—Species is ornamental, cultivated in the city of Rio Branco, Brazil and used as a street tree in Santa Cruz, Bolivia. The fruits are oily, but there is no record for the use of its oil. The Parque Zoobotânico of the Universidade Federal do Acre has an experimental planting of this species and has supplied seeds for seedling production.

Notes:—This is a tall, solitary Andean *Syagrus* with inflorescences containing an unusually high number of rachillae, close to 200. Each infructescence produces ca. 1,500 yellow fruits.

When Karsten described *Syagrus chiragua* (as *Platenia chiragua*), he remarked that it grew like *S. sancona,* but he provided no illustrations and cited no specimens. The species was designated as a *species dubium* by Glassman (1987: 91). He wrote that Karsten's description was incomplete and that there was nothing in his description that would indicate that this was even a species of *Syagrus,* but that if it is *Syagrus*, it could be either *Syagrus orinocensis* or *Syagrus sancona*. Bernal and Galeano-Garces (1989) traveled to the type locality and confirmed it to be *Syagrus sancona*.

Bernal and Galeano-Garces (1989) reported: "Concerning the common name *chiragua* reported by Karsten, it must be noted that this name is not currently applied to this species in the region of Pamplona; the name presently used is *quirache*, which is probably not different from the *guirache* reported by Engel (1865) for his *Cocos argentea* Engel [*Syagrus argentea* (Engel) Becc.], described from the same general area. Actually, *Syagrus argentea* is also a synonym of *Syagrus sancona*, as recently proved by Wessels Boer (1988)." Therefore, *Syagrus argentea* is no longer a doubtful or uncertain species as designated by Glassman (1987), but is *Syagrus sancona* and included in the synonymy above. A supposed isotype (JSTOR, 2016) of *Cocos argentea* was found at the Komarov Botanical Institute (LE) herbarium. Franz Engel (1834–1920) was born and died in cities about 35 miles apart in northeastern Germany. On the specimen label it listed the original institution as Herbarium Horti Botanici Imperialis Petri Magni (a Russian herbarium?). Engel travelled extensively in South America from 1857–1863, when he was in his 20's. The closest major German herbarium to him at the time was in Berlin, ca. 70 miles away from his home. Since some of his collections were found in Berlin (B), the original holotype is presumed destroyed in Berlin as a result of World War II. Since Engel (1865) never listed any specimens in his original protologue, he did not designate any types.The specimen at LE is indeed an appropriate choice for a type specimen, since it was collected and verified by Engel, but it cannot be an isotype, therefore it is herein designated as a neotype.

Representative specimens:—BOLIVIA. **Beni:** Ballivian, 35 km en coamino de Yucumo a Rurrenabaque, Colegio Técnico Agropecuário Río Colorado, 235 m, –14.83, –67.03, 20–25 June 1989, *D.N. Smith et al. 13565* (BOLV, LPB, MBM!, MO, NY!, U, USZ); Espiritu, isla Espíritu, 200 m, March 1990, *M. Moraes 1271* (LPB); Estación Biologica Beni, Río Curiraba, 250 m, –14.67, –66.00, 4 April 1986, *M. Moraes 792–793* (LPB); Río Aguas Negras, 250 m, –14.47, –66.43, 14 September 1987, *M. Moraes 897* (LPB); Vaca Diez, Along Río Beni (here called Río Madre de Dios on some maps), vic. Florida, 125 m, –10.83, –65.85, 13 September 1985, *M.H. Nee 31904* (LPB, MO!, NY); Yacuma, Espiritu, Isla Lucumo, Río Yacuma, 200 m, 29 September 1979, *Beck 2640* (LPB, US); **La Paz:** Abel Iturralde, Parque Nacional Madidi, Asariamas, sector San Martin, 1216 m, –14.16, –68.72, 18 July 2013, *A.F. Fuentes Claros et al. 18351* (LPB, MO); Franz Tamayo, Parque Nacional Madidi, Rio Tuichi, arroyo Pintata, 750 m, –14.43, –68.59, 5 December 2005, *A. Araujo Murakami 2695* (LPB, MO); Franz Tamayo, Parque Nacional Madidi, camino Apolo-Azariamas, arroyo Pintata. Bajando 400 m del campamento en direccion NE, aproximadamente a 5 minutos saliendo del camino, 860 m, –14.47, –68.54, 20 February 2003, *L.E. Cayola Pérez* 78 (LPB, MO); Franz Tamayo, Area Natural de Manejo Integrado Madidi, Azariamas, frente al

arroyo Jaukantista, 656 m, –14.24, –68.53, 29 September 2005, *L.E. Cayola Pérez* 1983 (LPB, MO); Franz Tamayo, Area Natural de Manejo Integrado Madidi, Azariamas, 2 km al E del arroyo Javillas, 933 m, –14.25, –68.53, 27 November 2005, *L.E. Cayola Pérez* 2223 (LPB, MO); Franz Tamayo, Parque Nacional Madidi, Azariamas, 1 km al N del rio Chiriuno, 853 m, –14.25, –68.59, 3 December 2005, *L.E. Cayola Pérez* 2306 (LPB, MO); Franz Tamayo, Parque Nacional Madidi, Azariamas, Rio San Juan, 991 m, 8 October 2005, *V.W. Torrez Flores 175* (AAU, LPB, MO); Sud Yungas, 15 km de Palos Brancos en camino a San Borja, 990 m, 12 July 1987, *M. Moraes & H. Balslev 843* (AAU!, BOL, LPB!, MO, US!); **Pando:** Nicolás Suárez, Los Angeles, 280 m, –11.30, –69.22, 20 July 1992, *Ely et al. 29* (K, LPB, MO, NY); Molienda, –11.43, –69.13, 13 August 1992, *Ely et al. 65* (K, LPB, NY); **Santa Cruz:** Andrés Ibañez, Cercado, 460 m 12 April 1990, *L.R. Moreno 31* (LPB, NY!); Campus da universidade, 1 km NW de la ciudad, 415 m, –17.77, –63.18, 15 September 1988, *M. Salcias Paz 441* (MO, NY); Guarayos, ao largo del camino ca. 30 km N de Sant Julián, 500 m, 14 August 1982, *M.J. Balick et al. 1429* (F!, LPB, MO, NY!); Parque Nacional Noel Kempff Mercado, 15 km SE del campamento Los Fierros, en sendero al aserradero Tarbo, 225 m, –14.67, –60.77, *M. Saldias et al. 3370* (NY!, USZ); 5 km S de Perserverancia, 280 m, –14.68, –62.62, 2 July 1992, I.G. *Vargas et al. 1543* (LPB, MO); Reserva de Vida Silvestre ríos Balanco y Negro, concepción Oquiriquia, 2–3 km SW del campamento a largo del Río San Martín, 300 m, –15.05, –61.80, 11 September 1993, *I.G. Vargas et al. 2798* (LPB, MO, USZ); Velasco, Campamento El Refugio, 3 km NE del campamento, a 2800 m al NE de la casa, em la Bahia Las Petas, 150 m, –14.75, –61.03, 26 June 1994, *R. Guillén 1943* (NY!, USZ); BRAZIL. **Acre:** 20 June 1989, *D.N. Smith 13565* (MBM); 8 February 1999, *J.R. Bandeira 85* (HPZ); Rio Branco [–9.97, –67.81], 20 September 1993, *E. Ferreira 210* (HPZ); COLOMBIA. **Cundinamarca:** Rio Guapaya, Sierra de la Macrena, 1949, *Philipson et al. 1656* (BM, F!, COL); **North de Santander:** carretera Cúcuta Pamplona 4 km al sur de la Donjuana, 950 m, 23 March 1987, *R. Bernal & G. Galeano 1359* (AAU!); **Valle del Cauca:** Hoya del río de la Vieja, entre Piedra de Moler [10.45, –75.13] y Alto del Dinde [2.73, –76.75], 1170 m, 17 November 1946, *J. Cuatrecasas 22971* (COL, F!, MO); ECUADOR. **El Oro:** Machala-Cuenca road, 3 km from Uzhcurrumi to Santa Isabel, 300 m, –3.32, –79.55, 14 May 1987, *H. Balslev et al. 62525* (AAU, MO); **Esmeraldas:** Hda. Monte Armelo 12 km south of Borbón, 50 m, 1.08, –79.00, 17–18 July 1985, *A.S. Barfod 60080* (AAU!, MO); **Los Ríos:** Vinces, 3 August 1978, *C.H. Dodson 6968* (MO); Vinces, Jauneche Forest, between Mocachi and Palenque on Estero Peñafiel, 70 m, –1.27, –79.70, 25 January 1981, *A.H. Gentry 30802* (AAU, MO, SEL); **Manabi**: without date (ca. 1897?), *H. Eggers 15681* (K, MO, US); **Napo:** ca. 5 km downriver from Pañacocha, 200 m, –0.45, –76.05, 16 April 1987, *H. Balslev et al. 62466* (AAU, MO); North of Archidona-San Pablo rd. Quichua homegarden, 700 m, –0.93, –77.77, 3 January 1991, *Pederson 97644* (AAU, MO); PERU, **Amazonas:** Bagua: Imaza-Bagua road, 89 km from Imaza, 500 m, 23 May 1990, *F. Kahn & F. Borchsenius 2584* (P!); **Loreto:** Coronel Portillo, Buenos Aires, 1960, *H.E. Moore, et al. 8408* (BH); **Madre de Dios:** –12.00, –70.25, 26 August 1984, *R.B. Foster 9910* (F!); **Pasco:** Oxapampa, trail between Yanahuanca and Chumalli along Río Pozuzo, 820–1100 m, –10.52, –76.50, 15–16 March 1984, *D.N. Smith 6376* (MO); **San Martin:** Outskirts of Tarapoto, –6.50, –76.42, 15 February 1984, *A.H. Gentry 45573* (MO); 8 km N of road from Tarapato to Shapaja, 1960, *H.E. Moore et al. 8537* (BH); VENEZUELA. **Barinas:** Barrancas, without date, *J.P. Schultz 418a* (U); Barrancas, 1967, *J.G. Wessels Boer 1762* (F!, U), *1766* (F!, U); Socopó, along Hwy. 5, 1966, *J.A. Steyermark & Rabe 96519* (BH, GH!, NY, U, US, VEN); **Bolívar:** Cerro Pichacho [Tumeremo], 1961, *J.A. Steyermark 88913* (BH, F!, NY, U, VEN); **Mérida:** 2–4 km above dam site on Río Guaimaral, 200–400 m, 7.75, –71.483, 16 March 1981, *R.L. Liesner 10680* (F!, MO!); **Portuguesa:** 30 km west of Guanare by air. Along Río Tucupido, 200–300 m, 9.03, –70.02, 13 March 1982, *R.L. Liesner 12656* (MO).

56. *Syagrus santosii* Soares & Guimarães. (2013a: 420). Type:—BRAZIL. Bahia: lateral direta [south side] da barragem do Rio Jequitinhonha, –15.97, –39.59, 28 July 2011, *L.A. Mattos Silva, C.A. Guimarães & J.L. Paixão 5243* (holotype HUESC [HUESC-10000], isotypes ALCB, CEPEC, RB, R)

Figure 78 plate, Figure 77 map.

Short to moderately-sized, solitary palm. **Stem** ca. 1.6–4.4 m × 15–21 cm; 47–67 cm in circumference, generally inclined for 0.6–3.5 m with persistent spiny leaf bases. **Leaves** 12–20; *sheathing leaf base* ca. 85 cm long, covered with a sparse indument, armed with spines along their margins; *pseudopetiole* 64–75 cm long; *petiole* 0–2 long; *rachis* 160–194 cm long; *leaflets* green to yellow-green slightly lighter on the abaxial surface, 71–90 along one side, regularly arrange, lying in one plane, ramenta scales or tomentum frequently present where the leaflets are

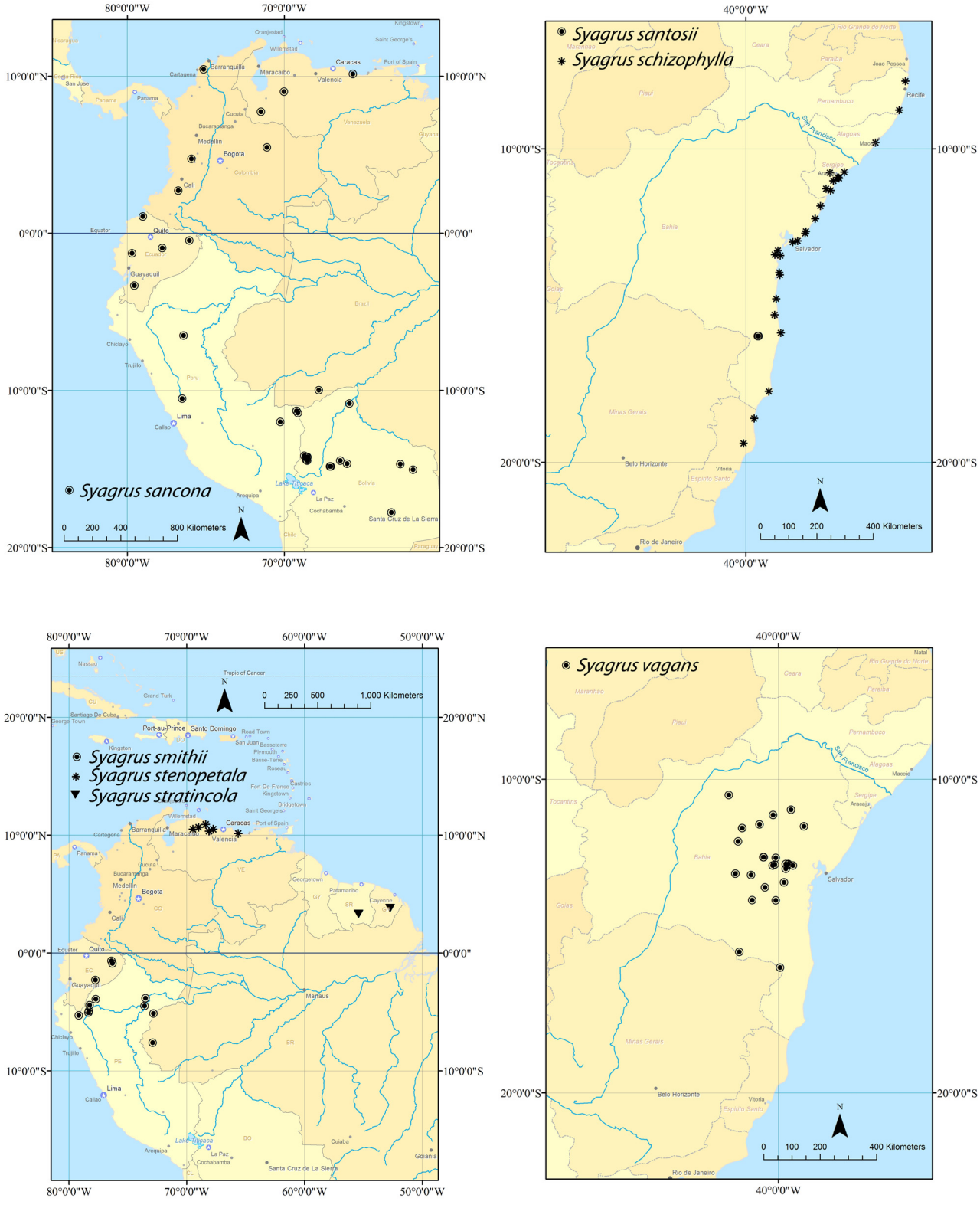

FIGURE 77. Distribution maps of *Syagrus sancona, S. santosii, S. schizophylla, S. smithii, S. stenopetala, S. stratincola* and *S. vagans*.

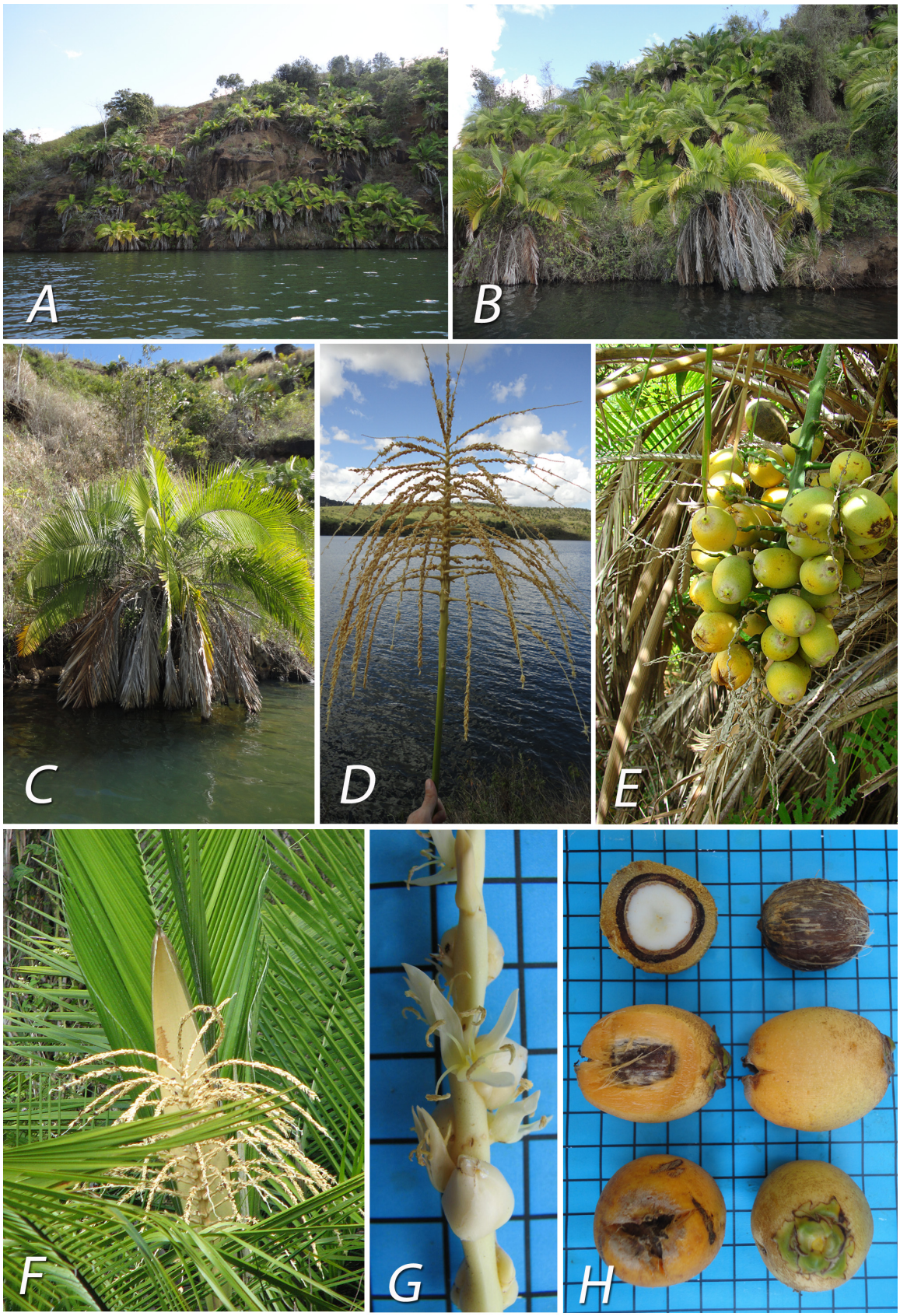

FIGURE 78. *Syagrus santosii*. A. Habitat near Itapebi, Bahia, steep banks of a new reservoir on the Rio Jequitinhonha. B. Habit of several palms. C. Habit. D. Inflorescence. E. Infructescence. Note petioles near top of image are heavily armed with spines. F. Newly opened inflorescence with staminate flower. G. Flowers. H. Fruits with cross-section of fruit showing homogeneous endosperm with no internal cavity on top left and endocarp on top right. Also note splitting apices. Grids are in centimeters.

inserted on the rachis and along the abaxial midvein; basal leaflets 50–58 × 1.2–2.0 cm, middle leaflets 46–54 × 2.0–3.0 cm, apical leaflets 20–27 × 1.0–1.5 cm with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 26–41 × 4.0–5.2 cm, fibrous, lanceolate; *peduncular bract* 130–156 cm long, expanded portion 51–70 cm long, including a beak to 3.5 cm, perimeter 7.0–8.4 cm, 1–2 mm thickness, narrow, woody, sulcate, exterior covered with a rusty tomentum; *peduncle* ca. 85–120 × 1.2–1.3 cm, elliptical in cross-section, covered with a sparse chestnut-colored indument when young; *inflorescence axis* 50–70 cm long; *rachis* 38–48 cm long, initially whitish yellow then turning green in fruit; *rachillae* 43–62, glabrous, 22–24 cm long at the apex, 26–34 cm long at the base; *staminate flowers* 7–10 mm long, some with a short pedicel up to 1 mm long near the base of the inflorescence, green to yellow, sepals 1.5 mm long, glabrous, petals 6–8 × 1.5–2 mm with acute tips, coriaceous, nerves indistinct, stamens 5–6 mm long, anthers 2.5–4 mm long, filaments 3.5–4 mm long, pistillode less than 1 mm long; *pistillate flowers* conical, 7–10 × 6–7 mm, yellow, glabrous, sepals 7–9 × 7–10 mm, petals 6–9 × 7–9 mm, glabrous, pistil 5–7 × 3–4 mm, stigmas not measured, glabrous, staminodal ring not measured. **Fruit** ellipsoid or ovoid, 2.9–4.6 × 2.6–3.8 cm, which frequently split at its tip, yellow or greenish yellow when mature covered with a rusty tomentum, epicarp is less than 0.5 mm thick, mesocarp 2–4 mm thick, yellow, sweet-tasting, succulent and fibrous; *endocarp* ovoid, 2.7–4.2 × 2.4–3 cm, 2.5–3 mm thick on its sides; *seed* more or less ellipsoid, not measured, endosperm homogeneous. Germination remote-tubular.

Common name:—None known.

Etymology:—The specific epithet, *santosii,* honors João Eduardo Santos of Itapebi, Bahia, Brazil, known locally as "Joãozinho das Orquídeas," a well-known local expert of orchids and bromeliads and also the discoverer of this species, as well as *Syagrus itapebiensis*.

Distribution and habitat:—At the moment only one population of this species has been found on the margins of the Rio Jequitinonha, in the Municipio of Itapebi, Bahia, Brazil, where it grows for a distance of 4 km along the southern margin of the river at an elevation of 111–119 m above sea level on rocky 80° slopes in areas of heavy brush in sandy clay soils. It grows next to other Arecaceae, like *Allagoptera caudescens* (Mart.) Kuntze, *Attalea burretiana* Bondar and naturalized *Elaeis guineensis* Jacq.

Conservation:—A large portion of the population was drowned by the construction of the hydroelectric dam of Itapebi. It is estimated that the current population of this species is ca. 5,000 individuals at this location. The area is not under any protection, but it is a very steep, slope that is unsuitable for agriculture or pasture. Since there is only one population of ca. 5,000 individuals, this species is classified as vulnerable, VU B1+2ab(i,v); C2a(ii).

Phenology:—This species flowers and fruits throughout the year, especially in the months of April–May and September–October.

Uses:—This is a potential landscape palm with edible fruits.

Notes:—According to the authors, this species is similar to *S. schizophylla* with its spiny petioles, but *Syagrus santosii* differs from *S. schizophylla* by its larger fruits (2.9–4.6 × 2.6–3.8 cm vs. 2–3.5 × 1.5–2.5 cm), larger endocarps (2.7–4.2 × 2.4–3 vs. 1.8–2.5 × 1.3–2.2 cm), and homogeneous endosperm. The *S. santosii* inflorescence has many more rachillae (43–62 vs. 14–38). Its leaf rachis is only slightly curved with 71–90 leaflets, while *S. schizophylla* is more curved with 18–50 leaflets. *Syagrus schizophylla* grows only a short distance from the coast in the restinga region, while *S. santosii* grows more than 70 km from the coast along the Rio Jequitinhonha in the rainforest region.

Representative specimens:—BRAZIL. **Bahia:** Itapebi, Represa da UHE do Rio Jequitinonha, –15.97, –39.62, 28 August 2012, *K.P. Soares et al.* (paratype HDCF [HDCF-6276]).

57. *Syagrus schizophylla* (Mart.) Glassman (1968b: 386). *Cocos schizophylla* Martius (1826: 119). *Calappa schizophylla* (Mart.) Kuntze (1891: 982). *Arikury schizophylla* (Mart.) Beccari (1916: 445). *Arikuryroba schizophylla* (Mart.) Bailey (1930: 196). Lectotype (designated by Dahlgren 1959, plate 7):—BRAZIL. *Martius 1924* (M!)

Arikuryroba capanemae Barbosa Rodrigues (1891: 6). *Cocos capanemae* (Barb.Rodr.) Drude in Engler & Prantl (1897: 56). Lectotype (designated by Glassman [1972b: 13]):—BRAZIL. Bahia: Barbosa Rodrigues (1891) t. 3, fig. 1, 1891.
Cocos arikuryroba Barbosa Rodrigues (1898: 27) (illegitimate name, *nomen nudum*).

Figure 79 plate, Figure 77 map.

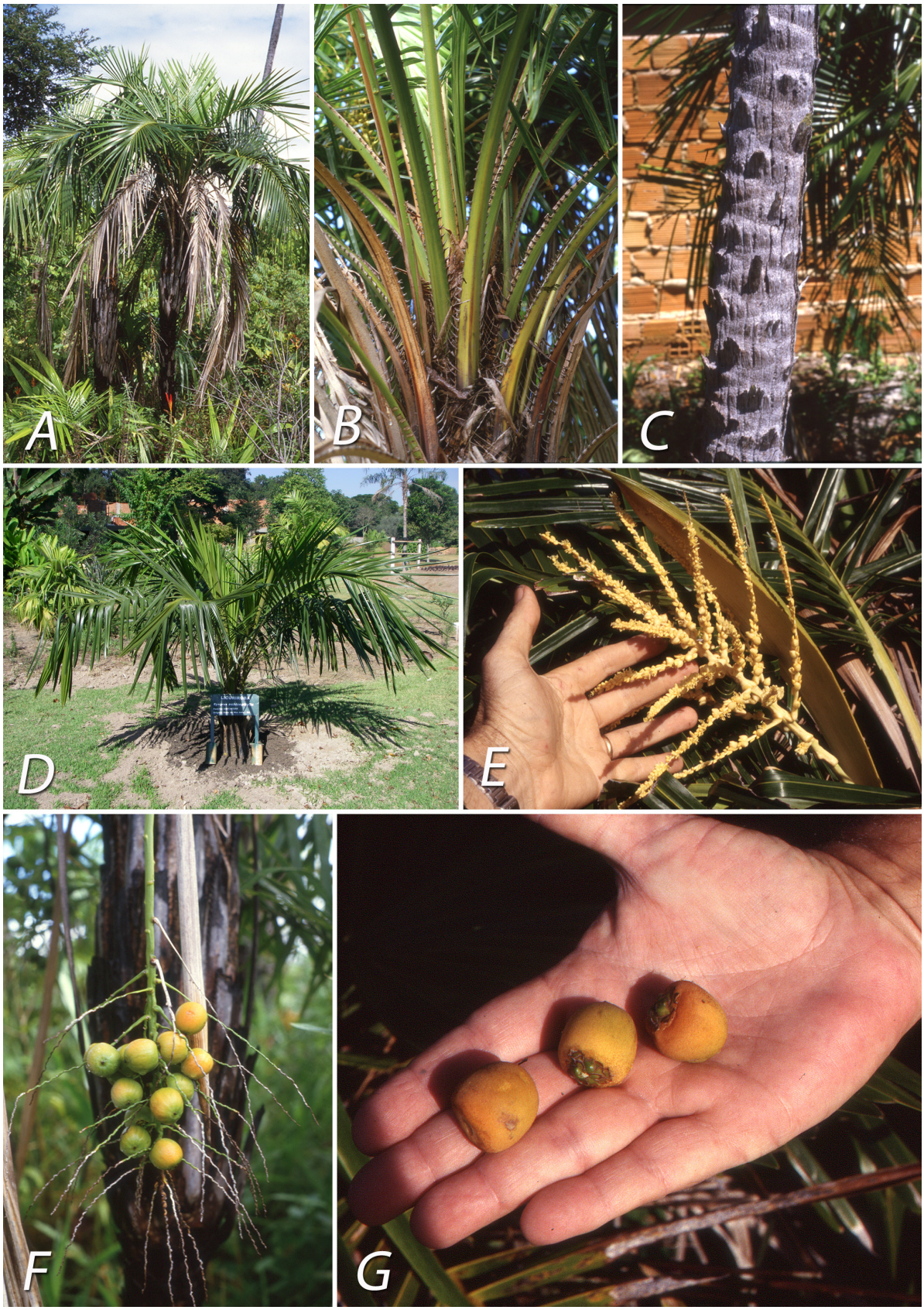

FIGURE 79. *Syagrus schizophylla*. A. Habit, note flat topped canopy. B. Pseudopetioles heavily armed with spines. C. Older stem with leaf sheath remains. D. Habit at Jardim Botânica Plantarum. E. Inflorescence. F. Infructescence with long peduncle. G. Mature fruit.

Small moderate, solitary, armed, palms. **Stem** (0–)1.5–4 m × 10–15 cm, usually erect, with persistent spiny leaf bases, with leaf scar intervals ca. 1–5 cm long when visible. **Leaves** 8–25 in crown, spirally arranged, spreading; *sheathing leaf base* 19–25 cm long, short, narrow, glabrous, woody with spine-like or dentate serrate margins, often persisting on the trunk; *pseudopetiole* 50–200 cm long; *petiole* short 0–11 × 1.2–2.5 cm, glabrous; *rachis* 67–180(–190) cm long; *leaflets* medium green above, paler below, 18–48 along one side, usually regularly distributed but sometimes in pairs in one plane; no ramenta scales or tomentum present where the leaflets are inserted on the rachis, but a few to several along the abaxial midvein; basal leaflets 23–50 × 0.2–1.2 cm, middle leaflets 29–65(–79) × 1.5–3.5(–4) cm, apical leaflets 24–36 × 0.7–1.5 cm mostly with asymmetric tips. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 22–35 × 1.8–2.5 cm; *peduncular bract* ca. 48–130 cm long, expanded portion 22–70 × (1.5–)2–6.5 cm, bearing a 0–4 cm beak, woody, deeply sulcate, light orange, *peduncle* ca. (20–)45–200 cm × 4–8 mm; *inflorescence axis* 18–60 cm long; *rachis* 10–29 cm long; *rachillae* (8–)14–32, 5–24 cm long at the apex, 11–37 cm long at the base, rachillae bracts usually absent; *staminate flowers* 3–5 mm long at the tip, 5–8 × 2.5–3(–4) mm at the base, yellow, sepals 1–2 × 1–2 mm, glabrous, no visible nerves, petals 3–5 mm long at the tip, 5–7.5 × 1.5–3 mm at the base, with brown, acute to acuminate tips, glabrous, nerves rarely visible, usually indistinct, stamens 3–5.5 mm long, anthers (2–)2.5–4.5 mm long, filaments 1–3 mm long, pistillode 1–1.5 mm long; *pistillate flowers* rounded or conical, 5–8 × 3–5(–6.5) mm, dark orangish, sepals 4.5–7(–8) × 3–6 mm, glabrous, veins visible at the tip and the margins, not keeled, petals 4–6 × 3–5 mm, valvate tips 2/5 the length of the petal, ca. 1.5–2.5 mm long, glabrous, veins distinctly visible, pistil 4–6 × 2–3 mm, glabrous, stigmas 1–2 mm long, staminodal ring ca. 1 mm high. **Fruit** ellipsoid, 2–3.5 × 1.5–2.5(–3) cm, persistent perianth (cupule) beige to light brown, 10–12 mm wide, 4–5 mm deep, ring 3 mm in height, epicarp less than 0.5 mm thick, smooth, reddish–orange when mature, mesocarp ca. 1 mm thick, sweet, succulent, fibrous, and mucilaginous; *endocarp* 2.4–3 × 1.8–2.1 cm, 1–2 mm thick on the sides, 2–3 mm thick at its ends, bony to woody, hard, smooth, brown to yellowish brown, trivittate, with no clusters of fibers; *seed* nearly globose, (1.0–)1.4–1.7 × 1.2–1.5 cm, endosperm ruminate. Germination remote-tubular.

Common name:—arikuriroba, uricuriroba, nicuri, nicuriroba, aricuri, ariri, ariri-de-praia, guriri, licuriroba, côco-caboclo, coco-caboclo-do-littoral, licuri-da-praia, guriri, licuri-de-raposa, côco-babão.

Etymology:—The specific epithet, *schizophylla,* refers to the ease at which the leaflets tend to split at their oblique tips. The common name "arikuryroba" is a Tupí Indian word translated as long infructescence (arib) with bitter (rob) nuts (kury).

Distribution and habitat:—Brazil, from Pernambuco to the northern portion of Espirito Santo including the states of Alagoas and Sergipe, in open coastal restingas along the beaches as well as in the adjacent restinga forests, generally in sandy soils. This salt tolerant species is found in a narrow band of coastal vegetation, called restinga, reaching as far north as Cabo, Pernambuco (Medeiros-Costa, 1982). This palm grows only in the coastal restinga, usually in the more mesic areas, between dune habitats and in the higher restinga forest zone. It appears to grow best in sandy soils, especially where ample supplies of fresh water are available. It also grows in lateritic clay soils, as it does on the steep hills that abut the shoreline in Ondina, Salvador, Bahia.

Conservation:—This species is widely distributed. It grows near the coast in areas coveted by developers for beachside properties. It commonly produces an abundance of seeds, which germinate easily. It is protected within the boundaries of a few coastal reserves: the national park (Monte Pascoal) near Porto Seguro, one near Una, Bahia and another just north of Salvador, Bahia and yet another just south of Maceio, Alagoas (Santa Rita). However most of its populations are not protected from the threat of developers. It is not expected to go extinct, but it is expected that there will be some serious reductions in its populations, especially close to large municipal centers. This species is classified as vulnerable, VU A4c.

Phenology:—Fruiting and flowering year around with the greatest flowering and fruiting in the summer months, December to March. This species fruits abundantly in summer. Germination of the seeds occurs 3–6 months after sowing.

Uses:—The plant is ornamental and is occasionally cultivated in the landscaping of beach properties, due to its salt tolerance. It has a succulent, sweet-tasting mesocarp eaten by children and domestic animals (Bondar 1964); however, the seed is invaded by the seed coat (ruminate) giving it a very bitter taste.

Notes:—This is a short palm with a slightly flattened crown, armed with large teeth along its petiole margins, a long peduncle, and ruminate endosperm resulting in a bitter tasting nut. *Syagrus schizophylla* is distinguished from other *Syagrus* by its unusual petioles armed on their margins with broad serrate teeth (Fig. 79C). The only

other *Syagrus* that has similarly armed petioles is *Syagrus santosii*, but it has homogeneous endosperm and a different habit. Other distinguishing characters are its unusually long peduncle, attractive bright red-orange fruit, persistent leaf petiole bases and leaf sheaths on an otherwise very narrow stem (15 cm diameter with the leaf sheaths). Glassman (1987) described the species as "frequently caespitose [clustering]," but the author cannot remember ever seeing one with a clustering stem.

Barbosa Rodrigues (1891, 1898) distinguished three similar palm species, *Cocos schizophylla, Arikuryroba capanemae* and *Cocos arikuryroba*. He considered their distribution as *C. schizophylla* (Bahia, adding Sergipe later), *Arikuryroba capanemae* (Bahia and Sergipe) and *Cocos arikuryroba* (Pernambuco). Only the first two names were formally described (*Cocos schizophylla* and *Arikuryroba capanemae*). *Cocos arikuryroba* has no description; it appears in a list of common names with their accompanying scientific names. It is a *nomen nudum*. In Pernambuco, this species is smaller than usual, so it is understandable why Barbosa Rodrigues thought that it was something different, but he never formally described it. Barbosa Rodrigues (1891) initially created the genus *Arikuryroba* because, like *Barbosa* and *Rhyticocos*, this palm has ruminate endosperm. However, he failed to connect *Cocos schizophylla* and *Arikuryroba capanemae* as the same species, even though their distribution is identical.

Representative specimens:—BRAZIL. **Alagoas:** Barra de São Miguel [–9.80, –35.87], 4 km após o entroncamento da Al-101/Al-215, 28 June 1982, *R.P. de Lyra-Lemos 557* (MAC!); Barra de São Miguel, Al-101, 19 October 1984, *R.P. de Lyra-Lemos & M.N.R. Staviski 874* (MAC!); Barra de São Miguel, 3 km depois do entroncamento da Al-101/Al-201, 1 August 1985, *R.P. de Lyra-Lemos & A.I.L. Pinheiro 976* (MAC!); Barra de São Miguel, 4 km depois do entroncamento da Al-101/Al-215, 3 August 1985, *R.P. de Lyra-Lemos 1199* (MAC!); Japatinga, 16 August 1985, *R.P. de Lyra-Lemos & A.I.L. Pinheiro 999* (MAC!, PEUPR!); São José da Lage, 29 October 1982, *R.P. de Lyra Lemos 870* (MAC!); **Bahia:** *M. Blanchet 4* (G!); *M. Blanchet 40* (P! P01797760); *M. Blanchet 162* (P! P11794929); *M. Blanchet s.n.* (P! P01878568); *Martius 1853* (P); Alcobaça, white coastal sand, restinga margin, sea level, –17.50, –39.22, 8 December 1981, *G.P. Lewis & A.M. de Carvalho 820* (CEPEC!, K!); Alcobaça, Rod. BA-001, a 5 km ao Sul de Alcobaça, 10–20 m, Folha SE-24 (18-39a), 17 March 1978, *S.A. Mori et al. 9624* (CEPEC!, NY!); Belmonte, a 3 km S da cidade, –15.86, –38.88, 7 January 1981, *A.M. de Carvalho & Gatti 463* (CEPEC!); Belmonte, 13 April 1967, *Lanna Sob. 1378 & Castellanos 26356* (CEPEC!); Belmonte, 23 September 1970, *T.S. dos Santos 1131* (ALCB!, CEPEC!); Camaçari, Guarijuba, 0–5 m, –12.63, –38.08, 21 January 1986*, L.R. Noblick & I. Britto 4514* (BH!, CEN!, CEPEC!, F!, HUEFS!, K!, MBM!, MO!, NY!, RB!, SP!, US!); Canavieiras, 29 January 1965, *Lanna & Castellanos 2552* (GUA!, BH photo!); Camamu, Litoral Sul, 17 m, –13.94, –38.93, 24 May 2009, *M.L. Guedes 15147* (ALCB); Caravelas, 16 km estr. Caravelas/Alcobaca, –17.73, –39.27, 5 September 1989, *A.M. de Carvalho 2474* (CEPEC!); Conde, 5 km W of Conde, 10–20 m, –11.82, –37.62, 1 December 1988*, L.R. Noblick & R. Soeiro 4703* (AAU!, CEPEC!, F!, HRB!); Entre Rios, 2 km W of the coastal village of Subaúma, 10–20 m, –12.23, –37.79, 29 November 1988*, L.R. Noblick & R. Soeiro 4698* (CEPEC!, F!, FTG!, GH!, HRB!); Ilhéus, restinga da Olivença, 15 September 1970, *A.L. Costa s.n.* (ALCB!); Ilhéus, 15 July 1918, *H.M. Curran 437* (F!); Ilhéus, 7 km S of Ilhéus, 1969, 7 July 1969*, S.F. Glassman & J.T. Medeiros-Costa 8741* (CEPEC!, F!); Ilhéus, Col. along oceanside of road Ilhéus to Olivença; also observed farther south at Santa Cruz, 14 January 1975, *R. Read & Daniels 3415* (US!); Ilhéus, Fazenda Barra do Manguinho, 11 km da Rodovia Ilhéus/Olivença/Una (BA-001), –14.78, –39.03, 10 m, 23 August 1984, *R.A. Voeks 42* (CEPEC!); Itacaré, a 3 km ao S de Itacaré, 8 December 1979, *S.A. Mori et al. 13085* (CEPEC!, NY!); Itacimirim, 12 February 1980, *A.P.* de *Araujo 193* (HRB!); Jandaira, Mangue Seco caminho para coqueiros, 10 March 1988, *Felix 40* (BAH!); Maraú, Coastal Zone ca. 11 km North from turning to Maraú along the road to Campinho, –14.02, –38.92, 18 May 1980, *R.M. Harley 22214* (CEPEC!, K!, SP, SPF!); Nova Viçosa, a 9 km de N. Viçosa (Sítio Natura), 27 May 1987, *H.Q. Boudet Fernandes 2089* (CEPEC!, MBML!); Porto Seguro, –16.45, –39.07, January 1980, *R. Barreto et al. s.n.* (IPA!); Porto Seguro, 23 August 1961, *A.P. Duarte 5977* (RB!); Porto Seguro, Trancoso, Ponto no. 1, 4 October 1997, *M.L. Guedes 5282* (ALCB); Porto Seguro, 21 November 1985*, J.L. de S. Lima s.n.* (HTSA!); Porto Seguro, January 1980, *Roxanna et al. s.n.* (IPA!); Porto Seguro, 3 km ao Sul, no ramal para os povoados do N.S. D'Ajuda e Trancoso, 25 August 1988, *L.A. Mattos Silva et al. 2510* (CEPEC!, MBM!); Salvador, litoral da Bahia*, G. Bondar s.n.* (F-404610!); Salvador*, G. Bondar s.n* (F-620750!, 620774!); Salvador, between Amaralina and Pituba, 1940, *B.E. Dahlgren s.n.* (F-620690!); Pituba, suburb of Salvador, 3 July 1969*, S.F. Glassman & J.T. Medeiros-Costa 8721, 8722* (F!, IPA!, K!); Salvador, Região Metropolitana Salvador, –13.00, –38.50, 10 February 1996, *M. Campos 02* (ALCB!); Salvador, Região Metropolitana Salvador, –13.00, –38.50, 13 September 1959, *A.L. Costa*

544 (ALCB!); Salvador, Região Metropolitana Salvador, –13.00, –38.50, 1 February 1975, *A.L. Costa s.n.* (ALCB!); Salvador, Região Metropolitana Salvador, –13.00, –38.50, 23 February 2011, *M.L. Guedes 18009* (ALCB); Salvador, Região Metropolitana Salvador, –13.00, –38.50, 18 April 2011, *M.L. Guedes 18452* (ALCB); Salvador, Região Metropolitana Salvador, –12.69, –38.11, 5 June 2011, *M.L. Guedes 18139* (ALCB); Salvador, Dunas de Itapuã, –12.93, –38.35, 30 August 1985*, L.R. Noblick & Nishida 4378* (ALCB!, F!, HUEFS!); Salvador, Av. Centen Rio, 2 October 1996, *M.C. Peso 2* (ALCB); Santa Cruz Cabrália, restinga de Santa Cruz Cabrália a Coroa Vermelho-próximo a Porto Seguro, juntamente com *Diplothemium* [*Allagoptera*], 27 November 1970, *L.E.* de *Mello Filho 2970 & Emmerich 3508* (CEPEC!); Santo Amaro Brotas, Município de Santo Amaro Brotas, 8 km após o terminal Portuário de Aracajú, 18 November 1991, *C. Farney 2883* (RB!); Una, Estrada para o Distrito de Pedras, ca. 7 km a partir da BA-001 que liga Ilhéus/Una, –15.29, –39.08, 13 April 1993, *A.M. Amorim 1191* (NY); Valença, estrada Guaibim praia do Taquarri, 3 km ao N de Guaibim, 11 August 1980, *A.M. de Carvalho et al. 320* (CEPEC!); Valença, Litoral Sul, –13.40, –38.90, 25 October 1996, *M.L. Guedes 4765* (ALCB!); Valença, Rodovia Valença/Guaibim, km 12, –13.37, –39.07, 25 February 1986, *J.L. Hage et al. 1946* (CEPEC!, US); Valença, –13.37, –39.07, 13 October 1998, *G. Hatschbach 68508* (MBM!); Valença, Ponta do Curral, –13.24, –38.98, 6 November 2011, *E.N. de Matos 757* (HUEFS!); **Espírito Santo:** Conceição da Barra, Área 135 da Aracruz Celulose S.A, –18.59, –39.73, 10 June 1992, *O.J. Pereira et al. 3478* (VIES); Linhares, Palmeto L. E, –19.39, –40.07, 11 April 2000, *D.A. Folli 3598* (CVRD); **Pernambuco:** Cabo de Santo Agustinho, 6 January 1953, *D.A. Lima 53-1655* (IPA!); Cabo de Santo Agustinho, 22 September 1977, *D.A. Lima & J.T. Medeiros-Costa* 25 (IPA!); Cabo de Santo Agustinho, 18 km E of Cabo near the Porto de Suape, 40–50 m, –8.36, –34.93, 4 July 1997, *L.R. Noblick & J.T. Medeiros-Costa* 5134 (IPA!); Igarassu, –7.83, –34.91, 16 March 1970, *O. Lima 1992* (UFP); Ipojuca, Porto de Galinhas, Estação Experimental de Litoral Ipa, 6 December 1967, *P. Ferreira 67-35* (IPA); Porto de Galinhas, Estação Experimental de Litoral Ipa, 1969*, S.F. Glassman & J.T. de Medeiros-Costa 8708* (F); Rio Formoso, Tamandaré, –8.76, –35.11, December 1991, *M. Guerra 851* (UFP); Rio Formoso, Tamandaré, –9.12, –35.25, 8 February 1985*, J.L. de S. Lima 10, 11* (HTSA!); **Sergipe:** Aracajú, Lado direito da BR 101 num baixo mais ou menos 10 km . São Cristovão, –10.91, –37.07, 23 May 1984*, J.L. de S. Lima* (HTSA-Carpoteca); Areia Branca, PARNA, Serra de Itabaiana, topo da Serra Comprida, –10.76, –37.32, 1 August 2007, *J.E. Nascimento-Júnior 146* (ASE); Areia Branca, Parque Nacional da Serra de Itabaiana, –10.76, –37.32, 13 January 2010, *L.A.S. Santos 539* (ASE); Barra dos Coqueiros, –10.91, –37.04, 18 December 2008, *J.E. Nascimento-Júnior 452* (ASE); Barra dos Coqueiros, –10.93, –37.03, 10 August 2011, *A.P. Prata 2736* (ASE); Barra dos Coqueiros, margem esquerda da BR 101, 19 m, 2 July 2010, *J.A. Siqueira Filho 2350* (HVASF); Estância, –11.27, –37.44, 2 July 2011, *A.P. Prata 2690* (ASE); Estância, 1 km a Oeste estr. Abais/BR-101, 10 m, –11.32, –37.29, 15 June 1994, *L.A. Mattos Silva 3043* (CEPEC); Pirambu, Reserva Biológica de Santa Isabel of Peru11 km da praia, na direção da ponta do mangue, –10.74, –36.86, 28 January 1992, *C. Farney 2953* (RB); Pirambu, Assentamento Sao Sebastião, –10.74, –36.86, 1 April 2011, *D.M. Oliveira 38* (ASE); São Cristóvão, 47 m, –11.02, –37.21, 27 June 2009, *C.R.P. Franco, 8* (ASE); São Cristóvão, Campus Universitário, 23 September 1986, *R.P. de Lyra-Lemos 1233* (MAC!); Umbaubau, 97 km na estrada de Aracajú p/ Esplanada, –11.64, –38.08, without date*, J.L. de S. Lima 9* (HTSA); **Without specific locality**: 1848, *Mercier s.n.* (P! [P-01878570, P-01878571, P-01878572, P-01878573, P-01878574]);

58. *Syagrus smithii* (H.E.Moore) Glassman (1970b: 231). *Chrysallidosperma smithii* Moore (1963a:109). Type:—PERU. Loreto: Province Alto Amazonas, between km 13 and 14 on Yurimaguas-Tarapoto road, 24 May 1960, *H.E. Moore Jr., A. Salazar C., & E.E. Smith 8516* (holotype BH, isotype USM)

Figure 80 plate, Figure 77 map.

Moderately-sized, solitary palm. **Stem** ca. 4–10 m × 5–8 cm, erect, columnar, self-cleaning. **Leaves** 5–18; *sheathing leaf base* ca. 45 cm long; *pseudopetiole* 25–90 cm long; *petiole* ca. 10 cm long; *rachis* 190–300 cm long; *leaflets* slightly lighter on the abaxial surface, 83–92 along one side, in clusters of (1–)2–5, inserted at various angles, giving the leaf a plumose appearance, adult leaflets with raised transverse veins when dried, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets not measured, middle leaflets 65–66 × 3–3.7 cm, apical leaflets not measured with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* ca. 40 cm long, width not measured; *peduncular bract* ca. 135 cm long, expanded portion 51–85 × 13.5–14 cm, including a 6 cm beak, 5 cm perimeter, 2–3 mm

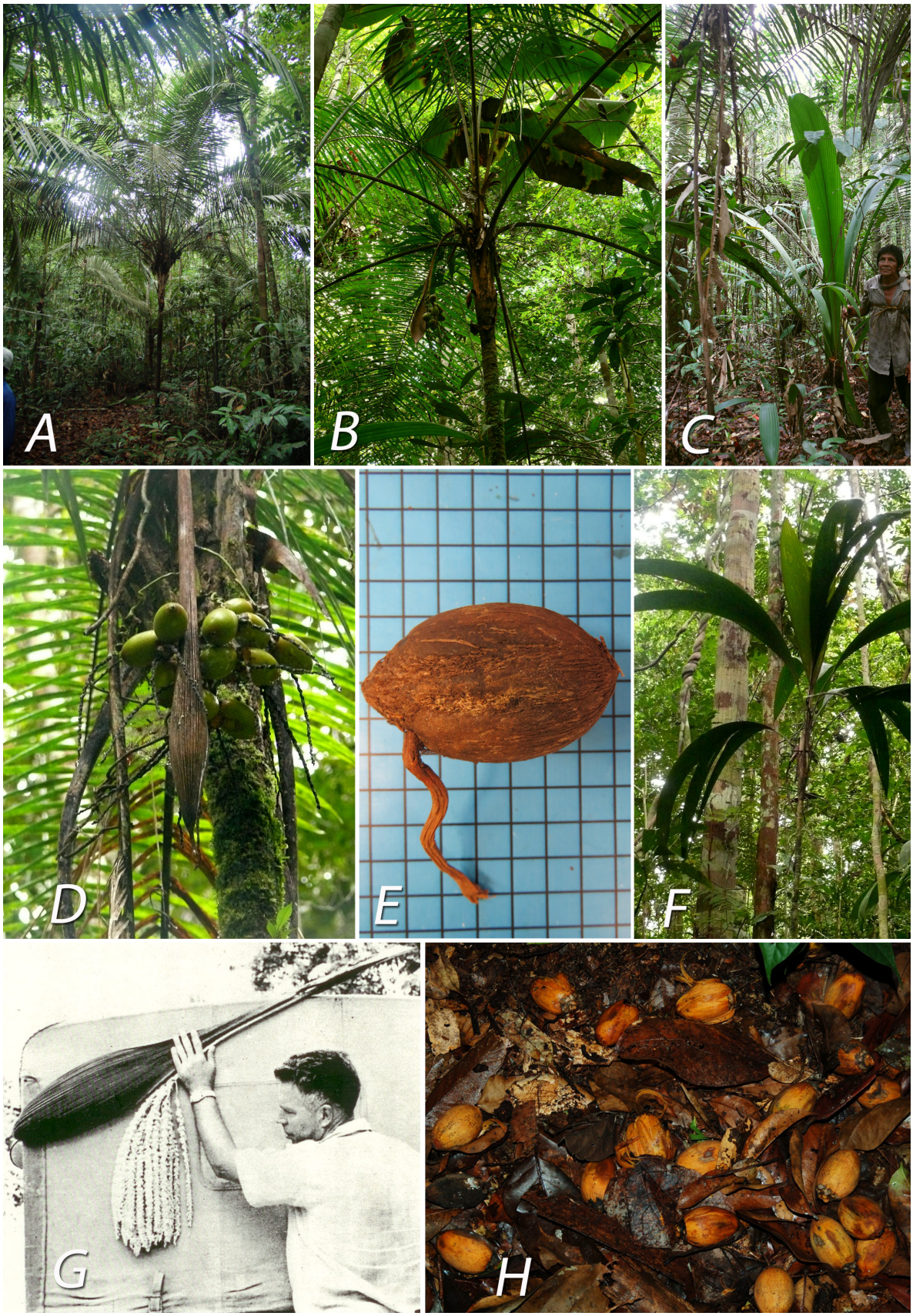

FIGURE 80. *Syagrus smithii*. A. Habit. B. Crown. C. New juvenile palm with strap leaves from Colombia. D. Infructescence. E. Endocarp, note resemblance to a chrysallid. Grid is in centimeters. F. Juvenile palms sometimes retain *Geonoma*-like bifid leaves (pers. comm. Rodrigo Bernal). G. Inflorescence with Dr. E. E. Smith near Yurimaguas, Loreto, Peru. H. Mature fruits. Photo A and G by Harri Lorenzi. Photos B–D by Rodrigo Bernal. Photo F by Gloria Galeano. Photo G by Harold E. Moore Jr. from *Principes* 7: 163.

thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 75–77 cm × 9–14 mm, 3–4 mm thick, elliptical in cross-section, chocolate brown tomentose; *inflorescence axis* 50–62 cm long; *rachis* 12–25 cm long; *rachillae* 9–35, tomentose, 19–26 cm long at the apex, 25–40 cm long at the base; *staminate flowers* 9–11 mm long at the apex, 11–13 × 5 mm at the base, green to yellow, sepals (1–)2–3 × 1 mm, petals 8 mm long at the apex, 13 × 3–4 mm at the base, with acute tips, nerves not observed, stamens 5.5–7 mm long, anthers 5–6 mm long, filaments 2–3 mm long, pistillode less than 1 mm long; basal *pistillate flowers* pyramidal, 11–13 × 9–10 mm, yellow, sepals 9–11 × 8–9 mm, petals 8–10(–12) × 7–10 mm, glabrous, pistil 7–8 × 5–6 mm, glabrous, stigmas 2.5–3 mm long, glabrous, staminodal ring ca. 2 mm high, 6-dentate. **Fruit** ellipsoid, 5–8 × 3–4.2 cm, dark brown or yellowish when mature, glabrous, epicarp less than 0.5 mm thick, mesocarp 3 mm thick, succulent and fibrous; *endocarp* ca.5.5–6 × 3.5–3.9 cm, 5–6 mm thick on its sides, 5–9 mm thick at the ends; *seed* ellipsoid, ca. 3.5 × 1.8–2 cm, endosperm ruminate, especially near its outer surface. Germination remote-tubular.

Common name:—catolé.

Etymology:—The specific epithet, *smithii,* honors Dr. Earl E. Smith, who initiated, arranged, and participated in the survey of palms of Peru as part of the program of Agriculture Division, United States Operation Mission to Peru, International Cooperation Administration, and of the Servicio Florestal of Peru (Moore 1963a). He helped Dr. Harold Moore collect the holotype for this species.

Distribution and habitat:—This species grows in tropical primary and secondary forests. The species has been found in Acre and western Amazonas in Brazil. It also grows in Peru, Ecuador, and Colombia.

Conservation:—This species grows in lowlands and on steep slopes in the Andes. It is protected within the boundaries of the Parque Nacional de Serra da Divisor in Acre, Brazil, where it is common within the park and the adjacent regions. Because it still resides in a somewhat remote area and part of the population is protected within a national park, this species is classified as least concern, LC.

Phenology:—Fruits in fall and winter (April–September).

Uses:—The fruits are sought out by animals, even domestic ones. This species has the potential to be cultivated as an ornamental, which is already being done on a limited scale in some countries.

Notes:—This is a slender trunked palm with large fruit. Some of the identifying characters for this species are the large (5–8 cm) ellipsoid fruit with the triangular endocarp, three-sided endocarp cavity and ruminate endosperm (ruminate at the edges). In the original description (Moore 1963a), there is a black and white photo of this species that shows a peduncular bract that is at least 135 cm long (Fig. 80G), and yet most of the *S. smithii* that were pointed out on a 2007 trip into Northern Peru had a very short peduncular bracts, similar to the image in Lorenzi *et al.* (2010). There may be more than one species in the area. The odd thing about this species is that some individuals, even after they have become reproductive, will retain simple bifid leaves (Fig. 80F) instead of pinnate leaves (Rodrigo Bernal, pers. comm.).

Representative specimens:—BRAZIL. **Acre:** Mâncio Lima, Serra do Moa near the Rio Moa, 350 m, –7.61, –72.90, 12 October 1989, *A.J. Henderson et al. 1117* (NY!); Mâncio Lima, Rio Moa, near junction with Rio Azul, Igarapé Sao Pedro, 3.30 hours walk north of Rio Moa, –7.61, –72.90, 5 February 1992, *A.J. Henderson et al. 1694* (NY); Mancio Lima, Serra do Mar, –7.61, –72.90, 31 March 2003, *H. Lorenzi 3722* (HPL!); Mâncio Lima, *J. Ribamar 27* (HPZ); Amazonas: Rio Javari, behind Palmeiras Army Post, –5.13, –72.82, 31 July 1973, *E. Lleras et al. P16953* (NY!); COLOMBIA. **Amazonas:** Río Cahuinarí, entre el lago Carijona y el lago Pecado, 9 September 1988, *G.A. Galeano & A. Miraño 1669* (NY!); ECUADOR. **Morona-Santiago:** 600 m, –2.28, –77.75, 30 May 1986, *H. Balslev 62414* (AAU!, MO, QCA); **Napo:** Roadside near Yasuni Scientific Research Station.230 m, –0.67, –76.38, 25 August 1995, *H. Balslev 6379A* (AAU, MO); Maxus road km 80 S of Pompeya, –0.88, –76.30, 2000, *H. Balslev 6404* (AAU, MO); PERU. **Amazonas:** Bagua, Yamayakat, 320 m, –4.92, –78.32, 3 February 1996, *N. Jaramillo et al. 1051* (MO, NY); Bagua, 350 m, –5.057, –78.34, 8 November 1997, *R. del P. Rojas G. 531* (MO); Bagua, 550 m, –5.06, –78.34, 21 June 1996, *R. Vásquez Martínez 21328* (MO, NY); Condorcanqui, Rio Cenepa region. Trail above Quebrada Cikan Inci to Shimpuntz, west of Huampami, 700–900 ft, –4.43, –78.25, 18 December 1979, *B. Berlin 593* (MO); Condorcanqui, Monte virgin, 1 km atrás de la comunidad de Caterpiza, trocha de metayar, banda este de la Quebrada Caterpiza, Río Santiago, 180–200 m, –3.92, –77.72, 24 October 1979, *V. Huaskikat 1039* (MO!); **Loreto:** Distrito de Yaquerana, Gálvez River, Nuevo San Juan, ca. 5 km north of the village on the opposite side of the Gálvez from the village, 150 m, –5.292, –79.16, 13 September 1999, *D.W. Fleck 459* (NY); Loreto, Nauta, carretera Nauta-Dtto. Iquitos, 150 m, –4.48, –73.58, 11 January 1988, *R. Vásquez Martínez 10366* (MO!); Maynas, 140 m, –3.83, –73.50, 1 March 1995, *A.H. Gentry 25290* (MO); **Ucayali:**

Province Coronel Portillo, 6–8 km beyond Aguaytía on to San Alejandro, ca. 330 m, 29 April 1960, *H.E. Moore Jr. et al. 8375* (BH, USM).

59. *Syagrus stenopetala* Burret (1932: 322). Type:—VENEZUELA. Anzoategui: Distrito Federal, Puerto La Cruz, 500 m, 26 April 1923, *A. Jahn 1208* (holotype VEN, isotype US!)

Figure 81 plate, Figure 77 map.

Medium to large, solitary to frequently clustering palm. **Stem** ca. 3–15 m × 12–18 cm, erect to arching, self-cleaning. **Leaves** 13–18; *sheathing leaf base* ca. 117–123 × 14–18 cm; *pseudopetiole* 50–107 cm long; *petiole* 5–15 × 4–4.5 cm, 1.5–1.8 cm thick; *rachis* 2.1–2.4 m long; *leaflets* slightly lighter on the abaxial surface, 97–118 along one side, in clusters of 2–4, inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis and a few may be present on the proximal leaflets on the proximal portion of each leaflet along the abaxial midvein; basal leaflets 50–77 × 0.7–2.6 cm, middle leaflets 14–73 × 2–3.4 cm, apical leaflets 14–32 × 0.2–1.3 cm with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 27–42 × 7–8 cm; *peduncular bract* 70–150 cm long, expanded portion 43–82 × 8–12 cm, including a 4–7 cm beak, 12–21 cm perimeter, 2–3 mm thickness, narrow, woody, sulcate, exterior relatively glabrous with scattered thin indument only on the lower part of the bract; *peduncle* ca. (20–)25–47 × 2.3–2.5 cm, 1.0–1.5 cm thick, elliptical in cross-section, glabrous, but with thin indument when young, later becoming glabrous; *inflorescence axis* 22–70 cm long; *rachis* 20–44 cm long; *rachillae* 45–81, glabrous, except on the lower rachillae, 14–3 cm long at the apex, 44–58 cm long at the base; *staminate flowers* 7–9 mm long at the apex, 8–12 × 3–6 mm at the base, green to yellow, sepals 1.2–2 × 1–2 mm, glabrous, relatively smooth, petals 7–10 × 2–4 mm at the base with acute tips, nerves indistinct, stamens 5–8 mm long, anthers 4.5–6 mm long, filaments 2–4 mm long, pistillode ca. 1 mm long; basal *pistillate flowers* conical, 7–8 × 5–8 mm, sepals 7–8 × 6–8 mm, yellow, glabrous, petals 6–9 × 4–6 mm, glabrous, pistil 3–7 × 3.5–6 mm, glabrous, stigmas 1.5–2 mm long, glabrous, staminodal ring ca. 1.5–2 mm high, 6-dentate. **Fruit** ellipsoid, 3–4(–5) × (1.3–)1.8–2.6 cm, yellow-green, yellow to orange when mature, glabrous on the lower half, scattered lepidote on the upper half becoming ever more dense, tomentose at the apex, epicarp is less than 0.5 mm thick, mesocarp 1–2 mm thick, succulent and fibrous; *endocarp* ca. 3.2–3.5 × 1.8–2.2 cm, ca. 1–3 mm thick on the sides, 5 mm thick at the tips; *seed* ellipsoid, ca. 2.1–2.9 × ca. 1.5–1.6 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—cococito, palmita, yaraco.

Etymology:—The specific epithet, *stenopetala,* means narrow petals.

Distribution and habitat:—Northern Venezuela coastal mountain ranges in the states of Aragua, Carabobo, Distrito Federal, Falcón, Lara, Miranda and Yaracuy, in the rocky to sandy or clay soils of the seasonally dry or transitional areas from sea level to 700 m.

Conservation:—This species is occasional to common throughout the northern Venezuelan coastal range. This palm grows in areas that are rocky, mountainous and not agriculturally valuable. It is very resilient to dry spells and will re-sprout from the base should the original stems be killed by drought or damaged by humans. It is probably found within the borders of several national parks in that northern part of Venezuela. Therefore, it is classified as least concern, LC.

Phenology:—Some plants have fruits in late spring (November–December).

Uses:—Trunks of these palms are used in construction of homes and buildings. Fruit mesocarp and seed are edible.

Notes:—*Syagrus stenopetala,* with a few exceptions, always clusters, and *S. orinocensis* almost never does (with one exception observed in cultivation). In the wild, the leaves of *S. stenopetala* appear to be more robust, stiffer and more erect, while those of *S. orinocensis* are more pendulous, but in cultivation these differences are not as apparent. This species was placed in synonymy with *S. orinocensis* (Glassman, 1987), but because of its clustering habit, more robust proportions, and other distinctions enumerated by Stauffer (1996), the author retains it as a distinct species. In addition, their flowering and fruiting times are distinct (Noblick 2013b).

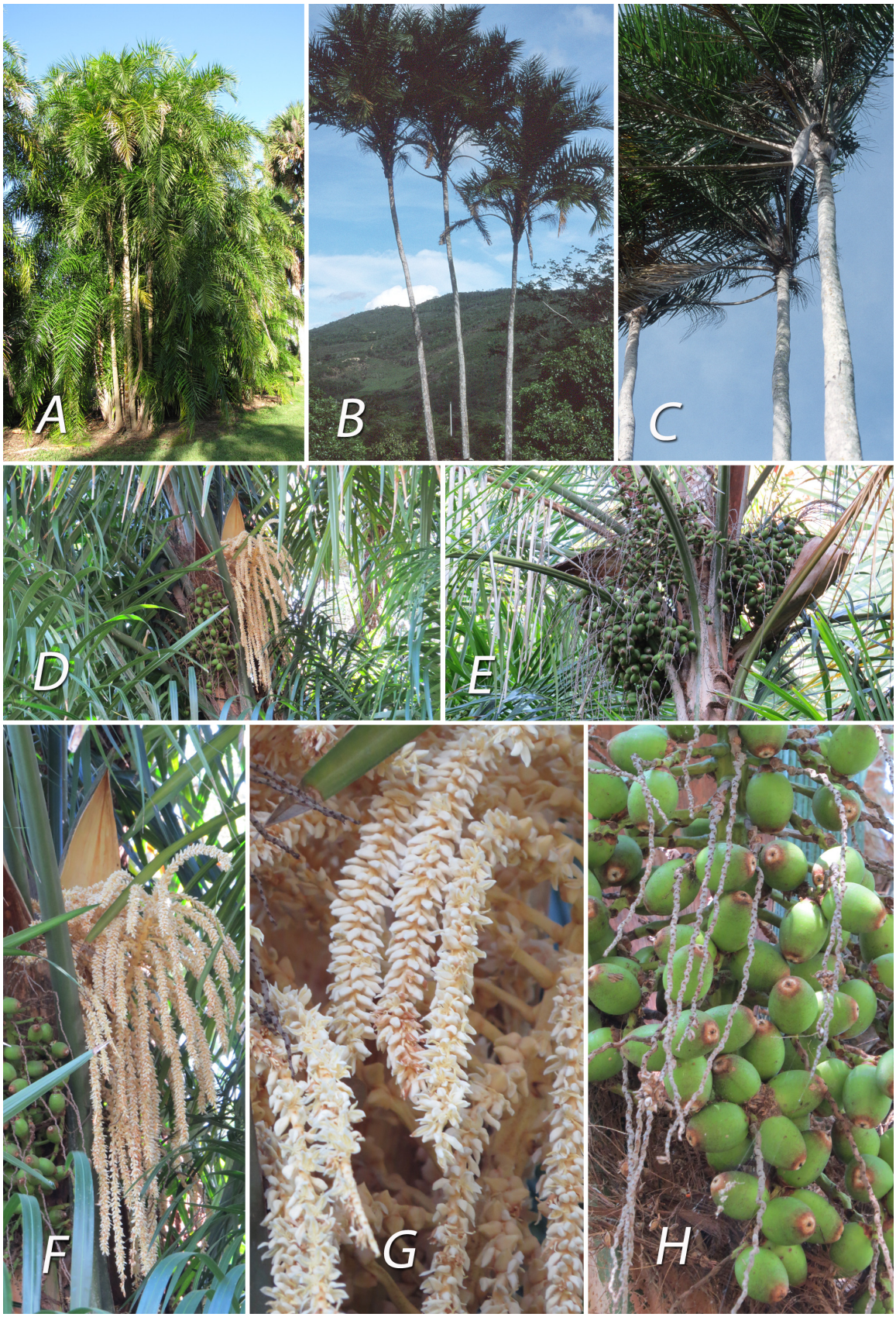

FIGURE 81. *Syagrus stenopetala*. A. Clustering habit at MBC. B. Clustering habit near Bobare, Venezuela (*Noblick & Smith 4947*). C. Crowns, which are more rigid and ascending in habitat. D. Inflorescence. E. Infructescences. F. Inflorescence and Infructescence. G. Staminate flowers. H. Fruits, which are green at maturity.

Representative specimens:—VENEZUELA. **Carabobo:** Guaremales near Urama, road from Puerto Cabello to San Felipe, 10 December 1920 [1921], *H. Pittier 9154* (G, GH, NY!, US!, VEN); Puerto Cabello, 1916, *J.N. Rose 22007* (GH); entre Valencia y Las Trincheras, en selva veranera, 400 m, 5 June 1974, *L. Schnee 1757* (MY); alrededores de Patanemo, cerca del March en espinar, 40 m, 5 June 1974, *L. Schnee 1758* (MY); Distrito Puerto Cabello, al E de caseiro El Castraño y crusando el Río Aguas Calientes, en falda del Parque Nacional San Estanban, 250 m, 10.35, –68.10, 29 August 1996, *F. Stauffer et al. 215* (VEN); Distrito Guarcara, via al pueblo de Las Trincheras, en alrededores de las aguas termales, 450–500 m, without date, *F. Stauffer et al. 216* (VEN); a largo de la carretera Valencia–Puerto Cabello, 2 km al sur de Las Trincheras, 100 m, 6 January 1970, *J.A. Steyermark 102432* (MO!, NY, U, VEN); Parque Nacional Henri Pittier, Rancho Grande, 300–500 m, 10.50, –67.75, 27 January 1987, *W.J. Hahn & F.T. Grifo 3471* (K!, MO!, US); near El Cambur, 1968, *J.G. Wessels Boer 2449* (F!, U); **Distrito Federal:** Falcon: Distrito Zamoura, Cerro La Ceiba, 100 m, 8 June 1977, *T. Ruiz et al. 1595* (VEN); Falcon, al este del Cerro Topopo, cerca de El Maicillal, en selva veranera, 80 m, 17 October 1974, L. Schnee 1778 (MY); Falcon, al este del Cerro Topopo, 13 March 1975, *L. Schnee 1798* (MY); Falcon, Distrito Silva, entre Sanare y El Cruce, 1 km noroeste de La Soledad, 10.92, –68.38, 1 September 1974, *J.A. Steyermark & B. Manara 110614* (BH!, VEN); **Lara:** Bobare, 11 km N of Bobare on the road Baraquisimeto/Coro (Falcon), 700 m, 10.50, –69.47, 18 June 1994, *L.R. Noblick & R. Smith 4937* (FTG!); Gamilotal, 2–3 km E of El Altar, 200–300 m, 10.67, –69, 17 June 1994, *L.R. Noblick & R. Smith 4936* (FTG!, PORTO!); alrededores de Sanare cerca de los maglares, 10 m, 30 January 1975, *L. Schnee 1792* (MY); a 25 km N de Barquisimeto, en las cumbres, 14 May, 1968, *R. Smith 3666* (VEN); **Miranda:** 7 km E of Cupira; new road 1 km S of main road, starting at the Río Chupaquire S of El Guacuco, 0–150 m, 10.15, –65.63, 16 May 1981, *R.L. Liesner & A. González 11928* (MO, NY!, VEN); **Yaracuy:** alrededores de Chivacoa, 16 April 1975, *L. Schnee 1805* (MY); Distrito Nirgua, via Nirgua–Bejuma, 650–700, 29 November 1996–1 December 1996, *F. Stauffer et al. 264* (VEN); Along the road between Boca de Uchire and San José de Río Chico, 4 May 1960, *J.A. Steyermark & S. Nilsson 844* (NY); Nirgua, without date, *J.G. Wessels Boer 2445* (U).

60. *Syagrus stratincola* Wessels Boer (1965: 170). Type:—Suriname, Paloemeu River, upper Marowijne area, *J.G. Wessels Boer 1303* (holotype U!, isotype BH!, F!, NY!)

Figure 82 plate, Figure 77 map.

Small to medium-sized, clustering palm. **Stem** ca. 2–4(–14) m × 5–8 cm. **Leaves** ca. 12; *sheathing leaf base* ca. 15–30 cm long; *pseudopetiole* 100–180 cm long, *petiole* ca. 10 × 1.2–2.5 cm; *rachis* 210–240 cm long; *leaflets* slightly lighter on the abaxial surface, 60–82 along one side, in clusters of 2–4, inserted at various angles, giving the leaf a plumose appearance, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets not measured, middle leaflets 60–70 × ca. 3 cm, apical leaflets not measured with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 22–30 × ca. 2.5 cm; *peduncular bract* 65–120 cm long, expanded portion 35–80 × 5–6 cm, including a 0–0.5 cm beak, 10–18 cm perimeter, 3–4 mm thickness, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 35–70 cm × 5–8 mm, elliptical in cross-section, tomentose; *inflorescence axis* 20–58 cm long; *rachis* 7–17 cm long; *rachillae* 10–15, glabrous, 15–20 cm long at the apex, 18–26 cm long at the base; *staminate flowers* 14–15 mm long at the apex, 17–20 mm long at the base, green to yellow, sepals 3–5 mm long, glabrous, petals 14 mm long at the apex, 20 × 5–6 mm at the base with acute tips, stamens not measured, anthers ca. 6 mm long, filaments ca. 2 mm long, pistillode less than 1 mm long; basal *pistillate flowers* elongate pyramidal, 16–25 × 6–7 mm, yellow, glabrous, sepals 15–25 × 5–7 mm, petals 13–19 × 3–5 mm, glabrous, pistil 11–17 × 3–4.5 mm, glabrous, stigmas not measured, glabrous, staminodal ring not measured. **Fruit** nearly globose, 4–4.5 × 3.7–4 cm, yellowish-green when mature, epicarp less than 0.5 mm thick, longitudinally grooved, mesocarp 3–5 mm thick, succulent and fibrous; *endocarp* ca. 3.5–5 × ca. 3.5 cm, 1.5–3 mm thick on its sides, ca. 5 mm thick at the ends; *seed* nearly globose, ca. 1.5–2.2 × 2.1–2.6 mm, endosperm homogeneous. Germination remote-tubular.

Common name:—akanauwirie, pali

Etymology:—Wessels Boer (1965) wrote "The species is named *stratincola* (*statum*, pavement) as it grows on granite plates."



FIGURE 82. *Syagrus stratincola*. A–B. Palm in habitat on Pic du Grand Crossant, Camopi, French Guiana. C. Cultivated specimen in Cayenne, French Guiana near CAY herbarium. D. Inflorescence. E. Newly emerged flowers. F. Infructescence. G. Close of infructescence showing fruits with spit apices. H. Fruits showing deeply grooved epicarp. White scale = 2 cm. Photos A and B by Emile Piqard.

Distribution and habitat:—Found in Guyana, Suriname, French Guiana and probably in Amapa, Brazil, the extreme northern part of Brazil bordering the Guyanas, usually on rock outcrops (granitic inselbergs) in very thin soils.

Conservation:—Although rare throughout most of its distribution, because of its very specific habitat, this palm is well protected within the borders of the Guiana Amazonian National Park (Parc Amazonien de Guyane), which covers most of the southern half of French Guyana, but continues into Brazil in the form of the Parque Nacional Montanhas do Tumucumaque. It grows in some of the most remote and inaccessible regions of the Guyanas and Brazil–so remote that there are no collections of it from Brazil, even though the habitat is surely present in Amapa. It grows on nearly bare rock surfaces of isolated inselbergs in very thin soils, which are of no agricultural value. Therefore, this palm is not currently threatened and is classified as least concern, LC.

Phenology:—This species probably flowering and fruiting year around. Flowers, immature fruits, and fallen mature fruits were observed in the months of April and May.

Uses:—It is occasionally cultivated.

Notes:—The longitudinally grooved epicarp of its globose fruit is especially distinctive, as are its clustering habit and unusual inselberg habitat.

Representative specimens:—FRENCH GUIANA. **Cayenne:** Natural helicopter drop zone [DZ naturelle], Dalle rocheuse, á 3–4 km á ENE du Pic du Grand Croissant, Haute Crique Nouciri, [basin] affluent de l'Oyapock, 130 m, 2 December 1983, *G. Cremers 8250* (CAY!, P!, U!); Mont Chauve, Bassin de l'Approuague, fourré isolé de savane roche, face oueste de l'inselberg, 240 m, 3.82, –52.73, 27 April 1997, *G. Cremers & F. Crozier 15219* (CAY!, NY, P!, Spé); Natural helicopter drop zone [DZ naturelle], savane roche au Nord du piton rocheux Armontabo, basin de l'Armontabo, 24 February 1981, *J.-J. de Granville 4394* (CAY!, K!); Nouragues, Station des Nouragues, Bassin de l'Approuague, arataye, pied du versant sud, 100 m, 6 August 1989, *J.-J. de Granville et al. 11079* (CAY!, US); Roche Touatou, Bassin de l'Oyapock, 23 May 1995, *J.-J. de Granville & G. Cremers 13052* (B, CAY!, K, NY, P!, U!, US); Station des Nouragues, Bassin de l'Approuague, 1 November 1989, *D. Larpin 772* (CAY!); Montagne des Nouragues, Bassin de l'Approuague, 1 December 1989, *D. Larpin* 839 (CAY!); GUYANA. Base of Roosevelt Peak, 140 m, 1977, *H.E. Moore et al. 10329* (BH, F!); SURINAM. Near Paloemeu airstrip, along Paloemeu River, upper Marowijne area, 0–100 m, 3.33, –55.42, 16 April 1963, *J.G. Wessels Boer 1303* (BH!, F!, NY!, U!); Tapanaboni River, 100 m, 14 August 1904, *G.M. Versteeg 805* (U!).

61. *Syagrus vagans* (Bondar) Hawkes (1952a: 178). *Cocos vagans* Bondar (1942a: 457). Lectotype (designated by Glassman [1972b: 95]):—BRAZIL. Bahia: 1941*, G. Bondar s.n.* (lectotype F! [F-619777])

Figure 83 plate, Figure 77 map.

Small, clustered or solitary, unarmed, palms 1.2–2.2 m tall. **Stem** subterranean, growing horizontally, appearing acaulescent, usually 15–30 × 10–15 cm below the ground, and strongly rooted along its length, with persistent leaf bases. **Leaves** 6–30 in the crown, spirally arranged and spreading to stiffly ascending up to 3 m high; *sheathing leaf base* 30–32 cm long, often persistent on the underground stem, sheath with very narrow, stiff, flattened fibers along the margins; *pseudopetiole* 30–140 cm long, basal portion with short, narrow, fine, serrate projections along the margin, *petiole* 2–45 cm long; *rachis* 44–186 cm long; *leaflets* dark green to yellow green leaflets with waxy coating above, whitish beneath, usually at an acute angle with the rachis, 17–38 along one side, regularly distributed in one plane or rarely clustered 2–3; ramenta scales or tomentum present or absent where the leaflets are inserted on the rachis or along the abaxial midvein; basal leaflets 16–23 × 0.2–1.6 cm, middle leaflets 18–54 × 1.8–3.5 cm, apical leaflets 29–37 × 0.7–1.6 cm, mostly with acute to asymmetric tips. **Inflorescence** erect, spirally branched; *prophyll* 21–34 × 2.5–4 cm; *peduncular bract* ca. 80–150(–180) cm long, expanded portion 31–98(–106) × 2.5–7(–8) cm, bearing a 2–3 cm beak, woody, sulcate; *peduncle* ca. 38–110 × 5–11 mm; *inflorescence axis* 18–65 cm long; *rachis* 12–37 cm long; *rachillae* (5–)15–35(–46), 5–49 cm long at the base, 3–22 cm long at the apex, rachillae bracts absent or up to 2 mm long; *staminate flowers* 2–5 mm long at the apex, 5–7 × 2–4(–5.5) mm at the base, pale yellow, sepals 1–1.5 × (< 1–)1.7–2 mm, glabrous, no visible veins, petals 2–4 mm long at the tip, 4–6(–7) × 1.5–3 mm at the base of the rachillae, with acute tips, glabrous, nerves none to indistinct, stamens 2.3–4 mm long, anthers 1.5–3 mm long, filaments 1.5–3 mm long, pistillode 1.5 mm long; *pistillate flowers* somewhat rounded or conical, 5–7 × 5–6(–7) mm, sepals 5–7 × 4–6 mm, yellow, glabrous, distinctly veined, not keeled, petals

4–5 × 3–5.5 mm, glabrous, distinctly veined except at the tip, valvate tips 1/5–1/2 the length of the petal, ca. 1–2.5 mm long, pistil 4 × 3–4.5 mm with white tomentum, stigmas 1 mm long, staminodal ring ca. 1 mm high. **Fruit** narrowly ellipsoid, 2.8–3.7 × 1.5–1.8 cm, persistent perianth (cupule) light brown, 12–14 mm wide, 4–5 mm deep, ring 3 mm in height, epicarp less than 0.5 mm thick, smooth green with scattered fine white tomentum, yellowish green when mature, mesocarp 1–2 mm thick, fibrous; *endocarp* 3.1–3.5 × 1.8–2.1 cm, bony, light to dark brown, trivittate on interior, 1–2 mm thick on the sides, 3–5 mm thick at the ends, with no clusters of fibers; *seeds* 1.9–2.6 × 0.8–1.1 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—ariri, licuriroba, licurioba, licurioba-das-caatingas, licuriroba-das-caatingas, pindoba.

Etymology:—The specific epithet, *vagans,* means wandering and refers to the prostrate trunk which tends to push the crown from one location to another as it grows.

Distribution and habitat:—Brazil, eastern Bahia in the dryer caatinga vegetation regions. This species is nearly endemic to the state of Bahia, just barely reaching into the state of Minas Gerais in caatinga vegetation above 250 m elevation. In Bahia, its northern limit is around Senhor do Bonfim and Monte Santo. Its western limit is around the Serra do Tombador and the Serra do Sincorá, and the eastern limit is around Castro Alves. *Syagrus vagans* reaches its southern limit in northern Minas Gerais just north of Pedra Azul along the BR 116 (G. F. Essenfelder Abrahão, pers. comm.). This species grows in a variety of soil types, usually sandy and gravelly in nature, but occasionally lateritic and often in association with *Syagrus coronata*. It has been observed only once in a transitional zone between campo rupestre and caatinga vegetation at an elevation of 850–900 m. It is the only acaulescent palm that grows in the arid caatinga, all other palms with short subterranean stems are either restricted to the high elevation campo rupestre or in cerrado vegetation.

Conservation:—This species is widely distributed within the eastern portion of Bahia and slightly into Minas Gerais. It grows in some of the driest regions of the state and in soils that have no agricultural value. It produces an abundance of seeds, which germinate well. It is not threatened and is classified as least concern, LC.

Phenology:—This species flowers December–May and fruits April–August.

Uses:—The mesocarp of the fruit is edible, and the nut is rich in oil. In nature the fruits and seeds are eaten by insects or consumed by wild animals. Leaves and inflorescences are used as forage for livestock. Seeds are oily and are used to fatten pigs and chickens. Oil is extracted from the seed. Part of the leaves are used to make hats and to cover rustic dwellings (Bondar, 1939d). The palm possesses ornamental attributes and is recommended for landscaping.

Notes:—This is a drought-resistant, prostrate palm with stiff erect leaves possessing narrow tooth-like flattened fibers on the lower part of its sheath and pseudopetiole, and narrow ellipsoid fruits that remain green even at maturity.

Because it is restrictive in its habitat, it is easy to identify in the field. The dark green stiffly erect to somewhat spreading leaves are very characteristic. The inflorescence often will stick above the leaves of some of the smaller individuals. This species has very long narrow rachillae, up to 65 cm in some cases, and has 15–35(–46) rachillae, which tend to always be upwardly oriented. Its fruits are narrow and long, up to 3.7 cm, which is longer than the fruits of other acaulescent species.

There is some suspicion that the specimens growing in the Morro do Chapéu region are different than those growing at lower elevations, but the author could not find any significant differences in their anatomy. However, there are no ramenta scales or tomentum present, and none where the leaflets are inserted on the rachis or along the abaxial midvein in the northern Morro do Chapéu, Bahia population, but there are ramenta scales present along the abaxial midvein in the southern Brumado, Bahia population.

Representative specimens:—BRAZIL. **Bahia:** Argom, without date, *E.R. Salviani & H. Lorenzi 187* (HPL!); Brumado, 22 km E of Brumado, caatinga, ca. 50 clumps seen, 5 July 1969*, S.F. Glassman & J.T. Medeiros-Costa 8725, 8726* (F!, FTG!); Conceição de Coite, Serra do Mucambo, topo da serra, –11.50, –39.18, 24 April 2013, *D.N. Carvalho 203* (HUEFS!); Contendas do Sincorá, Sudoeste, –13.85, –40.83, 19 October 1997, *M.L. Guedes 6878* (ALCB!); Iaçú, 20 km N of Lagedo Alto, 29 June 1969*, S.F. Glassman & J.T. Medeiros-Costa 8709* (F!); Iaçú, 5–10 km W of Lagedo Alto, 29 June 1969*, S.F. Glassman & J.T. Medeiros-Costa 8710–8713* (F!); Iaçú, 40 km leste da cidade na BA 046, –12.75, –40.18, 22 April 1984*, L.R. Noblick et al. 3161* (HUEFS!); Iaçú, Fazenda Suibra (Boa Sorte), 18 km leste da cidade, –12.72, –40.12, seguindo a ferrovia, 13 March 1985*, L.R. Noblick 3609* (HUEFS!); Itaberaba, BR-242, a 30 km de Argoim na direção de Itaberaba, 16 April 1991, *R.P. de Lyra Lemos & Esteves 1822* (MAC!); Itaberaba, Morro Itibiraba, 270 m, –12.50, –40.08, without date, *A.O.Moraes 72* (HUEFS);



FIGURE 83. *Syagrus vagans*. A. Palm with typical inflorescence. B. Palm with guide holding an infructescence. C. Infructescence with narrow ellipsoid fruit. D. Palm at Jardim Botânico Palmarum (JBP) from Jequié, Bahia. E. Infructescence. F. Specimen from Jequié, Bahia. G. Specimen from Morro do Chapéu, Bahia, note how it looks a bit different in habit from D or F. H. JBP specimen from Brumado, Bahia.

Itaberaba, 480 m, –12.48, –40.47, 20 November 1986, *L.P. Queiroz de 1331* (HUEFS); Itatim, Morro do Agenor, 280–410 m, –12.70, –39.77, 26 November 1995, *F. França 1488* (HUEFS); Itatim, Morro do Tocas, 310–430 m, –12.72, –39.70, 29 September 1996, *F. França 1501* (HUEFS); Itatim, –12.70, –39.68, 29 September 1996, *V. de Monterro & C.M.L. Aguiar s.n.* (HUEFS!); Itaeté, Itaeté/Marcionilio Souza, –13.05, –40.87, SD 24-VC, 19 October 1978, *A.P.* de *Araujo 96* (HRB!, RB!); Itiúba, Povoado de Picos, serra entre o povoado e a Fazenda Lage da Cruz, 485 m, 5 April 2012, *D. Fernandes 4* (HVASF); Itiúba, Povoado de Picos, Serra de Picos, 514 m, 5 April 2012, *R.R.V. Gonçalves 6* (HVASF); Jequié, Rodovia Rio–Bahia BR-4, 30 km N of Jequié, para Milagres, 22 January 1965, *R.P. Belém & J.M. Mendes 242* (BH!, UB!); Jequié, –13.86, –40.08, 20 November 2000, *E.R. Salviani & H. Lorenzi 1849* (HPL!); Gonçalo, Piemonte da Diamantina, –11.13, –40.17, 5 August 2001, *M.L. Guedes 9081* (ALCB); Maracás, 20 km N of Maracás, Morros, in caatinga, very local or sparse, 1 July 1969, *S.F. Glassman & J.T. Medeiros-Costa 8717–8719* (F!); Maracas, 29 km ao S de Maracás, pela antiga rod. para Jequié, 700 m, Folha SD 24 (14-40a), 27 April 1978, *S.A. Mori et al. 10065* (CEPEC!), *10066* (CEPEC!, NY!); Maracás, –13.44, –40.43, 29 June 1993, *L.P. de Queiroz 3272* (HUEFS); Marcionílio Souza, Vicinity of Machado Portello, –13.00, –40.53, 19 June 1915, *J.N. Rose & Russell 19900* (NY!, US!); Miguel Calmon, 10 km N da cidade, estrada para Brejo Grande, Fazenda Licuri, –11.43, –40.60, 15 June 1985, *L.R. Noblick 3846* (F!, HUEFS!); Milagres, December 2009, *A.F. Brito 35* (HUEFS); Milagres, entroncamento Milagres e Amargosa, 10 km, March 1972, *A.L. Costa s.n.* (ALCB-410!); Milagres, Rodovia BR-116 Rio/Bahia, prox. a Milagres, 11 January 1983 *L.A. Mattos Silva et al. s.n.* (CEPEC!); Fazenda Bom Jesus, 7 December 1970, *A.L. Costa s.n.* (ALCB-411!); Morro do Chapéu, 48 km da estrada de Riacho das Lages/Morro do Chapéu, BA-426, –11.55, –41.16, 3 April 1986, *A.M. de Carvalho et al. 2409* (CEPEC!); Morro do Chapéu, –11.55, –41.16, 19 October 2009, *L.H.P. Kiill & L.S.D. de Cunha 3820* (HTSA); Morro do Chapéu, 18 km norte do Morro do Chapéu, –11.98, –41.29, 3 November 1985, *J.L. de S. Lima & L.R. Noblick 140–147* (HTSA!); Morro do Chapéu, 11 km norte na estrada para Jacobina, Fazenda Homoriô, –11.55, –41.15, November 1984, *L.R. Noblick & Clodoaldo 3537* (HUEFS!); Morro do Chapéu, ca. 20 km N of the city on BR-426 (Morro do Chapéu/Jacobina), –11.55, –41.16, February 1992, *L.R. Noblick 4834* (FTG!, K!, NY!); Poções, Col. along the main highway near Poções, and common from Plan Alto [Planalto] to Jequié, ca. 700 m, 17 January 1975, *R. Read & Daniels 3437* (US!); Queimadas, –10.97, –39.60, 16 November 1986, *L.P. de Queiroz 1141* (HUEFS!); Rio Branco, 15 May 1918, *H.M. Curran 300* (NY!); Santa Inês, Sudoeste, –13.28, –39.82, 21 January 1995, *A.J. Ribeiro s.n.* (ALCB!); Santa Teresinha, 25 March 1931, *G. Bondar 1559* (SP!); Santa Teresinha, 1941, *G. Bondar s.n.* (F-619778!, 620715!, 620752!); Riacho Grande, 4–5 km nordeste de Itatim, –12.75, –39.53, 16 May 1984, *L.R. Noblick et al. 3253* (HUEFS!); Santa Terezinha, BA 016, para Amargosa, ca. 4 km SE do entroncamento com a BR 116, –12.85, –39.77, 2 June 1993, *L.P. de Queiroz 3199* (HUEFS!); Sento Sé, Serra do Curral Feio, 2 km de Almas, –10.50, –41.58, 7 October 1988, *J.L. de S. Lima 90a* (HTSA!); Tartaruga, 18 July 1979, *G. Hatschbach 42466* (MBM!); Vitoria da Conquista, Along the main highway near pocoes, 700 m, 17 January 1975, (US); Vitoria da Conquista, Perto de Cândido Sales, Nova Conquista, –15.50, –41.25, August 1989, *G.F.E. Abrahão* (MBML!); **Minas Gerais:** Salto da Divisa, –16.00, –39.95, 18 July 1988, *G. Hatschbach 50220* (MBM!).

62. *Syagrus vermicularis* Noblick (2004: 109). Type:—BRAZIL. Maranhão: Açailândia, Fazenda Itaibaiana (Companhia Vale do Rio Doce), ca. 17 km S on BR-110 km 1398, 100–150 m, –5.03, –47.02, 6 September 1994, *L.R. Noblick & J.A. Feitosa 4971* (holotype IPA!, isotypes FTG!, Herbarium of Fazenda Itaibaiana!, K!, MO!, NY!, US!)

Figures 84–85 plates, Figure 86 map.

Moderate to large, solitary palm. **Stem** 8–15 m × 12–20 cm, erect, columnar with a large root boss to ca. 45 cm, self-cleaning, conspicuously ringed with oblique leaf scars, the new internodes densely covered with a white caducous wooly indument, which later sloughs off, the rings becoming less distinct; internode length ca. 9–17 cm. **Leaves** ca. 12–15 in the crown, spirally arranged, spreading; leaf *sheath* ca. 80 cm long, *pseudopetiole* 40–100 × ca. 18–20 cm, sheath margins composed of a finely-netted matting of fibers that easily break away leaving a finely fibrous margin, pseudopetiole and petiole, covered adaxially with a wooly caducous indument; *petiole* 3–8 × ca. 3.1–4.4, 1.5–2.2 cm thick at the base of the leaf blade; leaf *rachis* 2.2–2.5 m long with ca. 100–140 pairs of *leaflets* distributed in clusters of 2 or 3 in various divergent planes; ramenta scales or tomentum present where the leaflets are inserted on the rachis and also along the abaxial midvein, especially on the proximal portion of the basal

leaflets; basal leaflets 59–63 × 0.4–0.6 cm, middle leaflets ca. 80–90 × 3–4 cm, apical leaflets 44–47 × 0.2–0.5 cm with an asymmetric tip. **Inflorescence** erect, later pendulous, spirally branched; *prophyll* 72–82 cm long; *peduncular bract* ca. 90–110 cm long, the expanded part of the bract ca. 55–74 × 27–29 cm, including a beak of 4–5 cm, 30–37 cm perimeter, 5–9 mm thickness, sometimes separating from the peduncle before fruits mature; *peduncle* 36–61 × 4 cm, 2 cm thick, elliptical in cross-section; *inflorescence axis* 63–92 cm long; *rachis* 49–52 cm long; *rachillae* ca. 70–137, apical ones ca. 54 cm long, basal ones ca. 118 cm, a major part of the upper or apical portion of the rachillae devoid of any flowers, sterile, folded back and forth on themselves like noodles or worm-like; *staminate flowers* 9–10 mm long at the apex, 10–11 × ca. 5–7 mm at the base, green to yellow, bright yellow drying white or cream-colored; sepals 2–3 × ca. 2 mm, distinct, triangular, acute, membranaceous, glabrous, inconspicuous nerves, petals obovate, ca. 7 mm long at the apex, 8–9 × 4–4.5 mm at the base, fleshy, glabrous, with inconspicuous venation, obtuse to broadly acute; stamens 4–6 mm long, anthers 3.5–4 mm long, filaments 1.5–2 m long, pistillode, less than 0.5 mm long; *pistillate flowers* conical, ca. 9–13 × 8–10 mm, yellow turning green, sessile; sepals ca. 8 × ca. 8 mm, glabrous, without visible venation, sclerenchymous or fleshy, acute, faintly keeled at tip, petals 10–11 × 8–9 mm, with valvate tips ca. 1/5 the length of the petal, ca. 2–3 mm long, triangular, indistinctly nerved, glabrous, acute; pistil (of receptive flower), ovoid, 9 × 7–8 mm, wooly tomentose, persisting as tomentum on the apex of the fruit; stigmas 1–2 mm long; staminodal ring ca. 2.5–3 mm high, undulate with ca. 6 undulations, three small residual teeth, one on every other undulation. **Fruit** ovoid, 5–6 × 4 cm, orange when mature, cupule (persistent perianth) dark brown, ca. 2 cm in diameter × ca. 1 cm high; petals slightly longer than sepals, staminodal ring truncate, ca. 3 mm high × 10 mm diam.; epicarp less than 0.5 mm thick, smooth for most part, but tomentose at apex, mesocarp 2–3 mm thick, succulent and fibrous (pulpy) remaining as a fibrous mat over endocarp; *endocarp* ovoid, 4.5–5 × ca. 3.5–4 cm, ca. 6 mm thick, hard, bony, brown to red-brown, apex with a distinctive, trilobed protuberance or beak, interior smooth, trivittate, slightly triangular in cross-section, outer surface nearly smooth, with small fibers, only slightly pitted, pores 3 (rarely 4) nearly even with surface, sutures visible especially at apex; *seed* ellipsoid, 3 × 2.5–3.2 cm, endosperm homogeneous. Germination remote-tubular with a long, cotyledonary sheath penetrating deeply before sending up a plumule.

Common name:—pati (Brazil), noodle palm (USA). Pati is also applied to *S. botryophora* from the Atlantic coastal rain forest.

Etymology:—The specific epithet, *vermicularis,* means worm-like and refers to the ends of rachillae that are twisty, tangled and devoid of flowers, resembling a tangle of worms.

Distribution and habitat:—This species grows in the Brazilian states of Maranhão, Pará, Tocantins, Mato Grosso (?), and Rondônia in semideciduous forests and in transitional to tropical humid forest, persisting in secondary vegetation and in open pastures. In the state of Maranhão, it was discovered in the mid-western portion near Açailândia and Imperatriz. It was also observed in the state of Pará near Serra Carajás and the Rio Paraupebas. It is probably common in the northern part of the state of Tocantins as well. *Syagrus vermicularis* has been photographed in Rondônia (H. Lorenzi, pers. comm.), so it would not be surprising to discover that it grows in Mato Grosso as well, although no collections have yet been made from there. Ideally, it grows in pre-Amazonian seasonally wet, marginal or secondary forests on terra firme with deep lateritic clay soils on rolling or steep slopes at ca. 100–200 m. elevation. Also seen on lower slopes adjacent to river floodplains near Carajás.

Conservation:—*Syagrus vermicularis* is threatened by the heavy lumbering practices that are reducing the regional forests to pasture. However, this palm species seems to thrive in secondary growth, and farmers often maintain the trees in their pastures. Even though some populations are protected within a few private preserves owned by the Vale do Rio Doce Mining company, because of the expanding lumbering interests and the potential for continued rapid decline of its habitat, it is classified as vulnerable, VU A2c.

Phenology:—It fruits in the months of September–November, and the seeds will germinate in 2–4 months. Once this species obtains its adult stem diameter, the palm grows rapidly but does not become reproductively active until it reaches a height of about 6–7 m. In Brazil, many of the trees in September still had immature developing fruit. A small number had mature fruits, and fewer still had flowers. The first few inflorescences of young palms frequently produce only male flowers, and often these appear outside their normal season. At Montgomery Botanical Center (MBC), all of the flowering and mature fruiting occurs in the late summer and fall (August–November), which is also the rainy season in Florida. At MBC, several new inflorescences were observed opening in the later part of August and into October, the fruits of which were not ready until the following year. This cycle of flowering and fruiting appears to be nearly the same in both Brazil and Florida, despite one being far above the equator and the other being just a few degrees below it.

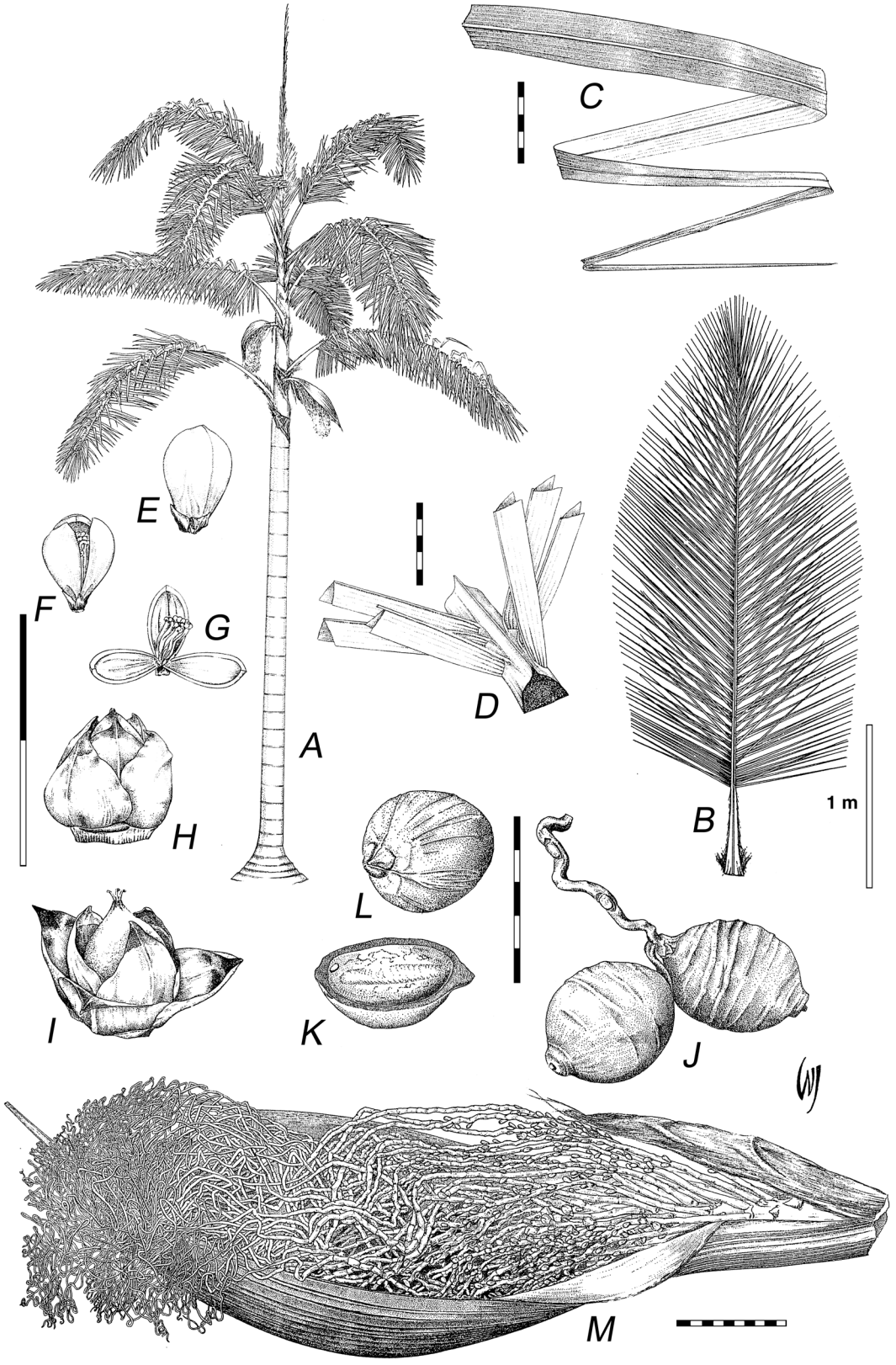

FIGURE 84. *Syagrus vermicularis.* A. Habit. B. Leaf. C. Leaflet. D. Section of leaf rachis showing inserted leaflets. E–G. Staminate (male) flower. H. Receptive pistillate (female) flower. I. Pistillate flower showing tomentose ovary. J. Dried fruits. K. Endocarp shown in longitudinal section. L. Endocarp showing the trilobed beak at the apex. M. Inflorescence showing the "ramen noodle-like" ends of the rachillae that are devoid of flowers. Habit drawn from MBC accession number 94690*G. Leaf, leaflet, flowers and inflorescence drawn fresh from 94690*D. and endocarp and fruit drawn from *Noblick & Feitosa 4971.* All scales are in centimeters with exception of A, which is a 1 m scale. Drawn by Wes Jurgens.

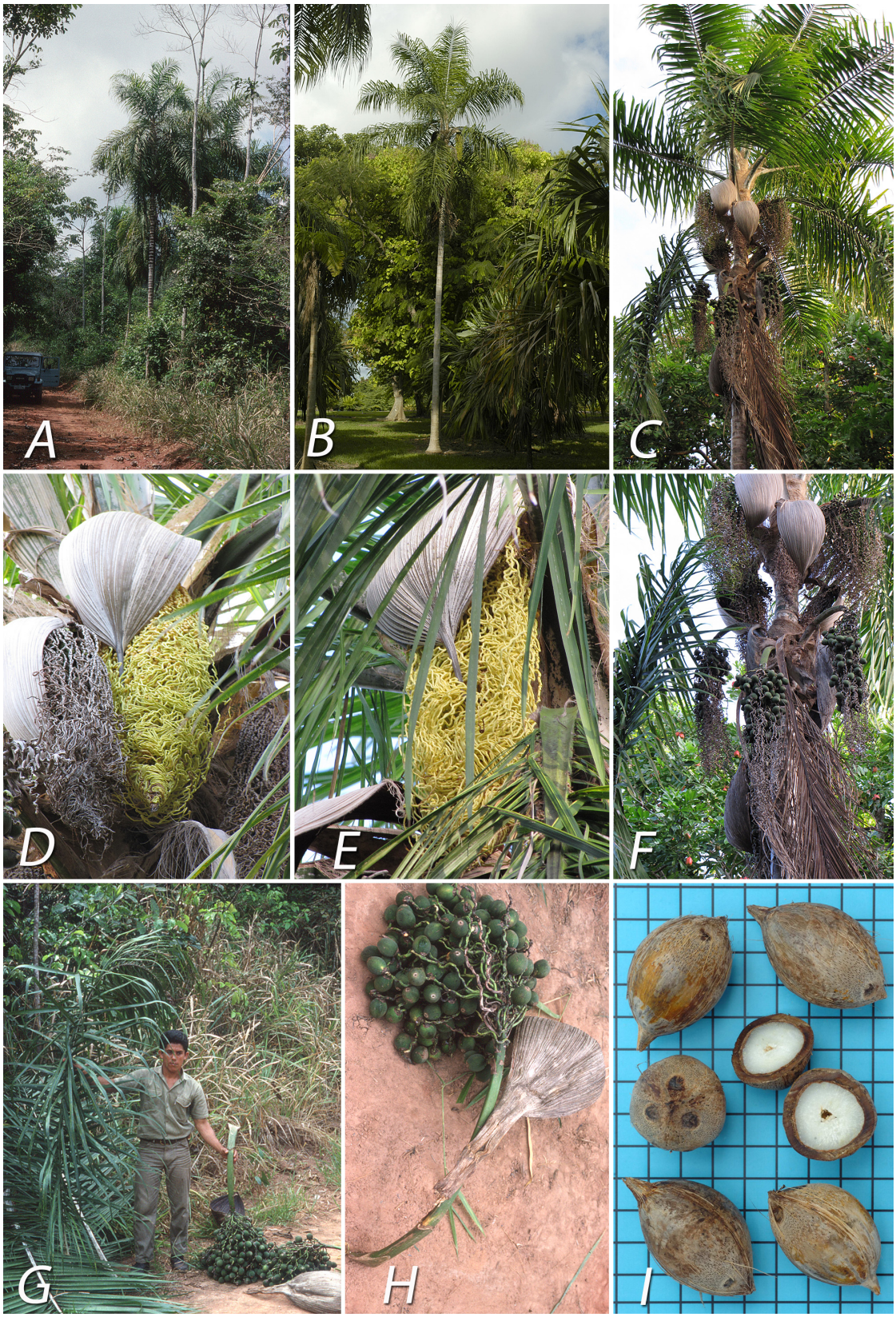

FIGURE 85. *Syagrus vermicularis.* A. Palm in its natural habitat, *Noblick & Feitosa 4971*. B. Habit of cultivated palm grown from seed (MBC 94690). C. Crown with inflorescences and infructescences. D. Inflorescence with newly emerged inflorescence. E. Inflorescence showing the long yellow noodle-like rachillae tips that are devoid of any flowers. F. Infructescences demonstrating the rapid growth of the stem as the inflorescences continue to mature for a period of one year below the crown. G. Leaf and infructescence with immature green fruits held by J.A. Feitosa. H. Infructescence with peduncular bract. I. Endocarps showing triangularly lobed beak, basal endocarp pores and homogeneous endosperm. Grid is in centimeters.

Uses:—The fruit has an edible mesocarp and seed. The plant is fast growing and possesses ornamental attributes that justify its cultivation in tropical and subtropical areas.

Notes:—This is the only *Syagrus* species with rachillae whose tips are completely devoid of flowers and are coiled and twisted like spaghetti. The young fast-growing tree trunks are covered with a caducous white waxy coating or waxy bloom that disappears with age. Some specimens of this species will dehisce their peduncular bract early, which has not yet been observed in other species of *Syagrus,* and its large endocarps possess a prominent trilobed beak (seen only occasionally in *S. botryophora*). A study of the leaf anatomy revealed that just below the upper leaf epidermis, there is a continuous one-cell thick layer of sclerenchyma fibers that is more or less present in all Amazonian species of *Syagrus* and in a few Atlantic coastal species (Noblick, 2013a). The Amazonian *Syagrus* possessing this character are *S. sancona, S. inajai, S. orinocensis, S. stenopetala, S. cocoides, S. smithii* and *S. stratincola.* The closely related *Syagrus* from the Atlantic Forest are *S. botryophora* and *S. pseudococos.*

Representative specimens:—BRAZIL. **Maranhão:** Açailândia, 5–6 km S. of the city on BR-010 (Açailândia/Imperatriz road), –5.03, –47.02, 8 September 1994, *L.R. Noblick et al. 4974* (FTG!, IPA!, K!, NY!); **Pará**, Canaã dos Carajas, na area de mineração, Serra do Sossego, 250 m, –6.44, –50.10, 21 January 2003, *H. Lorenzi 3623* (HPL!); Marabá: Carajás, Marabá Highway, 8 km from the entrance to Serra Carajás, 20 April 1985. *A.B. Anderson & M. Rosa 2202* (MG!); Parauapebas, Próximo Sítio de Chagas [near Chagas farm, margin of the Parauapeba River, Raimundo Mascarenha road], 19 October 1990, *J.P. Silva 650* (Herbarium of Carajás—HCJS!); Parauapebas, Serra dos Carajás, fazenda em Parauapebas; 12 January 1990, *J.B.P. Rocha & J.P. Silva 666* (Herbarium of Carajás—HCJS!); Parauapebas, Serra dos Carajás, fazenda em Parauapebas; 12 January 1990, *J.P. Silva 695* (Herbarium of Carajás—HCJS!); Lugar Antonina, região de Araguatins, 17 August 1961, *E. Oliveira 1760* (IAN!); **Rondônia:** Alta do Floresta d'Oeste, area de Hidroelétrica da Figueira, 447 m, –12.00, –62.17, 10 December 2008, *H. Lorenzi 6573* (HPL!).

63. ***Syagrus weddelliana*** (H.Wendl.) Beccari (1916: 468). *Cocos weddelliana* H.Wendl. ex Moore (1871: 114). *Lytocaryum weddellianum* (H.Wendl.) Toledo (1944, 8). *Microcoelum weddellianum* (H.Wendl.) Moore (1963b: 267). Lectotype (designated by Glassman [1987: 113]):—BRAZIL. Rio de Janeiro: Serra dos Orgãos, [–22.48, –42.91], 1832, M. *Lhotsky 8* (G)

Glaziova elegantissima Perring (1873: 116) (superfluous name for *Cocos weddelliana*, see notes). *Cocos elegantissima* Schaedtler (1875: 158) (superfluous). *Calappa elegantissima* (H.Wendl.) Kuntze (1891: 982) (superfluous). Type:—not designated and no specimens cited.

Glaziova martiana Glaz. ex Drude in Martius (1881: 397) (superfluous name for *Cocos weddelliana*). *Microcoelum martianum* (Glaz. ex Drude) Burret & Potztal (1956: 388) (illegitimate because *Cocos weddelliana* was cited as a synonym).

Cocos pynaertii auctorum (Masters [1891: 683]) (*nomen nudum,* misspelled *Cecos Pynaertii*). *Cocos weddelliana* var. *pynaertii* hort. ex Nicholson & Mottet (1899: 754). *Syagrus weddelliana* var. *pynaertii* (G.Nicholson & Mottet) Beccari (1916: 468). *Lytocaryum weddellianum* var. *pynaertii* (G.Nicholson & Mottet) Hawkes (1952b: 190). Type:—not designated and no specimen cited. Cultivated in nursery of Pynaert van Gurt, Ghent, Belgium (Glassman 1987).

Syagrus weddelliana var. *cinerea* Beccari (1916: 471). *Lytocaryum weddellianum* var. *cinereum* (Becc.) Hawkes (1952b: 190). Type:—BRAZIL. Rio de Janeiro: without date, *A.F.M. Glaziou 2758* (FI; MO)

Figure 87 plate, Figure 86 map.

Solitary palm with columnar **Stem** ca. 1.0–3.5 m × 3–6(–10) cm, often covered with persistent leaf bases. **Leaves** 7–25; *sheathing leaf base* not measured; *pseudopetiole* 54–61 cm long; *petiole* 5–14 × 0.5–0.7 cm, petiole and rachis densely covered with long dark brown to chestnut-brown fibers; *rachis* 65–88 cm long; *leaflets* dark green adaxially, silvery pubescent abaxially, linear-lanceolate, 33–45(–60) along one side, regularly arranged in one plane, ramenta scales or tomentum present where the leaflets are inserted on the rachis and also present along the abaxial midvein, especially the proximal portion; basal leaflets 20–21 × 0.1 cm, middle leaflets 18–25 × 0.4–1.2 cm, apical leaflets 3–4 × 0.1 cm with tip asymmetrically bifid. I*NFLORESCENCE* erect to pendulous, spirally branched; *prophyll* ca. 18 × 1 cm; *peduncular bract* ca. 60 cm long, expanded portion 34–40 × 2.5 cm, including a 2.0–7.5 cm beak, 1.5–1.8–3.0 cm perimeter, 0.5–1.0 mm thickness, narrow, woody, sulcate, exterior with scattered scaly lepidote; *peduncle* ca. 18–36 cm × 3–5 mm, elliptical in cross-section, scaly lepidote; *inflorescence axis* 20–36 cm long; *rachis* 15–28 cm long; *rachillae* 20–37(–62), scaly lepidote, 3–8 cm long at the apex, 6.5–19 cm

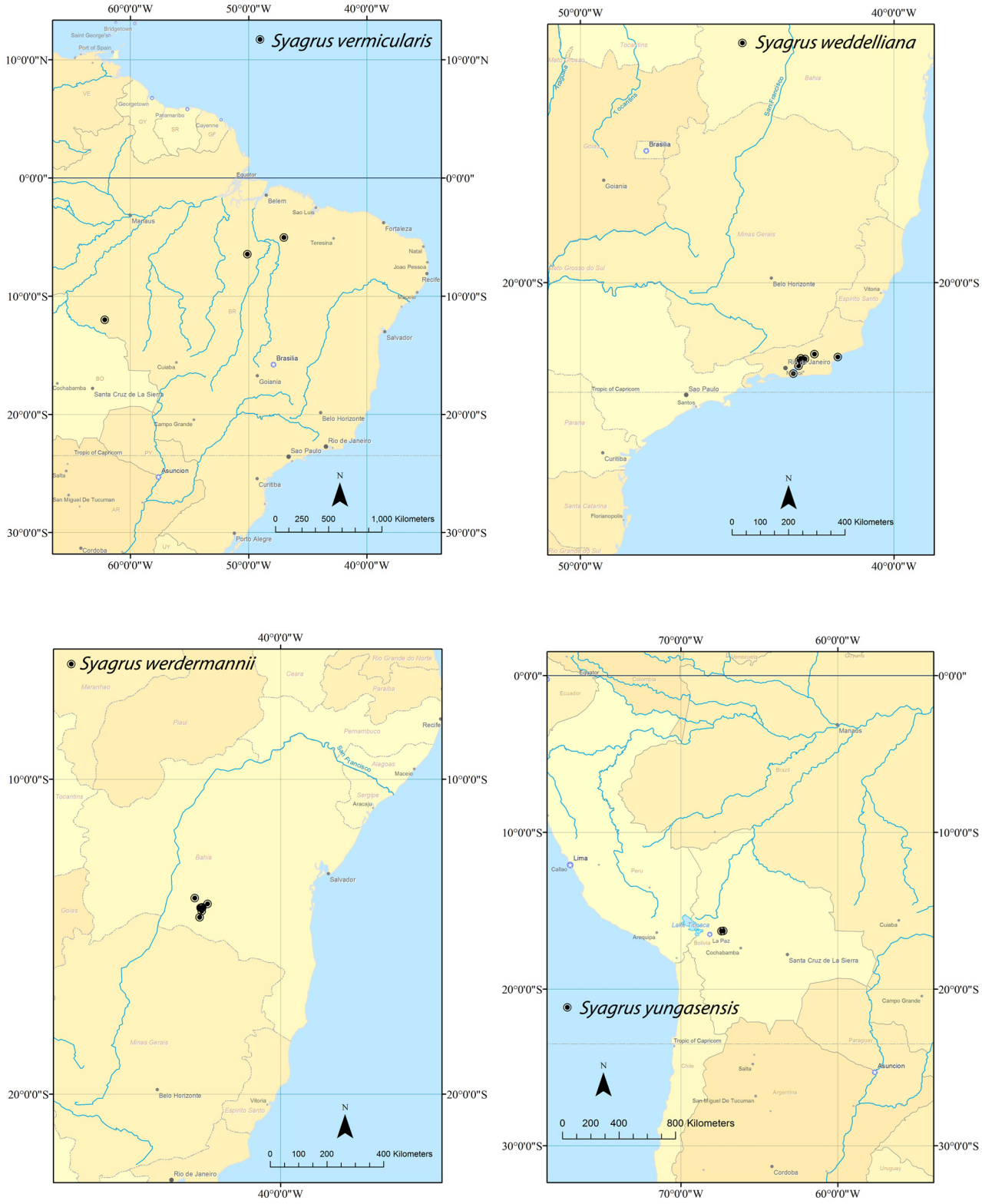

FIGURE 86. Distribution maps of *Syagrus vermicularis, S. weddelliana, S. werdermannii* and *S. yungasensis*.

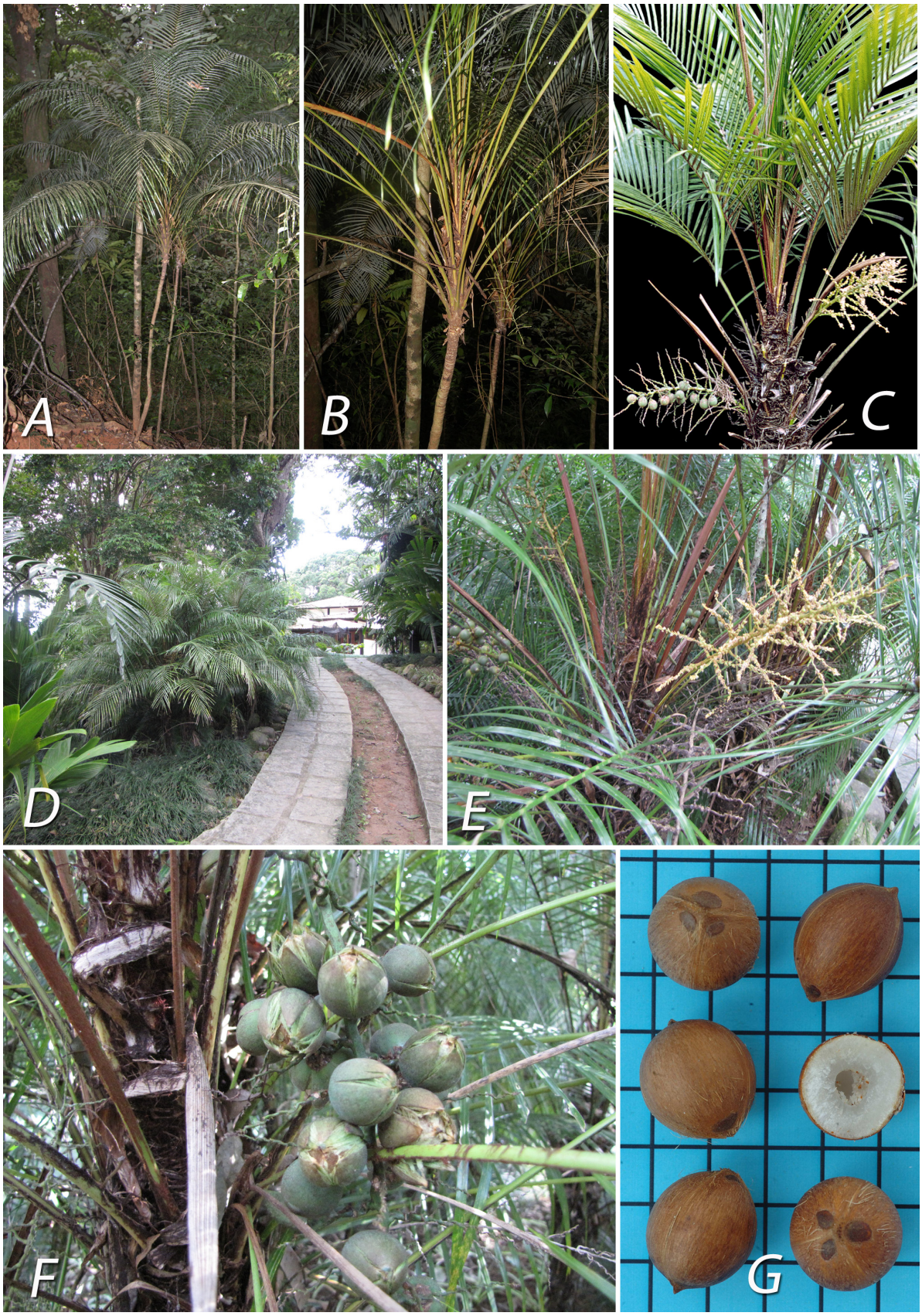

FIGURE 87. *Syagrus weddelliana*. A. Habit of palm. B. Leaf sheaths and petioles. C. Crown with inflorescence and infructescence. D. Habit of cultivated specimen. E. Inflorescence. F. Infructescence showing the spit epicarps when mature. G. Epicarps with one sectioned to show homogeneous endosperm and internal cavity. Grid is in centimeters. Photos A, B, C and G by Harri Lorenzi.

long at the base; *staminate flowers* 2.5–3.7 mm long at the apex, 2.7–5.7 × 0.9–2.5 mm at the base, green to yellow, sepals 0.7–1.8 × 0.8–1.9 mm, glabrous, faintly visible nerves, petals 1.9–3.3 mm long at the apex, 2.2–4.6 × 0.6–1.5 mm at the base with acute tips, nerves indistinct, stamens 0.9–0.3 mm long, anthers 0.6–2 mm long, filaments 0.4–2.0 mm long, pistillode ca. 1 mm long; basal *pistillate flowers* conical, 5.0–8.5 × 3.2–6.5 mm, yellow, glabrous, sepals 4–8 × 2.5–5.5 mm, glabrous, faintly nerved to indistinctly nerved, petals 3.0–4.5 × 1.2–2.7 mm, lepidote to glabrous, distinctly nerved, valvate tips 1/3 to greater than ½ the length of the petals, ca. 1.5–2 mm long, pistil 3.0–5.5 × 1.4–2 mm, scaly lepidote, stigmas ca. 1.3–2.0 mm long, glabrous, staminodal ring ca. 0.3–0.8 mm high, 6-dentate. **Fruit** globose to ovoid, 1.7 × 1.0–1.7 cm, brownish-green when mature, glabrous, epicarp less than 0.5 mm thick, mesocarp 0.5–1.0 mm thick, fibrous, epicarp and endocarp split longitudinally into three or more parts when mature exposing the endocarp; *endocarp* nearly globose, 1.5 × 1.3 cm, 0.5 mm thick on its sides, 1 mm thick at the ends, thin and fragile; *seed* depressed to very broadly ellipsoid, ca. 1.5 × 1.3 cm, endosperm homogeneous. Germination adjacent-ligular. Eophyll small, simple, entire, but the second leaf is pinnate.

Common name:—agué, icá, ico, palmeirinha-de-petrópolis, jara, micury.

Etymology:—The specific epithet, *weddelliana,* honors the English-born, French-raised botanist Hugh Algernon Weddell (1819–1877), who spent a number of years during at least two expeditions exploring and collecting in South America.

Distribution and habitat:—This palm occurs in the Brazilian state of Rio de Janeiro, in the Atlantic Forest on steep, rocky slopes below Petrópolis and Teresópolis. It grows in the humid rainforests from 50–800 m elevation.

Conservation:—Since this species grows on steep, rocky terrain that is not highly prized agriculturally, and since it is propagated in the nursery trade, it is classified as least concern, LC.

Phenology:—This species flowers and fruits in the spring (October–December), probably flowering and fruiting year around.

Uses:—This palm is very popular in the nursery trade for both interior and exterior landscaping. It can tolerate low light conditions.

Notes:—This species has been confused with *S. insignis,* but has a shorter stem, narrower pinnae and is covered with chestnut-brown hairs or fibers instead of black ones. The first leaf (eophyll) is lanceolate, ca. 5 cm long, but the second leaf is always pinnate, unlike *S. insignis*, which continues to produce simple lanceolate leaves until it is about 30 cm tall. As an adult plant, this species does not transplant as well as an adult *S. insignis* does. The designation of a lectotype or neotype for this species was amply covered by Glassman (1987). Basically, Wendland first described the species in 1871 under *Cocos weddelliana*. Unaware that it had already been validly described, Drude named it *Glaziova martiana*, but he listed *Cocos weddelliana* as a synonym, thereby making his own name illegitimate.

Glaziova elegantissima only became validly published by Wilhem Perry in 1873 even though it had appeared in the literature a few years before. The earlier quoted validation date of 1871 was found to be invalid (Govaerts *et al.* 2016). Therefore, since it was published after *Cocos weddelliana* (Moore 1871) it becomes a superfluous name, along with all of its later homonyms.

The name *Calappa elegantina* (a misspelling of *Calappa elegantissima*) and does not appear in Kuntze (1891: 982), as many have reported.

Representative specimens:—BRAZIL. **Espírito Santo:** Castelo, Trilha das piscinas para o mirante, –20.52, –41.08, 2 May 2008, *C.N. de Fraga 1983* (RB); **Rio de Janeiro:** [Guapimirim], forest descent from Serra dos Orgaos to Frechal, February 1826, *Burchell 2530* (K!, P); Guapimirim, Estação Ecológica Estadual de Paraíso. Proximidades do alojamento, –22.43, –42.83, 29 August 1991, *S.V.A. Pessoa 593* (RB); Guapimirim, Estação Ecológica Estadual de Paraíso. Mata atrâs da residência, –22.43, –42.83, 5 February 1992, *L. Sylvestre 709* (RB); Macaé, Serra de Macaé, Alto da Serra, –22.37, –41.77, 1 January 1909, *E. Garbe s.n.* (SP!); Magé, Estrada de parada Modelo para Cachoeiras de Macacu, ramal de acesso ao Centro de Primatologia da FEEMA. Em trilha à esq. da reserva, em direção a Guapimirim, –22.50, –42.91, 2 September 2006, *P. Fiaschi et al. 3149* (SPF); Magé, Paraíso, –22.65, –43.04, 16 October 1984, *H.C. de Lima et al. 2200* (MBM); Rio de Janeiro, –22.90, –43.21, 14 October 2004, *H. Lorenzi 4959* (HPL!); Rio de Janeiro, 1838–1842, *Wilkes Exploring Expedition s.n.* (GH); Sant'Ana, 1 January 1909, *E. Garbe s.n.* (SP!); Teresópolis, Parque Nacional da Serra dos Órgãos, Sede Guapimirim (sub-sede). Trilha para a capela do rio Soberbo, –22.41, –42.97, 14 April 2001, *P. Fiaschi et al. 790* (SP, SPF); Teresopolis, 1883, *A.F.M. Glaziou 16478* (BM, F, NY, P); Teresópolis, Soberbo, –22.41, –42.97, 25 July 1918, *F.C. Hoehne s.n.* (SP!); Teresópolis, Parque Nacional Serra dos Órgãos, vale do Rio Bananal, picada do

falecido Hipólito, –22.50, –43.03, 26 June 2007, *M. Nadruz 1849* (RB); Teresópolis, Serra dos olhos d´água, Terezópolis. Serra dos Órgãos, –22.41, –42.97, 1 March 1887, *H. Schenk 2957* (RB); **Without locality**, 1862, *A.F.M. Glaziou 288* (P); 1883, *Herb. Saldanha* (R-44707); 1891, *Uhle 1978* (R); 1894, *Uhle s.n.* (R [R-44582]); *A.F.M. Glaziou 3635* (C, P).

64. *Syagrus werdermannii* Burret (1933: 109). Type:—BRAZIL. Bahia: Höhe 800–1000 m ü. M. Auf offenen "Geraës" sehr charakteristisch [Elevation 800–1000 m above sea level. In very characteristic open "Gerais"]. April 1932, *E. Werdermann 3742* (holotype destroyed at B); Neotype (designated by Glassman [1971a: 7]):—Situ do Ouro, 15 km NW of Caetité, 6 July 1969*, S.F. Glassman & J.T. Medeiros-Costa 8728* (F!)

Figure 88 plate, Figure 86 map.

Small, clustered or solitary, unarmed, palm less than 1–2 m tall. **Stem** subterranean, often growing horizontally, appearing acaulescent. **Leaves** 4–8 in crown, spirally arranged, spreading; *sheathing leaf base* 20–36 cm long, fibrous; *pseudopetiole* 26–32 cm long with smooth to fibrous margins; *petiole* 8–20 × 0.7–1 cm; *rachis* 26–81 cm long; *leaflets* green above, paler beneath, 10–20 along one side, regularly distributed with the lower sometimes in clusters of 2 or 3 in one plane, no ramenta scales or tomentum present where the leaflets are inserted on the rachis, and none along the abaxial midvein; basal leaflets 19–28 × 0.2–0.8 cm, middle leaflets 20–50 × 1.0–2.8 cm, apical leaflets 22–29 × 0.4–0.6 cm mostly with acute, asymmetric tips. **Inflorescence** erect, spirally branched, with rachis and rachillae covered with a fine, dense white tomentum; *prophyll* 18–26 × 2–2.5 cm; *peduncular bract* ca. 60–80 cm long, expanded portion 22–54 × 2–5 cm, bearing a 0–3 cm beak, perimeter not measured, 1–3 mm thick, woody, sulcate, covered with dense grayish white to light brown tomentum, becoming glabrous with age; *peduncle* ca. 19–68(–72) × 0.5–0.7 cm; *inflorescence axis* 16–43 cm long; *rachis* 10–18 cm long; *rachillae* 6–18, 7–15 cm long at the apex, 12–25 cm long at the base, covered with tomentum, rachilla bracts usually absent or up to 2 mm long; *staminate flowers* 4–7 mm long at the apex, 7–9.5 × 3–5 mm at the base, pale yellow, sepals 1–3 × 1 mm or less, glabrous, veins sometimes visible at the base, petals 4–6 mm long at the apex, 6–9 × 2.5–4 mm at the base with broadly acute tips, glabrous, nerves obscurely visible, stamens 4–5 mm long, anthers 3–5 mm long, filaments 1.5–2.5 mm long, pistillode 1 mm long; *pistillate flowers* rounded to conical, 4–6 × 4–5 mm, yellow, sepals 4–6 × 2.5–5 mm, glabrous, with raised veins, not obviously keeled; petals 3–5 × 2–4 mm, valvate tips ½ of the length of the petal, ca. 1.5–2.5 mm long, glabrous, distinctly veined except at the tip, pistil 3–4 × 1.5–3 mm, stigmas 1 mm long, staminodal ring ca. 1 mm high. **Fruit** ellipsoid, 1.8–2.5 × 1.1–1.5 cm, persistent perianth (cupule) brown, 12–13 mm wide, 4 mm deep, ring 2 mm in height, epicarp less than 0.5 mm thick, smooth, light to yellow green when mature, mesocarp fibrous, 1–2 mm thick; *endocarp* 1.6–1.8 × 1.1–1.3 cm, 1–1.5 mm thick, bony to woody, smooth on the interior, trivittate, with no clusters of fibers; *seeds* 1.0–1.2 × 0.7–0.8 cm, endosperm homogeneous. Germination remote-tubular.

Common name:—côco-de-vassoura, côco-de-raposa, côco-de-peneira.

Etymology:—The specific epithet, *werdermannii,* is named for Dr. Erich Werdermann (1892–1959), German botanist, world traveler and general plant collector with a specialty in cactus species, whose only trip to Brazil was in 1932.

Distribution and habitat:—Endemic to the state of Bahia, Brazil, in a relatively small area of high elevation cerrado (“gerais”) with sandy soils near Caetité. This type of cerrado vegetation could best be described as "campo limpo," because there are very few trees or shrubs. Most of the populations appear to be within a short radius of Caetité. However, a new population has been recently discovered about 120 km farther north near Macaúbas (Kelen Soares, pers. comm.).

Conservation:—This species has a very limited distribution in the cerrado regions just west of Caetité, Bahia, Brazil. It grows on top of a relatively flat mesa, where the soil is very deep and sandy but the vegetation is very low and where there is not much available water. The palm is fairly common in this area west and south of the city of Caetité along the road to Brejinho das Ametistas. There are no preserves or parks in this region. Since the land does not appear to be of any great agricultural value, and there is no soybean production in the area, this species is currently not threatened. Therefore, it is classified as least concern, LC.



FIGURE 88. *Syagrus werdermannii*. A. Habit with José Lobo (*Noblick & Lobo 4519*). B. Habit with a few strap-like juvenile leaves still persisting and Clodoaldo José de Morais showing off an infructescence (*Noblick & Clodoaldo 3769*). C. Habitat with driver. D. Palm with horizontal procumbent stem. E. Inflorescence with whitish tomentum on the rachis, rachillae, and apex of the fruits on the infructescence. F. Inflorescence. G. Infructescence. H. Two leaf forms. Adult pinnate leaves on palm with inflorescence in the foreground and juvenile strap leaves still on the palm in the background.

Phenology:—This species probably flowers and fruits year around, but flowering peaks in January and fruiting peaks in June and July. Nevertheless, sparse fruiting has been found in the summer (January–March). The germination of the seeds is slow with low germination success.

Uses:—The dried leaves are used in the handicraft making of sieves (peneiras) and brooms (vassouras), as its popular name suggests. The palm is ornamental, principally for its foliage. It could be successfully cultivated in tropical and subtropical regions.

Notes:—This is the only palm with a short, prostrate or subterranean stem with stiff leaves that have regularly spaced leaflets and a fine dense grayish-white to light brown, wooly tomentum covering all parts of its peduncle, rachis and rachillae. Currently there are five acaulescent palms in Bahia that can have leaves with regularly spaced pinnae: *S. vagans*, *S. harleyi*, *S. itapebiensis, S. allagopteroides*, and *S. werdermannii*, but none have the aforementioned tomentum, except *S. werdermannii*. Only two of these grow in a cerrado type environment, *S. allagopteroides* and *S. werdermannii*. This species was rediscovered by Glassman (1971a), after its holotype was destroyed.

The author received a recent report of a population of *Syagrus werdermannii* with unusually tall above ground stems near Macaúbas (Kelen Soares, pers. comm.), a distance of ca. 120 km north of the Caetité population. However, Soares (pers. comm.) reported that although *Syagrus coronata* grows in the same region, he does not believe these specimens are hybrids. Nevertheless, further study of this population is warranted.

Representative specimens:—BRAZIL. **Bahia:** Caetité, Serra do Serra do Espinhaço, –14.08, –42.50, October 1989, *G.F.E. Abrahão s.n.* (MBML!); Brejinho das Ametistas, 2 km a SW da sede do povoado, 900 m, –14.07, –42.48, 15 April 1983, *A.M. de Carvalho et al. 1790* (CEPEC!, US); Situ do Ouro, 15 km northwest of Caetité, –14.07, –42.48, 6 July 1969, *S. F. Glassman 8728–8739* (ALCB!, CEPEC!, F!, MO!, NY!, RB); Caetité, Bacia medio Rio de Contas, km 1 estrada Brejinho das Ametistas, 17 October 1970, *Andrade-Lima 70-6078* (IPA!); Caetité, 29 March 1985, 3 km SW Caetite, estr. Para Brejinho das Ametistas, *A.M. de Carvalho 3728* (CEPEC!); Caetité, Serra Geral. Estrada para Brejinho das Ametistas, ca. 3 km de Caetité, 113 m, –14.089, –42.51, without date, *M.L. Guedes s.n.* (CEPEC); Caetité, 900 m, 22 February 1986*, J.L. de S. Lima s.n.* (HTSA!); Caetité, Região de Brejinhos das Ametistas, Área da Bahia Mineração, 985 m, –14.38, –42.56, April 2008, *M.S. Mendes 259* (HUEFS); Caetité, morro com antena das microundas de TV, cerrado ("gerais'), 800–1000 m, –14.07, –42.50, 25 May 1985*, L.R. Noblick & Clodoaldo 3769* (BH!, F!, HRB!, HUEFS!); Caetité, estrada para Brejinho das Ametistas, 0.5 km sul da BR 030, 900–1000 m, –14.08, –42.53, 29 January 1986*, L.R. Noblick & J. Lobo 4519* (BAH!, CEN!, CEPEC!, F!, FTG!, HUEFS!, K!, MO!, NY!, RB!); Caetité, 3–4 km W of Caetité on BR-030 (Caetité/Guanambi), 1000 m, –14.07, –42.53, 11 July 1997, *L.R. Noblick & J.B. de Macedo, Jr. 5138* (IPA!); Caetité, –13.95, –42.31, 19 July 2011, *M.V.C. Nogueira 8* (HUEFS!); Caetité, BR-122, Brejinhos dos Ametistas, entrada para BR-50, –14.08, –42.51, 20 May 2004, *G. Pereira-Silva et al. 9079* (CEN, HUEFS!); Caetité, Serra Geral, –14.18, –42.49, 28 April 2003, *N. Roque, 680* (ALCB); Caetité, 2 August 1998, *E.R. Salviani et al. 197, 198* (HPL!); Caetité, Serra Geral, 1132 m, –14.09, –42.51, 28 April 2003, *A.B. Xavier 01* (ALCB); Igaporã, sentido Caetité, próximo a uma portaria, porém do ourto lado da pista, –13.77, –42.71, 16 April 2008, *R. Tsuji & J. Jardim 2566* (HPL!).

65. *Syagrus yungasensis* Moraes (1996: 89). Type:—BOLIVIA. La Paz: Prov. Sud Yungas, 30 km del camino entre Chulumani y La Asunta, 900 m, 9 December 1994, *M. Moraes 1874* (holotype LPB, isotypes FTG!, NY)

Figure 89 plate, Figure 86 map.

Small to medium-sized, solitary palm. **Stem** ca. 3–6 m × 7–15 cm, erect, columnar, light gray, somewhat prominently ringed with closely spaced leaf scars less than 1 cm apart. **Leaves** 12–18; *sheathing* leaf base ca. 12–25 × ca. 13 cm; *pseudopetiole* 80–100 cm long; *petiole* 20–40 × 1.5–2.0 cm, 0.7–0.8 cm thick covered with a grayish tomentum; *rachis* 1.2–1.6 m long; *leaflets* a lustrous dark green on the upper or adaxial surface, slightly lighter on the abaxial surface, 90–120 along one side, in clusters of (2–)3–5(–10) and inserted at various angles, giving the leaf a plumose appearance, ramenta scales present where the leaflets are inserted on the rachis and fairly closely spaced along the abaxial midvein on the lower 2/3 of the leaflet, midveins of leaflets tomentose; basal leaflets 39–68 × 0.4–0.5 cm, middle leaflets 45–63 × 1.0–1.5 cm, apical leaflets 4–20 × 0.1–0.3 cm. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 20–30 × 3.5–4 cm, lanceolate with flattened margins; *peduncular*

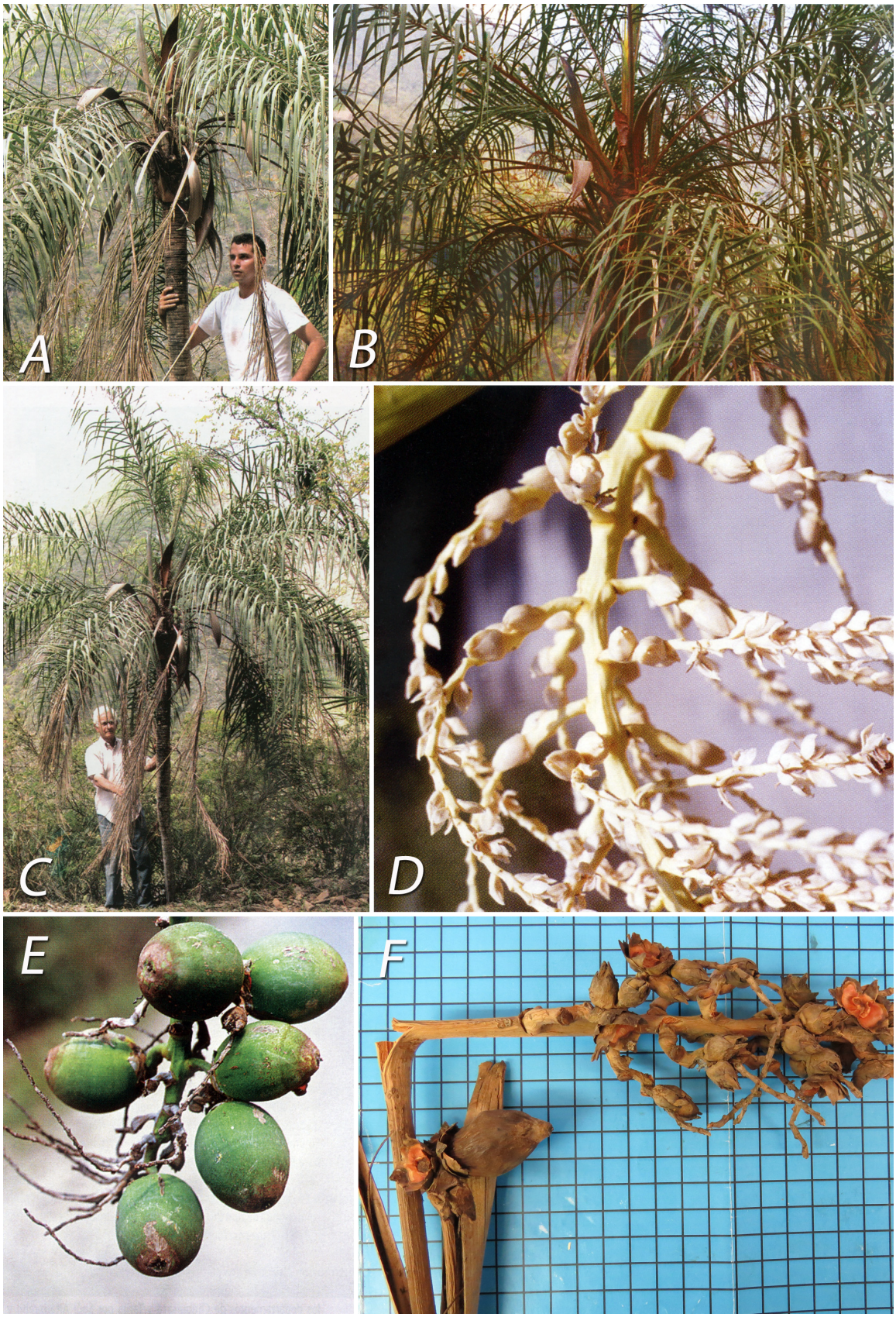

FIGURE 89. *Syagrus yungasensis*. A. Palm with J. Roca. B. Crown. C. Habit with Luis Moreno. D. Inflorescence. E. Infructescence. F. Infructescence of isotype showing only 1 or 2 pistillate flowers per rachilla (*Moraes 1874*). Grid is in centimeters. All photos except F by Oscar Moreno (Moreno & Moreno, 2006, 2013).

bract 80–120 cm long, expanded portion 50–66 × 4.5–7.0 cm, including a 2–3 cm beak, 7.5–8.5 cm perimeter, 2 mm thickness, narrow, woody, sulcate, exterior with thin indument on at least the apex and base; *peduncle* ca. 35–56 × 1.1–1.3 cm, 0.5–0.8 cm thick, elliptical in cross-section, glabrous; *inflorescence axis* 24–38 cm long; *rachis*, 10–13(–30) cm long, glabrous; *rachillae* 32–46, 2.5–17 cm long at the apex, 25–32 cm long at the base, glabrous, but with only ca. 15 basal branches with pistillate flowers located at the base of the rachillae, at times only one rachilla with pistillate flowers, the rest of the rachillae with staminate flowers, 1 or 2 fruits per rachilla; *staminate flowers* 8–10 × 3–4 mm, green to yellow, sepals 1 × 1 mm, glabrous, no raised nerves, petals 6–10 × 3–4 mm with acute tips, nerves indistinct to slightly raised at the base, stamens 6 mm long, anthers 4–5 mm long, filaments ca. 2–3 mm long, pistillode up to 2 mm long; *pistillate flowers* conical, 9–13 × 9–13 mm, yellow, glabrous, sepals 8–13 × 7–10 mm, glabrous, fleshy, with raised veins near the tips, petals 10–11 × 5–7 mm, glabrous to lepidote tomentose on the lower part of the petal, valvate tip 2/5 to ½ the length of the petal, ca. 2–3.5 mm long, pistil globose to ovoid, 7–8 × 4 mm, glabrous to lepidote or short tomentose at the base, with slightly raised veins, stigmas less than 2 mm long, glabrous, staminodal ring ca. 2 mm high, undulate. **Fruit** ellipsoid to ovoid, 3.5–4.5 × 2.5–3 cm, green when mature, glabrous, epicarp less than 0.5 mm thick, smooth, glabrous, green, with tomentum adpressed near the apex, mesocarp not measured, thin, succulent to dry-fibrous; *endocarp* ovoid, 3.0–3.4 × 2.2 cm, hard, boney with persistent fibers, 3–5 mm thick, with three crests or ridges that go from the base to the apex, slightly more raised apical crests or ridges near the apex, *seed* ovoid to broadly ellipsoid, 1.8–2.5 × 0.8–1.5 cm, endosperm homogenous, milky white, hard, with a small central cavity (Moraes 2004, Moreno 2006). Germination remote-tubular.

Common name:—none known

Etymology:—The specific epithet, *yungasensis,* refers to the locality from which it was originally collected in La Paz, province of Sud Yungas, Bolivia.

Distribution and habitat:—Endemic to Bolivia (Moraes 2004). Found southeast of La Paz in the province of Sud Yungas, between the towns of Chulumani and La Asunta. Restricted to narrow valleys and rocky slopes in semideciduous forests in the eastern Cordillera of the Andes with *Anadenanthera*, at 700–1000 m elevation.

Conservation:—This palm is threatened, because it grows in a zone of expansion of cultivated crops where farmers are accustomed to clearing the upper slopes (Moreno & Moreno 2006). Based on Moreno's description, this species is classified as vulnerable, VU A4.

Phenology:—This species has been seen flowering and fruiting in December.

Uses:—This palm has ornamental potential with its medium size, small trunk and attractive, full crown of plumose leaves.

Notes:—*Syagrus yungasensis* has inflorescences that have very few pistillate flowers per rachillae. They usually have only 2–4 flowers, although the basal rachilla usually can have 5 or 6(–10). As a consequence, there are also few fruits per rachilla. Both Moraes (2005) and Moreno & Moreno (2006, 2013) wrote how similar *S. yungasensis* is to *S. cardenasii*. They are both similar in having apiculate perianth in the fruiting stage, clustered leaflets and ellipsoid fruit (Moraes 2005). However, they differ in that *S. yungasensis* usually has a more robust solitary trunk with closely spaced internodes, slightly larger fruit (3.5–4.5 × 2.5–3 cm vs. 2.0–4.2 × 1.7–2.0 cm) and more rachillae in the inflorescence (32–46 vs. 6–18).

Representative specimens:—BOLIVIA. **La Paz:** Sud Yungas, 82 km de Chulumani en camino a La Asunta, 700 m, 30 May 1986, *Beck 12636* (LPB); 9 km del camino de Chamaca a Chulumani, Río La Paz, 900 m, –16.28, –67.28, 3 October 1995, *Kessler et al. 5732* (LPB); 30 km del camino entre Chulumani y La Asunta, 900 m, 9 December 1994, *Moraes 1874* (holotype LPB, isotypes FTG!, NY).

HYBRIDS

Hybrids occur where populations of closely related, natural occurring, species overlap. If the two species have synchronous phenologies, if there is a successful transfer of pollen, if no mechanical nor chemical barriers exist, and if they are genetically compatible, a hybrid may occur. Suspected hybrids are mainly recognized by the intermediate character states between the two suspected parents and their low frequency of occurrence. They are also often characterized by low fruit production, low seed germination, and by hybrid vigor resulting in the hybrid being more robust and vigorous than either of its parents.

A number of naturally occurring hybrids have been discovered in the genus *Syagrus* and some nurserymen and

palm enthusiasts have attempted to hybridize others. One can only speculate why this occurs with greater frequency in this genus than in other palm genera. As of this writing, no one has attempted to answer that question. There is no conservation assessment given for hybrids as most would be classified as critically endangered based on their rare occurrence and small population size. However, they are not threatened, vulnerable or endangered, because, theoretically, we should be able to reproduce them again from their parents. The following is our current knowledge of the hybrids found in *Syagrus*, and they are summarized in Table 2.

TABLE 2. Summary list of all natural and cultivated hybrids of *Syagrus*. Bolded names are naturally occurring.

Parent One	Parent Two	Hybrid Name
S. coronata	*S. botryophora*	***Syagrus* × *lacerdamourae***
S. coronata	*S. cearensis*	***Syagrus* × *costae***
S. coronata	*S. romanzoffiana*	***Syagrus* × *campos-portoana***
S. microphylla	*S. coronata*	***Syagrus* × *mirandana***
S. schizophylla	*S. coronata*	***Syagrus* × *tostana***
S. vagans	*S. coronata*	***Syagrus* × *matafome***
S. flexuosa	*S. romanzoffiana*	***Syagrus* × *andrequiceana***
S. glaucescens	*S. romanzoffiana*	***Syagrus* × *serroana***
S. loefgrenii	*S. romanzoffiana*	
S. oleracea	*S. romanzoffiana*	***Syagrus* × *teixeiriana***
S. pleioclada	*S. duartei*	***Syagrus* × *altopalacioensis***
S. pleioclada	*S. glaucescens*	
S. glaucescens	*S. oleracea*	***Syagrus* × *cipoensis***
S. comosa	*S. elata*	
CULTIVATED HYBRIDS		
S. coronata	*S. picrophylla*	
S. picrophylla	*S. romanzoffiana*	
S. romanzoffiana	*S. yungasensis*	
S. schizophylla	*S. romanzoffiana*	*Syagrus* × *montgomeryana*
S. weddelliana	*S. romanzoffiana*	*Syagrus* × *dickensonii*

66. *Syagrus* × *altopalacioensis* Soares & Assis (2013b: 88). (*S. pleioclada* × *S. duartei*)

Type:—BRAZIL. Minas Gerais: município de Santana do Riacho, Fazenda Alto do Palácio, próximo à Cachoeira do Coronel, 23k 0651840 7868433 (–19.27, –43.56), 16 June 2013, *K. Soares, L. Assis & A. G. Vieira 57* (holotype HDCF).

Figure 90 map.

Small, solitary palm with columnar **Stem** ca. 1.7 m × 10 cm, ringed, covered with leaf base remains. **Leaves** 10, ca. 70–80 cm long; *sheathing leaf base* ca. 37 cm long; *pseudopetiole* 15–20 cm long; *petiole* 4 × 1.2 cm long, covered with a ferruginous indument; *rachis* 65–70 cm long, densely covered with a ferruginous indument; *leaflets* green, slightly lighter on the abaxial surface, long-lanceolate, rigid, thin-leathery with midrib covered with tomentum abaxially, 35–40 along one side, in clusters of 2–4, inserted at various angles, giving the leaf a plumose appearance, clusters separated by 5–8 cm; basal leaflets 25–30 × 0.8 cm, middle leaflets 35–40 × 1.5–2.0 cm, apical leaflets 20–25 × 0.6–0.7 cm with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 30–35 × 3 cm; *peduncular bract* 85–100 cm long, expanded portion 30–35 × 7.5–9.5 cm, including a 1 cm beak, thickness not measured, narrow, woody, sulcate; *peduncle* ca. 54–60 cm × 5–6 mm, elliptical in cross-section, densely covered

with tomentum; *inflorescence axis* ca. 20–26 cm long; *rachis* 15–20 cm long; *rachillae*, spirally arranged, 10–12, 5.0–6.2 cm long at the apex, 7.5–10.5 cm in the middle, 10–13 cm at the base; *staminate flowers* 13 mm long at the apex, cream, yellow-green to yellow, sepals less than 1 mm long, glabrous, petals 12 × 3 mm with acute tips, glabrous, stamens 6 mm long, anthers 5–6 mm long, filaments not measured, pistillode not measured, basal *pistillate flowers* pyramidal or ovoid, 12–15 × 5–7 mm, yellow, sepals 12–15 mm long, petals 10–13 × 10–12 mm, glabrous, pistil 12–15 mm long, stigmas not measured, glabrous. **Fruit** ovoid, 4.5 × 3 cm, cream or yellowish-green when mature, covered by ferruginous indument, epicarp less than 0.5 mm thick, mesocarp thickness not measured, succulent and fibrous; *endocarp* ovoid, 3.2 × 2 cm; *seed* ellipsoid, endosperm homogeneous.

Common name:—None recorded.

Etymology:—The specific epithet, *altopalacioensis,* refers to the Alto do Palácio Private Reserve, RPPN (Reserva Particular do Patrimônio Natural), located in Santana do Riacho, Minas Gerais, Brazil, where the hybrids were found.

Distribution and habitat:—Only two plants found at the Alto do Palácio Private Reserve, with one being a young plant.

Conservation:—Rare. Only two plants found to date.

Phenology:—Unknown.

Uses:—None recorded.

Notes:—This hybrid shows characters intermediate between *S. pleioclada* and *S. duartei*. It differs from *S. pleioclada* by taller stems (vs. short stems usually less than 1.5 m) and by leaflets inserted in different planes (vs. deflexed). It differs from *S. duartei* by having fewer leaflets, which are widely spaced (vs. closely and evenly spaced leaflets).

Representative specimens:—Known only from the type specimen.

67. *Syagrus* × *andrequiceana* Soares & Assis (2013b: 90). (*S. romanzoffiana* × *S. flexuosa*)

Type:—BRAZIL. Minas Gerais: município de Datas, near Córrego Andrequicé, –18.56, –43.64, 17 October 2012, *K. Soares, L. Assis & A. G. Vieira 46* (holotype HDCF!).

Figure 90 map.

Large to moderate, solitary palm with columnar **Stem** ca. 5–13 m × 14–21 cm with persistent leaf bases. **Leaves** 15–26, spirally arranged; *sheathing leaf base* ca. 57–93 cm long, margins with hair-like fibers; *pseudopetiole* 46–67 cm long, *petiole* 6–10 × 1.8–2 cm, with whitish or grayish, scurfy, mealy, more or less deciduous tomentum abaxially; *rachis* 164–190 cm long with tomentum; *leaflets* long lanceolate, more or less pendulous, leathery, dark green and slightly lighter on the abaxial surface, conspicuous transverse veins on the adaxial surface, 100–120 along one side, in clusters of 3–5, inserted at various angles in 3 or 4 planes, giving the leaf a plumose appearance, but fairly separated from each other, ramenta scales or tomentum present but scarce where the leaflets are inserted on the rachis and along the abaxial midvein; basal leaflets 50–55 × 0.9–1.1 cm, middle leaflets 52–58 × 1.8–2.2 cm, apical leaflets 26–39 × 0.7–0.9 cm with an asymmetric tip. **Inflorescence** erect to pendulous, branched; *prophyll* 35 × 6 cm; *peduncular bract* 103–145 cm long, green, narrow, woody, sulcate, expanded portion 38–100 × 7.5–17 cm, including a 5–6 cm beak; *peduncle* ca. 38–70 × 1.5–2 cm, elliptical in cross-section, densely covered with tomentum; *inflorescence axis* ca. 40–85 cm long; *rachis* 27–60 cm long; *rachillae* 42–61, 8–24 cm long at the apex, 16–35 cm long in the middle, 25–40 cm long at the base, basal rachillae are arranged unilaterally on the rachis but arranged spirally near the apex; *staminate flowers* 7–9 mm long, cream, yellow-green or yellow, sepals ca. 1 mm long, petals 6–8 × 3 mm with acute tips, stamens ca. 4 mm long, anthers 4 mm long dorsifixed below the middle, filaments not measured, pistillode ca. 1 mm long; basal *pistillate flowers* ovoid, 8–10 × 7 mm, yellow, sepals 8–10 × 6–9 mm, petals 6–7 × 6–7 mm, glabrous, pistil ovoid, 8–9.5 × 5 mm, stigmas not measured, glabrous. **Fruit** ovoid, 4–5 × 2–2.5 cm, yellow orange or greenish yellow when mature, epicarp less than 0.5 mm thick, mesocarp thickness not measured, succulent and fibrous; *endocarp* ovoid, 2.2–3.2 × 1.2–1.6 cm; *seed* ellipsoid, endosperm homogeneous.

Common name:—None recorded.

Etymology:—The specific epithet, *andrequiceana,* refers to Andrequicé stream beside which the first individuals of these hybrids were found growing. It is located near Datas, Minas Gerais, Brazil.

Distribution and habitat:—This hybrid is relatively common in areas where *S. flexuosa* and *S. romanzoffiana* grow together, several hybrids were observed in the municipality of Datas, Minas Gerais, including some backcrossing of the hybrid and *S. romanzoffiana*. Other specimens were also seen in Belo Horizonte on Santa Rosa Avenue and in Parque das Mangabeiras, Vale Verde farm in Betim, Minas Gerais, and near Rio Manso, Minas Gerais, close to the road MG-831.

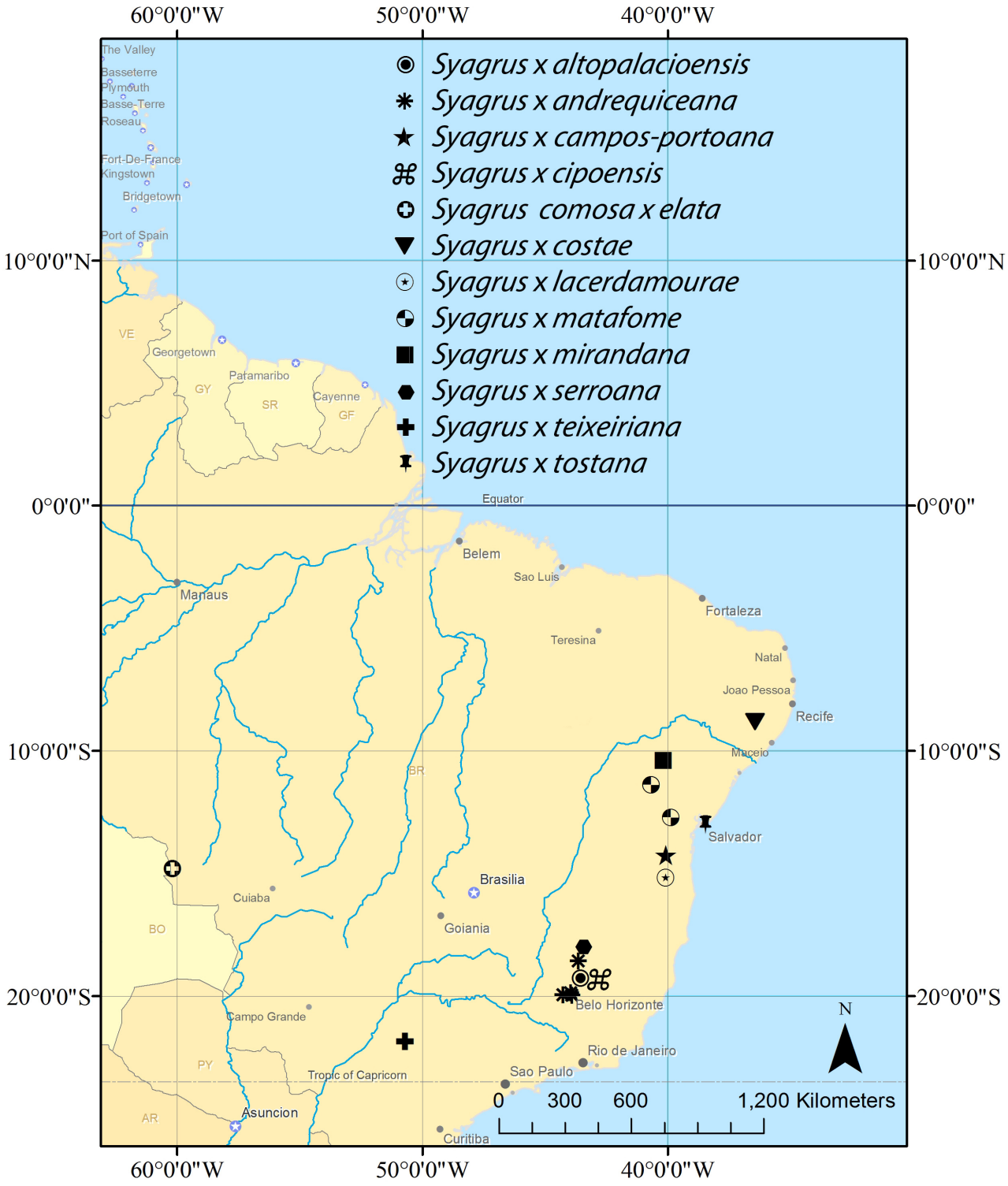

FIGURE 90. Distribution map of *Syagrus* hybrids. *S.* × *altopalacioensis*, *S.* × *andrequiceana*, *S.* × *campos-portoana*, *S.* × *cipoensis*, *S. comosa* × *elata*, *S.* × *costae*, *S.* × *lacerdamourae*, *S.* × *matafome*, *S.* × *mirandana*, S. × serroana, *S.* × *teixeiriana*, and *S.* × *tostana*.

Phenology:—Unknown.

Uses:—None recorded.

Notes:—It has characteristics intermediate between *S. romanzoffiana* and *S. flexuosa*. It differs from *S. romanzoffiana* by having a thinner stem, persistent leaf sheaths, deeper leaf scars (when they fall), larger pistillate flowers, larger fruit and endocarp, endocarp with a smooth endocarpal wall vs. an irregular wall that penetrates into the endosperm and the unilateral arrangement of the rachillae on the rachis. That is, on the first quarter of the rachis, the rachillae are arranged unilaterally similar to *S. flexuosa*; but all the rest of the rachillae are spirally arranged. It differs from *S. flexuosa* by having a larger, solitary stem and by having most of the rachillae spirally arranged along the rachis. This palm hybrid grows rapidly and is fertile. Although it produces few seeds per inflorescence, the seeds germinate easily.

Representative specimens:—Known only from the type specimen.

68. *Syagrus* × *campos-portoana* (Bondar) Glassman (1963:260). (*S. coronata* × *S. romanzoffiana*). *Cocos* × *campos-portoana* Bondar (1942a: 460). *Arecastrum* × *campos-portoanum* (Bondar) Hawkes (1952a: 175). Lectotype (designated by Glassman [1987: 81]):—BRAZIL. Bahia: cult. Fazenda Gangugy, Municipio de Poções, *G. Bondar s.n.* (F! [F-619765])

Figure 90 map.

Large, solitary, unarmed, palms. **Stem** erect, columnar 3 m × 30–35 cm, light gray to gray black, with leaf scar intervals 5–6 cm. **Leaves** 27–30 in crown, in 5 distinct spiraled vertical rows, often slightly spiraled, spreading; *sheathing leaf base* 20–25 cm wide, margins with wide woody fibers similar to *S. coronata*; *pseudopetiole* 150–170 cm long, with a margin armed with long, flat spine-like fibers; *petiole* not measured, with smooth margins; *rachis* up to 250–385 cm long; *leaflets* dark green adaxially, paler abaxially, 130 along one side, irregularly distributed in clusters of 3–5(–6) in divergent planes; those of middle series 80–90(–105) × 3–5 cm, mostly with acuminate, asymmetric tips. **Inflorescence** erect to pendulous, spirally branched; *prophyll* not measured; *peduncular bract* ca. 250–300 cm long, expanded portion 200–240 × 20–25 cm (fide Bondar), usually bearing a beak, woody, sulcate, grayish on the exterior, dark brown on the interior; *peduncle* ca. (60–)70–100 × 2–3 cm; *inflorescence axis* not measured; *rachis* 120–180 cm long; *rachillae* numerous, 70–80 cm long at the base of the inflorescence; *staminate flowers* whitish, 10–11 mm (13–15 mm long fide Bondar), petals 10–14 × 2 mm with obtuse acuminate tips, stamens 8.5–9 mm, anthers (5–)7–8 mm long, pistillode absent; *pistillate flowers* 6–9 × 4–5 mm, sepals 6–9 × 3–5 mm, petals 4–7 × 3–4 mm, pistil 7 mm in diameter, stigmas short, staminodal ring not measured, smooth or entire not dentate **Fruit** ovoid, 2.5–3.2 × 2–3 cm, persistent perianth (cupule) beige to grayish brown, 15 mm wide, 6–7 mm deep, epicarp less than 1 mm thick, smooth, fibrous, probably yellowish green when mature, mesocarp 2–3 mm thick, sweetish, mucilaginous to gummy sticky, fibrous; *endocarp* 2.0–2.8 × 1.0–2.5 cm, 3–5 mm thick on the sides, to 6–8 mm thick at tip, bony, cavity irregular in outline, but smooth internally, monovittate, with no clusters of fibers; *seeds* 11 × 10 mm, endosperm is homogeneous, but there is a slight protrusion of the endocarp wall into it.

Common name:—licuri-açú, licuri-assú, palmeirinha.

Etymology:—The specific epithet, *campos-portoana*, is named in honor of Dr. Campos Porto, a distinguished Brazilian botanist, who had encouraged Dr. Gregorio Bondar's botanical initiatives (Bondar, 1939e).

Distribution and habitat:—This rare hybrid is endemic to the southeastern portion of the state of Bahia, in the mesophytic or transitional forests where *S. coronata* and *S. romanzoffiana* populations overlap. It is especially found in the vicinity of Vitória da Conquista, near Poções, Bahia, where it was first spotted. Originally seeds are said to have come from the Municipio de Itabuna, in a transitional zone ("zona acaatingada") from mesophytic to caatinga vegetation near the Colonia river (Rio Colonia) and also said to be found in the Municipio de Itambé (Bondar, 1939e).

Phenology:—Probably similar to its parents with a high flowering season around November to February and fruiting in March to June.

Uses:—This hybrid would make an interesting ornamental. The palm has unusually large infructescences, and the seeds can be extracted easily. They are edible, sweet-tasting and rich in oil (Bondar, 1939e).

Notes:—This is the natural hybrid between *Syagrus coronata* and *Syagrus romanzoffiana*. It looks very much

like a robust *S. coronata*. Bondar (1964) wrote that the leaves, peduncular bracts, and fruits are larger than *S. coronata;* but it is similar in that the leaves are arranged in five spiraled, vertical rows, unlike *S. romanzoffiana*, which are just spiraled. The stem has distinct *S. coronata*-like scars with short internodes. It has a more robust stem (35–40 vs. 20–25 cm), and it also has longer leaves than *S. coronata* (250–385 vs. 120–275 cm long). The wall of the endocarp intrudes into the seed, but does not penetrate as deeply as in *S. romanzoffiana*; therefore, the seed is more easily extracted. Further differences are shown in Glassman (1968b).

Glassman (1987) wrote that in 1969 he spoke with a relative of the owner of the fazenda where this hybrid grows. The owners told Glassman that they had never successfully germinated seeds of this hybrid, which means that there must be substantial genetic barriers that prevent fertility. It must be considered a very rare natural hybridization event, because, other than Bondar's, the author only knows of one other (C. A. Guimarães, pers. comm.).

Representative specimens:—BRAZIL. **Bahia:** Municipio de Poções, Fazenda Gangugy, planted from seedlings coming from Itabuna, 1940*, G. Bondar s.n.* (F-610582!, 619766, 619767).

69. *Syagrus* × *cipoensis* Soares & Assis (2015: 117). (*S. glaucescens* × *S. oleracea*)

Type:—BRAZIL. Minas Gerais: município de Conceição do Mato Dentro, near the district of Tabuleiro, –19.05, –43.54, 28 October 2015, *K. Soares &, L. Assis 62* (holotype HDCF, isotype BHCB).

Figure 90 map.

Moderate, solitary palm with columnar **Stem** ca. 8–16 m × 18–23 cm, covered with leaf base remains on the uppermost parts of the stem, spirally inserted in vertical rows, when the sheaths fall, the scars remaining resemble *Syagrus glaucescens*. **Leaves** ca. 18–25, ca. 180–230 cm long; *sheathing leaf base* 80–100 × 22–30 cm, dark green adaxially, glaucous abaxially, margins with hair-like fibers; *pseudopetiole* 33–40 cm long; *petiole* 13–24 × 2.8–3.2 cm, covered with dense brownish, farinose, more or less pruinose tomentum; *rachis* 170–200 cm long, densely tomentose; *leaflets* irregularly arranged, rigid, long-lanceolate, straight, thin-leathery, straight, dark green adaxially, glaucous abaxially with an asymmetric tip, 99–120 per side, in clusters of 3–5, inserted at various angles; basal leaflets 60–87 × 1.4–1.8 cm, middle leaflets 58–80 × 3.3–3.4 cm, apical leaflets 28–30 × 1.4–2.0 cm. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 45–50 × 5 cm; *peduncular bract* 110–115 cm long, expanded portion 70–75 × 12–18 cm, including a 3 cm beak, woody, sulcate, green, covered with light brown indumentum; *peduncle* ca. 40–46 × 2.3–2.5 cm, elliptical in cross-section, densely tomentose; *inflorescence axis* ca. 62–77 cm long; *rachis* 40–46 cm long; *rachillae*, spirally arranged, 32–37, 22–31 cm long at the apex, 39–34 cm in the middle, 37–44 cm at the base; *staminate flowers* 12–15 mm long, cream, yellow-green to yellow, sepals 1 mm long, glabrous, petals 10–13 × 4–5 mm, glabrous, with acute tips, stamens 5–6 mm long, anthers 5–6 mm long, filaments 2–3 mm long, pistillode 1.5 mm long, basal *pistillate flowers* pyramidal or ovoid, 18–21 × 8–11 mm, sepals 18–20 × 14–15 mm, yellow, petals 14–15 × 8–11 mm, glabrous, pistil 10–11 mm long, ovoid, stigmas not measured, glabrous. **Fruit** 4.5–5.5 × 3.5–4.2 cm, greenish-yellow when mature, with dense brownish indumentum at apex (like a halo), ovoid, epicarp less than 0.5 mm thick, mesocarp thickness not measured, yellow, oily, succulent and fibrous; *endocarp*, ovoid, 4.0–4.4 × 2.5–2.8 cm; *seed* ellipsoid, endosperm homogeneous.

Common name:—None recorded.

Etymology:—The specific epithet, *cipoensis,* refers to the Serra do Cipó, located in the Espinhaço mountain range, Minas Gerais, Brazil, where this hybrid is commonly found.

Distribution and habitat:—This hybrid is found where *S. glaucescens* and *S. oleracea* grow together in the Serra do Cipó (municipalities of Conceição do Mato Dentro, Cardeal Mota, Jaboticatubas, and Santana do Riacho)

Conservation:—It is occasional to locally common. When recognized, locals often transplant it to their gardens.

Phenology:—It has been found with flowers and fruit in the month of October.

Uses:—This palm has landscape potential due to its beauty, hardiness and fast growth. It is a fertile hybrid. It has an edible endosperm or nut that the locals gather to eat raw or roasted.

Notes:—This hybrid shows characters intermediate between *S. glaucescens* and *S. oleracea*. It differs from *S. glaucescens* by taller, thicker stems (8–16 × 18–23 vs. 0.5–4 × 8–12 cm), larger leaf rachis (180–230 vs. 62–118 cm) and larger inflorescence rachis (40–46 vs. 5–16 cm) with more rachillae (32–37 vs.5–17) and larger fruits

(4.5–5.5 vs. 2–3 cm long) and endocarps (4.0–4.4 vs. 1.2–1.4 cm long). It differs from *S. oleracea* by leaf sheaths adhering to the stem for a long time, leaving deep scars on its surface when they fall off. It also has more rigid and abaxially glaucous leaflets. This *S. glaucescens* × *S. oleracea* hybrid resembles *Syagrus* × *serroana*, but differs by having a shorter inflorescence rachis (40–46 vs. 45–55 cm), fewer rachillae (32–37 vs. 60–70), larger pistillate flowers (18–21 vs. 10–12 mm long), larger staminate flowers (12–15 vs. 9–10 mm long), larger fruits (4.5–5.5 vs. 4.2–4.5 cm long), and larger endocarps (4.0–4.4 vs. 2.8–3.5 cm long).

Representative specimens:—Known only from the type specimen.

70. *Syagrus* × *costae* Glassman (1970c: 244). (*S. coronata* × *S. cearensis*). Type:—BRAZIL. Pernambuco: 2 km W of Neves, *S.F. Glassman & J.T. de Medeiros-Costa 8707* (holotype F!)

Figure 90 map.

Palm solitary, columnar. **Stem** ca. 6–9 m × 12–22 cm. **Leaves** 10–18; *sheathing leaf base* ca. 100–120 × 23–28 cm; *pseudopetiole* 70–90 cm long with the margins covered with fibrous cloth-like sheath fibers, which later separate into individual flat fibers, flexible or rigid of various widths; *petiole* 20–60 × 3.5–4.5 cm, 1.5–2.0 cm thick; *rachis* 200–230 cm long; *leaflets* lightly glaucous on both sides, linear, with acuminate, asymmetric apex, ca. 124 along one side, in clusters of mostly in clusters of 2–4, inserted at various angles, giving the leaf a plumose appearance, ramenta scales present where the leaflets are inserted on the rachis and along the abaxial midvein; basal leaflets 70–95 × 0.4–0.7 cm, middle leaflets 75–95 × 2.8–4.2 cm, apical leaflets 16–28 × 0.3–0.8 cm with an asymmetric tip. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 30–40 × 5–6 cm; *peduncular bract* ca. 150 cm long, expanded portion 70–85 × 13–17 cm, including a 10–12 cm beak, 16–21 cm perimeter, 1–2 mm thick, narrow, woody, sulcate, exterior with scattered thin indument; *peduncle* ca. 70 × 2.5 cm, 1.5 cm thick, elliptical in cross-section, lepidote; *inflorescence axis* 54–73 cm long; *rachis* 40–54 cm long; *rachillae* 43–53, 14–24 cm long at the apex, 31–53 cm long at the base, glabrous; *staminate flowers* 8–12 mm long at the apex, 13–16 × 3–5 mm at the base, green to yellow, sepals 1.1–2.2 × 1 mm, glabrous, petals 8–11 mm long at the apex, 12.4–13.2 × 2.6–3.8 mm at the base with acute tips, nerves indistinct, stamens 4.8–6.6 mm long, anthers 4–6 mm long, filaments 2.9–3.7 mm long, pistillode nearly absent to ca. 0.4 mm long; *pistillate flowers* pyramidal, 10–12 × 8 mm at the apex, 13–18 × 6–11 mm at the base, yellow, glabrous, sepals 8–14 × 5.8–8.0 mm, petals 5.8–11 × 4.8–5.8 mm, glabrous, pistil 5.8–8.0 × 4.4–5.1 mm, glabrous, stigmas less than 2.2–2.9 mm long, glabrous, staminodal ring ca. 2.9 mm high, 6-dentate. **Fruit** oblong, 2.8–4.5 × 2.4–3.0 cm, smooth, yellowish-creme to orange, when mature, lepidote, epicarp less than 0.5 mm thick, mesocarp 3–5 mm thick, orange, succulent and fibrous; *endocarp* ca. 4 × 2.2 cm, 4–5 mm thick on its sides; *seed* ellipsoid, not measured, endosperm homogeneous.

Common name:—coco-babão

Etymology:—The specific epithet, *costae,* honors Judas Tadeu de Medeiros-Costa, a University professor and palm expert from Recife, Pernambuco, Brazil, who assisted Dr. Sidney Glassman in collecting palms in Brazil.

Distribution and habitat:—This hybrid is found in Pernambuco (and possibly Alagoas), occurring in regions where populations of *S. coronata* and *S. cearensis* overlap. That area is located in northern Alagoas and southeastern Pernambuco. It grows in areas of greater seasonal rainfall in the transitional zone between the Atlantic forest and the caatinga at elevations above 500 m.

Phenology:—This species fruits during the summer months (January to March). The seeds are difficult to germinate, but usually do so in 4–5 months.

Uses:—The fruits are edible. The plant possesses ornamental attributes that justify its cultivation in landscaping.

Notes:—This hybrid is a natural, fertile hybrid between *S. cearensis* and *S. coronata*. Fibers along the petiole margin seem to approach the width of fibers in *S. coronata*, but they are not as stiff. Leaves are mostly spiraled on the trunk (rarely in rows). The cylindrical stem is not angular as in *S. coronata*. Glassman (1970c) originally identified this palm as a hybrid between *S. oleracea* and *S. coronata*. However, he failed to recognize the distinctive fruit and growth habit differences between *Syagrus cearensis* (Noblick 2004b) and *Syagrus oleracea*. Around the type locality for this hybrid (Neves and Garanhuns, Pernambuco), there are no specimens of *S. oleracea*, only *S. coronata* and *S. cearensis* and thus the change in parentage.

Representative specimens:—BRAZIL. **Pernambuco:** Jucati, ca. 7–9 km N of Garanhuns, 900–1000 m, –8.80, –36.44, 21 September 1994, *L.R. Noblick et al. 4980* (IPA!, FTG!); **Ceará:** Barbalha, Vila Arajara, –7.31, –39.30, 18 June 1970, *J.T. Medeiros-Costa 135* (IPA!).

71. *Syagrus* × *lacerdamourae* Soares & Guimarães (2013b: 93). (*S. coronata* × *S. botryophora*). Type:—BRAZIL. Bahia: Itapetinga, Fazenda Atalaia, –15.17, –40.085, 22 October 2013, *K. Soares, J. Santos, L. Assis, C. Guimarães 54* (holotype HDCF)

Figure 90 map.

Solitary palm, moderate to large in size, 5–16 m tall. **Stem** columnar, 4–14 m × 18–26 cm, ringed with a dilated base. **Leaves** 10–15, arched, spirally arranged, ca. 3 m long; *sheathing leaf base* ca. 120 × 20 cm with hair-like fibers; *pseudopetiole* not measured; *petiole* 13–15 × 2.5 cm, with whitish to grayish, scurfy, mealy, more or less deciduous tomentum abaxially; *rachis* 280–300 cm long; *leaflets* rigid, dark green, slightly lighter on the abaxial surface, 190–200 along one side, irregularly arranged in clusters, inserted at various angles, giving the leaf a plumose appearance, basal leaflets 77–86 × 1.4–2.0 cm, middle leaflets 63–84 × 2.5–3.0 cm, apical leaflets 20–25 × 1.0–1.3 cm with an asymmetric tip. **Inflorescence** 45–70 cm long, often branched to two orders (up to 4 branches, which are branched to two orders), prophyll 37–44 × 6–7 cm; *peduncular bract* 85–97 cm long, expanded portion 48–56 × 14–20 cm, including a 2–6 cm beak, perimeter not measured, woody, sulcate, but not as deeply sulcate as *S. botryophora*; *peduncle* ca. 38–41 × 2.5–3 cm, elliptical in cross-section, densely covered with tomentum; *inflorescence axis* ca. 46–53 cm long; *rachis* 38–43 cm long; *rachillae* 59–71, 8–10 cm long at the apex, 13–16 cm long at the middle, 20–25 cm long at the base; *staminate flowers* 14–17 mm long, cream to yellow, sepals 1 × 1.5 mm, petals 12–13 × 5 mm, long-ovate, stamens ca. 5 mm long, anthers 5 mm long, dorsifixed below the middle, filaments not measured, pistillode ca. 1 mm long; basal *pistillate flowers* ovoid, 17–18 × 10–11 mm, yellow, sepals 13–14 × 8–10 mm, petals 12–14 × 8–9 mm, glabrous, pistil ovoid, 12 × 5 mm, stigmas not measured, glabrous, staminodal ring not measured. **Fruit** ovoid, 4.5–4.7 × 2.7–2.8 cm, 2–5 per rachillae, epicarp less than 0.5 mm thick, white or yellowish green when mature, with brownish-yellow tomentum at the apex (like a halo), mesocarp thickness not measured, oil-rich, succulent and fibrous; *endocarp* ovoid, 4.2–5.0 × 2.4–2.6 cm; *seed* ellipsoid, endosperm homogeneous.

Common name:—None recorded.

Etymology:—The specific epithet, *lacerdamourae,* honors the forestry engineer José Inácio Lacerda Moura, expert on pests and diseases of palms.

Distribution and habitat:—To date, only eight hybrids have been found growing together in the type locality.

Phenology:—Unknown.

Uses:—None recorded.

Notes:—This fertile hybrid can occur where populations of *S. coronata* and *S. botryophora* overlap in Bahia. This palm is similar to *S. botryophora*, in having a smooth, slightly ringed, tall slender stem with a dilated base and with a short, wide peduncular bract. It differs from *S. botryophora* by having irregularly distributed leaflets in clusters arranged in divergent planes (vs. regularly spaced leaflets in a single plane). It also differs in having a peduncular bract that is not deeply grooved, but similar to its other parent *S. coronata.* The white to yellowish green epicarp of the fruit is covered with indumentum instead of orange and glabrous as in *S. botryophora* when ripe. This hybrid always displays a few branched rachillae (2–4), usually inserted in the middle part of the rachis; a character that is usually absent in the genus *Syagrus*.

Representative specimens:—Known only from type specimen.

72. *Syagrus* × *matafome* (Bondar) Hawkes (1952a: 178). (*S. vagans* × *S. coronata*)

Cocos matafome Bondar (1942a: 459). Lectotype (designated by Glassman [1972b: 92]):—BRAZIL. Bahia: Municipio de Santa Teresinha, without date, *G. Bondar s.n.* (F! [F-619770]).

Figure 90 map.

Moderate, solitary, unarmed, palms. **Stem** erect, gray black, 2.5–10 m × 15–25 cm, with very close leaf scar intervals. **Leaves** 15–30 in crown, spirally arranged on the trunk, spreading; *sheathing leaf base* not measured, with fine narrow flattened woody fibers; *pseudopetiole* 60–100 cm long; *petiole* not measured with smooth margins; *rachis* 43–200 cm long; *leaflets* glaucous green on both surfaces, 63–90 along one side, irregularly distributed in clusters of 2–5 in nearly one plane; basal leaflets not measured, middle leaflets 19.5–47(–55) × 2.5–4.5 cm, apical

leaflets not measured, mostly with acute to asymmetrical tips. **Inflorescence** erect to pendulous, spirally branched; *prophyll* not measured; *peduncular bract* ca. 75–120 cm long, expanded portion (25–)45–100 × 6–11 cm, bearing a (0–)1–6 cm beak, woody, sulcate, light gray; *peduncle* ca. 60–90 × 1.5–2 cm; *inflorescence axis* ca. 53–105 cm long; *rachis* 43–95 cm long; *rachillae* 30–80, 10–59 cm long, subtended by a bract (0–)2–4 × 6–10 mm; *staminate flowers* (7–)8–10 × 3–5 mm, pale yellow, sepals 1–2 × less than 1 mm, petals (6–)7–9(–10) × 2.5–3 mm with acute tips, nerves indistinct, stamens not measured, anthers 4–6 mm long, filaments 2–2.5 mm long, pistillode 2 mm long; *pistillate flowers* (7–)8–9(–11) × 6–8 mm, yellow or purplish, sepals 8–9(–11) × 5–7 mm, petals 7–8 × 5–6 mm, pistil (6–)7–8 × 4 mm, stigmas 2 mm long, staminodal ring ca. 1.5–2 mm high. **Fruit** ovoid, 2.5–3.7 × 1.5–2 cm, greenish-creme color, persistent perianth (cupule) light brown, 1–1.3 cm wide, 1 cm deep, ring absent, epicarp 1 mm thick, smooth green fibrous, yellowish when fruit is mature, mesocarp 1–2 mm thick, sweet, succulent and fibrous; *endocarp* 2.0–3.4 ×1.6 cm, 1.5–2 mm thick on the sides, 2.5–3 mm thick at the ends, bony, brown, not trivittate (divittate or monovittate), with no clusters of fibers; *seeds* 1.5–2.0 × 1.1–1.2 cm, endosperm homogeneous.

Common name:—mata-fome, licuri-mata-fome, licuri-de-boi, licuriroba, ariroba.

Etymology:—The specific epithet, *matafome,* comes from the Portuguese word "mata-fome," which in English means kill hunger. Indeed, this is the main use of its edible fruits in this desolate and arid caatinga region, where hunger can become a problem during periods of prolonged drought.

Distribution and habitat:—Endemic to the state of Bahia, in caatinga and in the transitional zones between Atlantic forest and caatinga or caatinga and cerrado. Its occurrence is relatively rare. Found wherever the populations of *S. coronata* and *S. vagans* overlap. The author saw one tree near the Bom Fim de Jesus and near Miguel Calmon and a very large population east of Iaçu near the village of Lajedo Alto. This palm grows well in caatinga vegetation in shallow sandy soils where the bedrock is close to the surface.

Phenology:—Collected in flower in January, March and September and in fruit in August. This hybrid can be found in flower and fruit year around. The palm fruits at the end of summer. Its seeds are difficult and slow to germinate.

Uses:—The thick, sweet mesocarp, as well as the nut, is edible. The palm with its ornamental aspects can be cultivated in general landscaping. Its leaves are used to cover rustic shelters and provide shading. Sometimes "milk" is made from the seeds by mashing them with a little water to form a slurry, then passing the slurry through a sieve or "peneira." Bondar mentioned that perhaps the resins on the leaf of this palm may have some industrial use (Bondar, 1939a).

Notes:—This palm is the natural fertile hybrid between *S. vagans* and *S. coronata*, occurring wherever the populations of these two species overlap. It is about the same size as *S. coronata* but is easily separated from it by having its leaves in a spiral arrangement, instead of in five rows, and with a slender, woody sheath or pseudopetiole fibers instead of thick and woody fibers. *Syagrus* × *matafome* is like *S. vagans* in having spirally arranged leaves. It is like *S. coronata* in having an erect above ground stem, leaves and trunk diameter of about the same length, persistent petioles on the stem for about a meter, clustered leaflets, pyramidal shaped pistillate flowers and fruits that are about the same size as *S. coronata*.

Syagrus × *matafome* is common in the area of Lajedo Alto, but only occasional to rare elsewhere. It is intermediate between the two species: in the number of leaflets, the armature of the pseudopetiole and the size and shape of the peduncular bract (see Glassman 1987).

Representative specimens:—BRAZIL. **Bahia**: *Bondar s.n.* (F! [F-619771, 619772]); Caetité, *H. Lorenzi et al. 5050* (HPL!); Iaçu, Fazenda São Sebastião a ca. 3 km oeste de Lajedo Alto, 180 m, 16 October 1985*, J.L. de S. Lima & Sá s.n.* (HTSA!); Iaçu, Lajedo Alto, 300–400 m, –12.72, –39.87, 25 November 1984*, L.R. Noblick & M.J. Lemos 3398* (F!, HUEFS!, US!); dentro de 1–3 km sul, norte, e leste do povoado, 16 January 1986*, L.R. Noblick & J. Lobo 4512* (CEPEC!, F!, HUEFS!, K!, MO!, NY!, RB!, SP!); Miguel Calmon, ca. de 10–12 km oeste da cidade até Lagoa Grande (= Urubu) e mais um km sul na estrada para Palmeiras na primeira baixada, 400–500 m, –11.38, –40.67, 13 March 1986*, L.R. Noblick 4533* (CEPEC!, F!, HUEFS!); Milagres, Rodovia BR-116 (Rio/Bahia), próx. a Milagres. Margem da rodovia. Abundante no local, 11 January 1983, *L.A. Mattos Silva et al. 1582* (CEPEC!); Santa Teresinha, 14 km W of Santa Teresinha in Caatinga, only two trees seen, 2.5 m tall with *S. vagans* and *S. coronata*, 30 June 1969*, S.F. Glassman & J.T. Medeiros-Costa 8716* (F!); Senhor do Bonfim, in a pasture ca. 1 km N of the village of Carrapichel on BR-407 (Senhor do Bonfim/Joazeiro), –10.40, –40.18, December 1982, *Silva & Mattos s.n.* (F!).

73. *Syagrus* × *mirandana* Noblick (2012: 58). (*S. microphylla* × *S. coronata*). Type:—BRAZIL. Bahia: Municipio de Sento Sé, Serra do Alegre 3 km S of Campo Largo in the Serra do Pau d'Arco, –10.41, –41.40, 7 October 1988, *L.R. Noblick & J.L. dos S. Lima 4613* (holotype CEPEC!, isotypes F!, HTSA!, BAH!, NY!, MO!, US!)

Figure 90 map.

Small, solitary or appearing clustered, unarmed, palms. **Stem** subterranean. **Leaves** 5–12 in crown, spirally arranged, spreading, leaves strongly recurved; *sheathing leaf base* not measured, *pseudopetiole* not measured with fibrous margins; *petiole* 6–28 cm long; *rachis* 56–95 cm long; *leaflets* waxy green on upper surface, whitish on the lower, 28–38 along one side, irregularly distributed in clusters of 2 or 3 in divergent planes; basal leaflets not measured, middle leaflets 14–34 × 1.4–2.7 cm, apical leaflets not measured with mostly asymmetric tips. **Inflorescence** erect, spirally branched; *prophyll* 18–20 × 2 cm; *peduncular bract* ca. 89–146 cm long, expanded portion 30–41 × 3.5–4 cm, bearing a 1.5–3 cm beak, woody, finely sulcate, light grayish green; *peduncle* ca. 55–118 × 8 cm; *inflorescence axis* ca. 33–60 cm long; *rachis* 25–42 cm long; *rachillae* 8–18, 13–26 cm long, each rachilla, especially lower ones, subtended by a bract 2–3 × 3 mm; *staminate flowers* 5–7 × 3–3.5 mm, cream, sepals 1 mm long, petals 6–7 × 2.5–3 mm with acute tips, indistinct, stamens 4.5–6 mm long, anthers 3–4 mm long, filaments 1–2 mm long, pistillode 1–1.5 mm; *pistillate flowers* pyramidal, 6–7 × 4–5 mm, grayish brown, sepals (5–)6–7 × 4–5 mm, petals (4–)5–6 × 2–3 mm, pistil 3 × 2 mm (aborted?), stigmas not measured, staminodal ring ca. 1 mm high. **Fruit** not seen; *seeds* not seen.

Common name:—None recorded.

Etymology:—The specific epithet, *mirandana,* honors Dr. E. E. Miranda, formerly of CPATSA (Centro de Pesquisa Agropecuário Tropico Semiárido, EMBRAPA), Petrolina, Pernambuco, who first drew attention to this palm from Sento Se, Bahia, Brazil.

Distribution and habitat:—This hybrid has only been seen in the Serra do Alegre, Sento Sé, Bahia. However, it could potentially be found wherever the ranges of *S. coronata* and *S. microphylla* overlap. This hybrid grows above 1000 m in an area of disjunct cerrado vegetation (gerais or campo limpo) which has no other tree species other than the occasional *S. coronata*. The soil is very poor, fine grain whitish sand to gravel.

Phenology:—Collected in flower in October.

Uses:—None recorded.

Notes:—This infrequent palm hybrid is intermediate between the only other two *Syagrus* species in the area, *S. coronata* and *S. microphylla*. It is easily distinguished from *S. coronata* by its smaller, acaulescent habit of growth, the smaller inflorescence, and smaller leaves. One can separate it from *S. microphylla* because of its larger size, strongly recurved leaf blades and rachis, a larger inflorescence that extends far above the height of the foliage, and many more rachillae. The height of the inflorescence above the rest of the plant is an especially good field character for locating this palm because *S. microphylla* inflorescences rarely extend much above the height of its own foliage (Noblick 2012).

Specimen examined:—BRAZIL. **Bahia**: Remanso [Sento Se?], without date, *Miranda s.n.* (HTSA!); Sento Sé, Serra do Alegre, 9 km S of Minas do Mimosa in the Serra das Almas, 1010 m, –10.33, –41.40, 7 October 1988, *L.R. Noblick & L.L. dos S. Lima 4610* (FTG!, HTSA!).

74. *Syagrus* × *serroana* Soares & Assis (2013b: 95). [*S. glaucescens* × *S. romanzoffiana*]

Type:—BRAZIL. Minas Gerais: Serro, próximo ao Rio do Peixe, –18.64, –43.41, 26 April 2012, *K. Soares, L. Assis & A.G. Vieira 48* (holotype HDCF).

Figure 90 map.

Solitary, moderately-sized palm. **Stem** columnar, ca. 4–7 m × 17–22 cm covered with leaf base remains on the younger part in vertically spirally rows, but less apparent than in *S. glaucescens*. **Leaves** 9–12 in the crown, more or less arched, 2.5–3 m long *sheathing leaf base* ca. 47–53 cm long; *pseudopetiole* 30 cm long; *petiole* 7–8 × 2.2–2.5 cm; *rachis* 220–250 cm long; *leaflets* long-lanceolate, thin, leathery, slightly lighter on the abaxial surface, 115–120 along one side, in clusters of 3 or 4, inserted at various angles, giving the leaf a plumose appearance, ramenta scales or tomentum scare along the abaxial midvein; basal leaflets 50–55 × 1.7–1.8 cm, middle leaflets

55–65 × 2.8–3 cm, apical leaflets 19–25 × 1.1–2 cm with an asymmetric tip. **Inflorescence** erect to pendulous, 80–100 cm, spirally branched; *prophyll* 59 × 6 cm; *peduncular bract* 120–130 cm long, expanded portion 76–81 × 11.5–15 cm, including a 3 cm beak, narrow, woody, sulcate; *peduncle* ca. 45–50 × 2.0–2.3 cm, elliptical in cross-section; *inflorescence axis* ca. 65–85 cm long; *rachis* 45–55 cm long; *rachillae* 60–70, 20–30 cm long at the apex, 35–50 cm long at the middle, 39–55 cm long at the base; *staminate flowers* 9–10 mm long at the apex, sepals less than 1 mm long, glabrous, petals 8–9 × 3 mm with acute tips, cream to yellow, stamens 4–5 mm long, anthers 3–4 mm long, filaments 1–2 mm long, pistillode 1.0–1.5 mm long; basal *pistillate flowers* ovoid, 10–12 × 5–6 mm, yellow, sepals 10–12 × 6–10 mm, petals 8–10 × 6–9 mm, glabrous, pistil ovoid, 10–11 mm long, stigmas not measured, glabrous, staminodal ring not measured. **Fruit** ovoid, 4.2–4.5 × 2.5–3.2 cm, yellowish-green when mature, epicarp less than 0.5 mm thick, mesocarp thickness not measured, succulent and fibrous; *endocarp* 2.8–3.5 × 1–1.3 cm, fusiform; *seed* ellipsoid not measured, endosperm homogeneous.

Common name:—None recorded.

Etymology:—The epithet, *serroana,* refers to Serro, Minas Gerais, Brazil; the first locality where this hybrid was found.

Distribution and habitat:—Known from the type locality and another on the road from Diamantina to Milho Verde, Brazil (–18.29, –43.55).

Phenology:—Unknown.

Uses:—None recorded.

Notes:—Natural hybrids between *S. glaucescens* and *S. romanzoffiana* are infrequent; only two individuals were found. This hybrid displays intermediate characteristics between *S. glaucescens* and *S. romanzoffiana* in the consistency of the leaflets and in the surface of the stem. There are intermediate differences in sizes between *S. glaucescens*, S. × serroana, and *S. romanzoffiana* in the inflorescence (16–30 / 65–85 / 81–167 cm), the stem length (0.5–4 / 4–7 / 7–18 m), and stem diameter (8–12 / 17–22 / 20–40 cm). It is easily identified among stands of the putative parent species.

Representative specimens:—Known only from the type specimen.

75. *Syagrus* × *teixeiriana* Glassman (1968c: 27). (*S. oleracea* × *S. romanzoffiana*). Type:—BRAZIL. São Paulo: 20 km N of Tupa [ca. –21.85, –50.71], Fazenda Vanuir, 5 July 1965, *S.F. Glassman & J.C. Gomes 8007* (holotype F, erroneously cited 8008 in Glassman 1968c)

Figure 90 map.

Palm solitary. **Stem** ca. 4 m × 15 cm. **Leaves** 10–12, arranged spirally; *sheathing leaf base* ca. 53 cm long; *pseudopetiole* ca. 40 cm long, *petiole* ca. 6 cm long; *rachis* 210 cm long; *leaflets* slightly glaucous on both sides, lighter on the abaxial surface, ca. 149–150 along one side, in clusters of 3–5, inserted at various angles, giving the leaf a plumose appearance, basal leaflets not measured, middle leaflets 66 × 2.7 cm, apical leaflets not measured with long acuminate asymmetric tips. **Inflorescence** erect to pendulous, spirally branched; *prophyll* not measured; *peduncular bract* 100–120 cm long, expanded portion ca. 82 × 13 cm, beak not measured, narrow, woody, sulcate, length; *peduncle* ca. 50–70 cm long, elliptical in cross-section; *inflorescence axis* 56–81 cm long; *rachis* ca. 60 cm long; *rachillae* 38–86, 41–48 cm long at the base; *staminate flowers* 8–12 mm long at the apex, 15–17 × 2 mm at the base with acute tips, green to yellow, sepals not measured, glabrous, stamens 4.5–5 mm, anthers 4 mm long, filaments not measured, pistillode not measured; basal *pistillate flowers* pyramidal, 7.0–7.5 × 5–7 mm at the base, yellow, sepals not measured, petals not measured, glabrous, pistil not measured, glabrous, stigmas not measured, glabrous, staminodal ring not measured, 6-dentate. **Fruit** ovoid, ca. 3 × 2 cm with a very short beak, orange when mature, epicarp less than 0.5 mm thick, mesocarp thickness not measured, succulent and fibrous; *endocarp* ca. 2.5 × 1.5 cm, 4.0–4.5 mm thick on its sides, to 7 mm thick at the ends, smooth on the inside but lightly irregular in shape; *seed* narrowly ellipsoid, ca. 1.3 × 0.6 cm, with an internal cavity, endosperm homogeneous.

Common name:—guarivá.

Etymology:—The specific epithet, *teixeiriana,* honors Dr. Alcides Teixeira, Director of the Instituto de Botanica, São Paulo, who greatly facilitated Dr. Sidney Glassman during his palm collecting research in Brazil.

Distribution and habitat:—This hybrid occurs where *S. oleracea* and *S. romanzoffiana* populations overlap. It has been seen in the Brazilian states of São Paulo and Goiás in sandy, clay soils of cerrado, and is apparently rare.

Phenology:—This species has been seen flowering in July.

Uses:—Ornamental and could easily be used in landscaping, as are *S. oleracea* and *S. romanzoffiana*. The palm has been seen cultivated in a city park in Jataí, Goiás (H. Lorenzi, pers. comm.).

Notes:—This palm is the natural fertile hybrid between *S. oleracea* and *S. romanzoffiana.* Its leaflets are stiff like *S. oleracea* and not pendulous. Its fruit is intermediate in size between the two species (4–7 × 2.4–2.5 / 3 × 2.0 / 2–3 × 1.2–1.8 cm), but ellipsoid or ovoid like *S. oleracea*. The fruit is bright orange, it has a tuft of whitish hairs at its tip, and the endocarp cavity is irregular like *S. romanzoffiana*.

Representative specimens:—Known only from the type specimen.

76. *Syagrus* × *tostana* (Bondar) Glassman (1963: 261) (*S. schizophylla* × *S. coronata*). *Cocos* × *tostana* Bondar (1942a: 458). *Arikuryroba* × *tostana* (Bondar) Hawkes (1952a: 175). Lectotype (designated by Glassman [1987: 88]):—BRAZIL. Bahia: near Pituba, Salvador [–13.00, –38.46], 1940, *G. Bondar s.n.* (F! [F–619775])

Figure 90 map.

Moderate, solitary, unarmed, palms. **Stem** erect, 2–3(–7.5) m × 10–15(–20) cm, with leaf scar intervals obscured by persistent petiole bases. **Leaves** 8–15, spirally arranged, stiff, erect–ascending; *sheathing leaf base* ca. 15–18 cm wide, broad, with unusual spines along the margins diminishing upward; *pseudopetiole* 100–116 cm long, but with margins with long, flat, spine–like projections for half its length, dentate beyond this point, and finally becoming devoid of spines for the last 10 cm, *petiole* ca. 10 cm long; *rachis* 210–220 cm long; *leaflets* bright green (not grayish) adaxially, paler abaxially, ca. 65 along one side, irregularly distributed, divergent in pairs on the lower half of the leaf, regularly distributed, lying in one plane on the upper half; basal leaflets not measured, middle leaflets 70–80 cm (most shorter) × 3.5–4 cm, apical leaflets not measured, mostly with acuminate tips. **Inflorescence** erect to pendulous, spirally branched; *prophyll* not measured; *peduncular bract* ca. 120–140 cm long, expanded portion 82–97 × 10 cm, woody, sulcate; *peduncle* ca. 70–80 × 1.5–2.5 cm, elliptical in cross–section; *inflorescence axis* 79–94 cm long; *rachis* ca. 50 cm long; *rachillae* 60 or more, 40–45 cm long at the base; rachillae bracts absent or to 2 mm long; *staminate flowers* 8–11 mm long at the apex, 11–14 × 3–5 mm at the base, yellow, sepals 1–2 × less than 1 mm, petals 6–9 mm long at the apex, 9–12 × 2–3 mm at the base with acute tips, nerves indistinct, stamens not measured, anthers 5–6 mm, filaments 3 mm long, attached to the basal 1/3 of the anther, pistillode 1–1.5 mm; *pistillate flowers* 10–11.5 × 6–8 mm, light greenish yellow, sepals 10–11 × 6–8 mm, petals 7–8 × 4–5 mm, pistil 5 × 3–4 mm, stigmas 2–2.5 mm long, staminodal ring ca. 1 mm high. **Fruit** ellipsoid, 3–4 × 2.3–2.6 cm, persistent perianth (cupule) light gray brown, 17–19 mm wide, 8–10 mm deep, ring 2–3 mm in height, epicarp fleshy and having a short beak, orange–red when fruit is mature, less than 1 mm thick, mesocarp 2–3 mm thick, fleshy or succulent, fibrous pulpy, mucilaginous, sweet–tasting; *endocarp* 3–4 × 1.8–2.0 cm, 2–3 mm thick on the sides, up to 7 mm thick at ends, bony, trivittate, with no clusters of fibers; *seeds* 1.7–2.1 × (0.8–)1.1–1.3 cm, endosperm homogeneous.

Common name:—licurioba–açú, licurioba-assú, licuriroba-ussú.

Etymology:—The specific epithet, *tostana,* honors Dr. Ignacio Tosta Filho, in admiration for his dedication to the progress of Bahia and gratitude for an old friendship. (Bondar 1942b).

Distribution and habitat:—Endemic to the Brazilian state of Bahia in the coastal restinga found wherever the ranges of *S. coronata* and *S. schizophylla* overlap. This range occurs in the restinga areas along the coast, from Salvador, Bahia to Sergipe. The original specimen was described from Pituba, a barrio or suburb of Salvador, Bahia. The only natural occurring specimen (the type) was collected in restinga vegetation in loose sandy soils.

Phenology:—This hybrid palm flowers in November.

Uses:—May have ornamental potential.

Notes:—*Syagrus* × *tostana* is the hybrid between *S. coronata* and *S. schizophylla*. It differs from *S. coronata* by having green leaves instead of grayish–green like the former, by the irregularly arranged leaflets which diverge very little from one another in the basal part of the leaf blade becoming more regularly arranged and lying in one plane in the upper half, and by having the leaves arranged in distinct spirals on the trunk rather than in five rows as seen in *S. coronata*. The fruit is larger than either one according to Bondar and the endosperm is homogeneous; not ruminate. Another difference mentioned by Bondar was an internally marked trivittate endocarp, instead of a "monovittate" one as seen in *S. coronata*, but in reality *S. coronata*'s endocarp is also trivittate.

This hybrid differs from *S. schizophylla* by being more robust with a thicker stem, the leaves are stiffly erect and not arching, the petioles of the leaves are wider at their bases; petiole margins with angled spines on the lower portions of the petiole, which disappear and become smooth for a short distance before the insertion of the first leaflets. The inflorescences are more robust, and staminate flowers are larger. The endosperm is homogeneous in this hybrid, but ruminate in *S. schizophylla*.

In Brazil, this is a very rare hybrid, which may be found wherever the ranges of *S. coronata* and *S. schizophylla* overlap in the restinga areas along the coast. The original specimen was described from a barrio of Salvador (Pituba). Bondar (1942a) wrote that he only saw two specimens, one in the backyard of a private residence in Barra, a barrio of Salvador, and the other (the type collection) on the fazenda Pituba, as mentioned above. After an intensive search, the author was unable to find any specimens near Salvador, which has experienced tremendous urban growth in recent years. Some specimens are reported to have been recently seen from Sergipe (Medeiros-Costa, pers. comm.)

Specimen examined:—Known only from the type, BRAZIL. **Bahia:** Salvador, Pituba, 1940*, G. Bondar s.n.* (F-619776).

77. *Syagrus comosa* × *elata*

Type:—BOLIVIA. Santa Cruz: Velasco, Parque Nacional Noel Kempff M., Campamento Los Gamas, –14.80, –60.18, 850 m, 11 June 1994, L. *Moreno, O. Moreno, H. Justiniano & R. Vásquez 140* (UBSC, NY).

Figure 90 map.

Small, solitary palm. **Stem** columnar, ca. 1.0–1.5 m × 8–12 cm with prominently raised leaf scars or rings. **Leaves** 5–7; *sheathing leaf base* triangular ca. 30 cm long, width not measured, covered with a gray deciduous tomentum; *pseudopetiole* not measured, *petiole* nearly absent, glabrous; *rachis* ca. 80 cm long; *leaflets* narrowly linear, slightly lighter on the abaxial surface, 50–60 along one side, in clusters of 2 or 3, inserted at various angles, but in nearly one plane near the apex and base; basal leaflets not measured, middle leaflets 30–32 × 1.8 cm, apical leaflets 12–28 × 0.5–0.8 cm, ending with one filiform leaflet. **Inflorescence** erect to pendulous, spirally branched; *prophyll* 20 cm long, fibrous; *peduncular bract* 55 cm long, expanded portion 25–30 × 7–8 cm, beak not measured, narrow, woody, sulcate; *peduncle* ca. 35–40 × 1 cm, elliptical in cross-section; *inflorescence axis* ca. 29–33 cm long; *rachis* 5–8 cm long; *rachillae* 5–6, 24–25 cm long, glabrous; *staminate flowers* oval-shaped, 1.2 × 0.6 mm, yellow, sepals 3 mm long, glabrous, no visible nerves, petals 1.2 × 0.6 mm, lanceolate, oval, acuminate, with acute tips, nerves indistinct, stamens 5 mm long, basally connate, anthers not measured, filaments not measured, pistillode not measured, very small; basal *pistillate flowers* ovoid, 10 mm long, yellow, sepals 10 × 8 mm, glabrous, no visible venation, petals 8 × 5 mm, glabrous, pistil 5 mm long, glabrous, stigmas not measured, glabrous, staminodal ring not measured. **Fruit** not seen; *seed* not seen.

Common name:—None recorded.

Etymology:—Not applicable.

Distribution and habitat:—Endemic to Bolivia in cerrado and campo rupestre. This hybrid has only seen on the plateau of Caparú in the fields near the Campamento Las Gamas in the Parque Nacional de Noel Kempff Mercado.

Phenology:—Unknown.

Uses:—None recorded.

Notes:—This is the natural hybrid between *S. comosa* and *S. elata.* It is similar to *S. elata* in having linear, narrow leaflets, with clustered leaflets in various planes, while *S. comosa* has wider, more coriaceous leaflets that are displayed in two planes (Moreno & Moreno 2006, 2013). The hybrid has a shorter inflorescence that soon becomes pendulous in fruit. It has 6 or more rachillae like *S. comosa* that is unlike *S. elata,* which has only one or two.

Specimen examined:—Known only from the original collection.

OTHER SUSPECTED NATURAL HYBRIDS

There are at least two other natural occurring hybrids. Unfortunately, complete collections have not been made or the collections are not available to the author to enable him to make a thorough description at this time.

78. *Syagrus pleioclada* × *S. glaucescens*

This is a natural cross between *S. pleioclada* and *S. glaucescens*. The hybrid is a bit taller than normal *S. pleioclada*, but much shorter than *S. glaucescens*, attaining a height of about 1–1.5 m. The leaves were somewhat deflexed but not as deflexed as *S. pleioclada* and with a much larger inflorescence than normal *S. pleioclada*. This is not a surprising cross since the hybrid between *S. pleioclada* and *S. duartei* (*Syagrus* × *altopalacioensis*) has already been discussed, and both *S. glaucescens* and *S. duartei* are thought to be closely related. In fact, some advocate that they are the same, but the author still believes that they should be keep distinct for reasons already mentioned under those two species.

Representative specimen:—BRAZIL, **Minas Gerais:** Diamantina, nas margens da rodovia no km 597, lado esquerdo, sentido Serro, 1383 m, –18.26, –43.68, 21 June 2008, *R. Tsuji et al. 2711* (HPL!).

79. *Syagrus loefgrenii* × *S. romanzoffiana*

A hybrid between *S. loefgrenii* and *S. romanzoffiana* was pointed out to the author located just south of Piracicaba in the vicinity of Boituva, São Paulo. However, to the author's knowledge collections have not yet been made of the specimen. The small palm has a solitary above ground stem that is well developed ca. 1.5–2 m × 10–15 cm and its overall height is ca. 3–4 m. There is only one specimen occurring in the area where both parents are present.

Representative specimen:—No specimens as of this writing.

Hybrids that occur in cultivation

There are *Syagrus* hybrids that occur in cultivation that would never occur naturally because their distributions do not overlap in nature. For example, the author discovered *Syagrus* × *montgomeryana* Noblick ex Hodel (2011: 142), the cross between *S. schizophylla* and *S. romanzoffiana,* among the living collections at Fairchild Tropical Botanic Garden (Noblick 1992). The hybrid was officially named by Hodel (2011):

Syagrus* × *montgomeryana Noblick ex Hodel. (*S. schizophylla* × *S. romanzoffiana*)
Lectotype (designated here):—UNITED STATES OF AMERICA. Florida**:** Miami, Fairchild Tropical Garden, plot 19B, accession number 73351*A. 17 October 1991, *L.R. Noblick 4830* (lectotype FTG!, isolectotypes AAU!, BH!, F!, MO!, NY!, US!).

Syagrus* × *dickensonii (Hodel) Noblick *comb. nov.* (*S. weddelliana* × *S. romanzoffiana*)
×*Lytoagrus dickensonii* Hodel (2005: 123) Type:—UNITED STATES OF AMERICA. California, Orange County, Fullerton, cultivated garden of William W. Dickenson, no date, *D.R. Hodel 1970* (holotype K, isotype BH).

Syagrus hybrids have been created artificially by ardent collectors and nurserymen who wish to expand the landscape potential of this genus (Hodel, 2005, 2011). For example, Hodel (2005) described the hybrid of *Syagrus weddelliana* × *S. romanzoffiana* as a new nothogenus and nothospecies. However, since *Lytocaryum* has now been transferred to the genus *Syagrus* (Noblick & Meerow 2015), the new correct combination for this hybrid is *Syagrus* × *dickensonii* (Hodel) Noblick.

Other unnamed hybrids have been successfully created by palm collectors and nurserymen (Hodel, 2011), most of which would never have occurred naturally. See Table 2 for the complete list of natural and artificial or garden hybrids. It is not surprising that the majority of these hybrids have been made with *S. coronata* and *S. romanzoffiana*, which are also the two most common parent *Syagrus* species of natural hybrids in Brazil (e.g. *Syagrus* × *campos-portoana, S.* × *matafome, S.* × *teixeiriana, S.* × *tostana, S.* × *mirandana*). A few of these hybrids are the following:

Syagrus coronata × *S. picrophylla*
Syagrus picrophylla × *S. romanzoffiana*
Syagrus romanzoffiana × *S. yungasensis*

Intergeneric hybrids

×*Butiagrus nabonnandii* (Prosch.) Vorster (1990: 662). ×*Butiarecastrum nabonnandii* Proschowsky (1921: 290). *Syagrus* × *nabonnandii* (Prosch.) Demoly (1989: 30). No specimens cited. Neotype (designated here):—UNITED STATES OF AMERICA. Florida: Miami, cultivated Fairchild Tropical Garden, plot 99C, accession number 58912, 28 June 1991, *L.R. Noblick 4811* (FTG!)

Syagrus × *fairchildensis* Glassman (1971c: 82). Type:—UNITED STATES OF AMERICA. Florida: Miami, cultivated, plot 111, no. FG-60-754A, 25 March 1920, *S.F. Glassman 8764* (holotype F! [formerly CHI]).

Butia odorata × *Syagrus romanzoffiana* = ×*Butiagrus nabonnandii* (Prosch.) Vorster (1990: 662) is an intergeneric hybrid that has been successfully crossed by nurserymen, but the author has also seen this hybrid naturally occurring in Uruguay and it probably occurs in Brazil as well. This palm hybrid was originally named ×*Butiarecastrum nabonnandii* Proschowsky when *S. romanzoffiana* was still in the genus *Arecastrum*. It is also known under the following *Syagrus* names: *Syagrus* × *fairchildensis* Glassman (1971c: 82) and *Syagrus* × *nabonnandii* (Prosch.) Demoly.

Representative specimens: UNITED STATES OF AMERICA. Florida: Miami, cultivated, plot 111, no. FG-60-754B, 25 March 1920, *S.F. Glassman 8765* (paratype F! [formerly CHI]); Miami, Florida, Fairchild Tropical Garden FTG accession number 58-912*C, plot 99C, source of seed from FTG plant RM-353*B in plot 110, now dead, RM-353 originally received from Hoffman as *Jubaea chilensis*, 31 January 1986, *Roger Sanders 1760* (FTG!).

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Appendix I: Excluded names

Cocos flexuosa var. *densiflora* Martius (1826: 120). Type:—BRAZIL. Bahia: Serra Fria (no specimens cited).
Cocos flexuosa var. *densiflora* was placed into synonymy with *S. flexuosa* (Glassman, 1987). Martius cited Serra Fria, Bahia as the type locality, but did not cite any specimens. The author has not yet been able to locate Serra Fria in Bahia. Martius and Spix first entered Bahia by crossing the Rio Carinhanha from Minas Gerais (Spix & Martius 1824), in the western cerrados of Bahia. They then went as far west as the Serra Geral before returning back through the town of Cocos. In western Bahia (the planalto region of Brazil), Martius probably did see *Syagrus flexuosa* (whose lectotype just says Brazil). Perhaps Serra Fria is located somewhere in western Bahia, close to the Serra Geral. They continued eastward through the town of Carinhanha, crossing the São Francisco River, and travelled through Caetité. There Martius found *Cocos flexuosa* var. *cataphracta* (= *Syagrus cataphracta*). They then headed northeast to Rio de Contas, which is located in the Chapada Diamantina complex of mountains and still within the range of *Syagrus cataphracta*. It is not unreasonable to imagine that Serra Fria was part of this complex and that *Syagrus flexuosa* var. *densiflora* is just a variation of *S. cataphracta* with densely-spaced female flowers, which were described by Martius as "floribus foemineis majusculus numerois aproximatis." If that is the case, then this name would have to be moved to the synonymy of that species. After Martius left Rio de Contas, he would not have encountered any *S. flexuosa* or anything related to it. He and Spix crossed a very dry, flat part of Bahia to the Rio Paraguaçu, spent time in Salvador to ship their collections, and explored down the coast of Bahia. They then proceeded northwest through Jacobina and on to the state of Piauí. While there is mountainous terrain near Jacobina, this *Syagrus* or anything related to it has never been seen nor collected in this region, so it is doubtful that Martius found it on his way to Piauí. With no specimen cited and questionable identification, it is best to exclude this variety.

Cocos petraea var. *genuina* Drude in Martius (1881: 426). Type:—none designated
This name is illegitimate because of the use of the epithet "genuina," this normally indicates that this is what we now call the autonym (i.e. *Cocos petraea* var. *petraea*).

Syagrus chloroleuca (Barb.Rodr.) Burret (1937: 692); *Cocos chloroleuca* Barbosa Rodrigues (1907: t. 38). No specimens were cited and none were seen and therefore this name was designated a *species dubium* by Glassman 1987, p. 91. Govaerts (2016) states that this is a synonym of *Bactris balanophora* Spruce.

Syagrus cogniauxiana (Barb.Rodr.) Beccari (1916: 466). *Cocos cogniauxiana* Barbosa Rodrigues (1903a: 102). Type:—PARAGUAY. Rio Apa, *E. Hassler 8553* (holotype G destroyed?). Lectotype (designated by Glassman 1972b, p. 90):—BRAZIL. Barbosa Rodrigues (1903a) volume 1, t. 76A, 1903a. Designated as a *species incerta* in Glassman 1987, p. 92. It could be *Syagrus campylospatha*, but the original holotype was never found and is presumed destroyed.

Syagrus edulis (Barb.Rodr.) Frambach ex Dahlgren (1936: 266); *Cocos edulis* Barbosa Rodrigues (1907: 105). Lectotype (designated by Glassman 1972b, p. 90):—BRAZIL. Rio Grande do Norte: Barbosa Rodrigues (1907) t. 24A, 1907. Govaerts (2016) simply calls it an unplaced name. The author agrees with Govaerts for the following reasons: Barbosa Rodrigues (1903a) said that the leaves of *S. edulis* resemble *Syagrus romanzoffiana* and the fruit has an agreeable flavor, which *S. cearensis* does. *Syagrus cearensis* is the only known *Syagrus* species that naturally occurs in Rio Grande do Norte. However, Barbosa Rodrigues' illustrated glabrous fruit with rounded glabrous apex differs from the brown lepidote-covered fruit with the squared-off apex of *S. cearensis*. *Syagrus cearensis* also does not have a distribution that extends from Rio Grande do Norte to Espirito Santo as reported by Barbosa Rodrigues (1903a). Glassman (1987) said that the plant description and illustrations resemble *Syagrus oleracea*, but without an accurate description of the leaves, he could not be certain of its identity. Glassman (1970c) misidentified *Syagrus cearensis* for *Syagrus oleracea* when describing a new hybrid. Both he and Barbosa Rodrigues have lumped together various *Syagrus* species that grow near the coast, such as *S. cearensis*, *S. picrophylla* and *S. lorenzoniorum.*

Syagrus majestic hort. ex Lemaire in Linden (1874: 87) This name first appeared in a list of "noble" species growing at an exhibition at the Botanic Garden of Florence. The article was authored by Charles (Antoine) Lemaire, but there was no description. Therefore, this name is a *nomen nudum*. The International Plant Names Index (2015) listed *Syagrus majestic* hort. ex H.Wendl. in a 1878 publication.

Syagrus petraea var. *meioclada* Burret
Syagrus meioclada Burret (1933: 111) is a typographical error. It is a misspelled *pleioclada* that occurred in the publication of *Syagrus pleioclada*. *Syagrus meioclada* should simply be corrected. However, in the process of comparing *S. petraea* and *S. pleioclada,* Burret also erroneously coined the variety *Syagrus petraea* var. *meioclada.* This taxa must be excluded because it is based on a typographical error.

Syagrus × *matafome* (Bondar) Glassman (1963: 260).
This is a superfluous name, because Hawkes made the first combination.

Syagrus petraea var. *platyphylla* (Drude) Beccari (1916: 467). *Cocos petraea* var. *platyphylla* Drude in Martius (1881: 426); Type:—BRAZIL. Between Goyaz and Cujaba, November and December 1844, *H.A. Weddell 2952* (P!). As of this writing, *Syagrus petraea* is considered an endemic of Bolivia and has not yet been collected in Brazil. *Syagrus glazioviana, S. pleiocladoides* and *S. guimaraesensis* can all be found between the cities of Goiás, Goiás and Cuiabá, Mato Grosso, the region collected by Weddell in Brazil. Weddell's collection has a very narrow spathe, spicate inflorescence, and a couple of leaflets that appear to be deflexed with very unequal leaflet tips that are suspiciously similar to *Syagrus pleiocladoides.* Weddell's collection is either *S. pleiocladoides,* or perhaps a variable form of *S. glazioviana*. The author has decided to classify it as a *species incerta*.

Syagrus purusana (Huber) Frambach ex Dahlgren (1936: 268); *Cocos purusana* Huber (1906: 271). This species was described by Huber in "La végétation de la vallée Rio Purus (Amazone)." Frambach in Dahlgren's 1936 Index of American Palms did little more than transfer it to the genus *Syagrus.* Neither Huber nor Frambach cite any specimens. Huber believed that it was a cocosoid palm that belonged to the genus *Syagrus*. He believed that it might be a form of *Syagrus inajai* 15–20 meters in height with a short peduncle and a very long 1 meter long inflorescence bearing up to 150 rachillae. However, *Syagrus inajai* normally has a long peduncle to 82 cm and a shorter inflorescence 34–68 cm long with 14–47 rachillae. Glassman wrote that this species has an inadequate description making it impossible to place in the genus *Syagrus*, much less a species of that genus (Glassman 1987). The author believes that Huber, who was an accomplished collector in the Amazon region, knew what he was writing about. His brief description could be that of a poorly known *Syagrus*. One Amazonian or pre-Amazonian *Syagrus* that approaches his description is *Syagrus vermicularis*. This species does have a shorter peduncle 36-61 cm and an inflorescence up to 92 cm long with up to 137 rachillae. Lorenzi (comm. pers.) sent the author images of this species from as far west as the state of Roraima, Brazil, which is close to the source of the Purus River. However, since no specimens of it have ever been officially collected from the Amazonian Purus valley of Brazil, we have no way to confirm this. Therefore, for now it is designated a *species incerta*.

Cocos rupestris Barbosa Rodrigues (1879: 45). Barbosa Rodrigues described the locality and habitat of this species as "Minas Gerais, ad margines Rio Sapucahy, montibus Serra da Tromba, inter saxlaoideus, inter gramineas", which roughly translates as "Minas Gerais, to the margins of the Rio Sapucahy, to the Serra da Tromba, among saxlaoideus, among grasses." Drude listed it as a synonym of *Cocos petraea*, but no specimens were cited by him, nor were illustrations published by Barbosa Rodrigues. Currently *Cocos petraea* (*Syagrus petraea*) is known only from Bolivia and not Minas Gerais, Brazil as reported by Barbosa Rodrigues. So, this only confirms Glassman's (1987, p. 95) designation of it as a *species incerta.*

Syagrus tamaca Linden (1881: 32). This name first appeared in a list of introduced plants for commerce by J. Linden with no description. Therefore, this name is a *nomen nudum*.

Syagrus wallisii Linden, (1861: ?). This is an unplaced name *fide* Govaerts *et al.* (2016). This name appeared in a catalogue of exotic, new and rare plants cultivated in the greenhouses of J. Linden, but there is no further

information to be had, as the author was unable to access this catalogue. This should probably be designated as a *nomen nudum.*

Excluded names (currently *Butia* species)
Syagrus amadelpha (Barb.Rodr.) Frambach ex Dahlgren (1936: 264) = *Butia* sp.
Syagrus archeri Glassman (1967a: 235) = *Butia archeri* (Glassman) Glassman (1979: 70)
Syagrus arenicola (Barb.Rodr.) Frambach ex Dahlgren (1936: 109) = *Butia arenicola* (Barb.Rodr.) Burret (1930: 1051)
Syagrus campicola (Barb.Rodr.) Beccari (1916: 465) = *Butia campicola* (Barb.Rodr.) Noblick (2004a: 42)
Syagrus capitata (Mart.) Glassman (1970a: 143) = *Butia capitata* (Mart.) Beccari (1916: 504)
Syagrus dyerana (Barb.Rodr.) Beccari (1916: 466) = *Butia paraguayensis* (Barb.Rodr.) L.H.Bailey (1936: 47) (Glassman guessed that it might be *B. yatay.* But *B. yatay* does not occur near Concepcion, Paraguay [the locality cited by Barbosa Rodrigues], while *Butia paraguayensis* does).
Syagrus eriospatha (Mart. ex Drude) Glassman (1970a: 145) = *Butia eriospatha* (Mart. ex Drude) Becc.
Syagrus hatschbachii Glassman (1967a: 240) = *Butia microspadix* Burret (1930: 1050)
Syagrus leptospatha Burret (1940: 105) = *Butia leptospatha* (Burret) Noblick (2006: 169)
Syagrus paraguayensis (Barb.Rodr.) Glassman (1970a: 151) = *Butia paraguayensis* (Barb.Rodr.) L.H.Bailey (1936: 47)
Syagrus wildemanniana (Barb.Rodr.) Frambach ex Dahlgren (1936: 270) = *Butia* sp.
Syagrus yatay (Mart.) Glassman (1970a: 157) = *Butia yatay* (Mart.) Beccari (1916: 498).

For more detailed information consult Glassman (1987), where many of these are discussed in greater detail.

APPENDIX II: Numerical List of Taxa and Index to Exsiccatae

Numerical List of Taxa

1. *S. allagopteroides*
2. *S. amara**
3. *S. angustifolia*
4. *S. botryophora*
5. *S. caerulescens*
6. *S. campestris*
7. *S. campylospatha*
8. *S. cardenasii**
9. *S. cataphracta*
10. *S. cearensis*
11. *S. cerqueirana*
12. *S. cocoides*
13. *S. comosa*
14. *S. coronata*
15. *S. deflexa*
16. *S. duartei*
17. *S. elata**
18. *S. emasensis*
19. *S. evansiana*
20. *S. flexuosa*
21. *S. glaucescens*
22. *S. glazioviana*
23. *S. gouveiana*
24.1 *S. graminifolia* subsp. *graminifolia*

24.2 *S. graminifolia* subsp. *cabraliensis*
24.3 *S. graminifolia* subsp. *glazioviana*
25. *S. guimaraesensis*
26. *S. harleyi*
27. *S. hoehnei*
28. *S. inajai*
29. *S. insignis*
30. *S. itacambirana*
31. *S. itapebiensis*
32. *S. kellyana*
33. *S. lilliputiana*
34. *S. loefgrenii*
35. *S. longipedunculata*
36. *S. lorenzoniorum*
37. *S. macrocarpa*
38. *S. mendanhensis*
39. *S. menzeliana*
40. *S. microphylla*
41. *S. minor*
42. *S. oleracea*
43. *S. orinocensis**
44. *S. petraea**
45. *S. picrophylla*
46. *S. pimentae*
47. *S. pleioclada*
48. *S. pleiocladoides*
49. *S. pompeoi*
50. *S. procumbens*
51. *S. pseudococos*
52. *S. romanzoffiana*
53. *S. rupicola*
54. *S. ruschiana*
55. *S. sancona*
56. *S. santosii*
57. *S. schizophylla*
58. *S. smithii*
59. *S. stenopetala**
60. *S. stratincola**
61. *S. vagans*
62. *S. vermicularis*
63. *S. weddelliana*
64. *S. werdermannii*
65. *S. yungasensis**
66. *S.* × *altopalacioensis* (*pleioclada* × *duartei*)
67. *S.* × *andrequiceana* (*romanzoffiana* × *flexuosa*)
68. *S.* × *campos-portoana* (*coronata* × *romanzoffiana*)
69. *S.* × *cipoensis* (*glaucescens* × *oleracea*)
70. *S.* × *costae* (*cearensis* × *coronata*)
71. *S.* × *lacerdamourae* (*coronata* × *botryophora*)
72. *S.* × *matafome* (*vagans* × *coronata*)
73. *S.* × *mirandana* (*microphylla* × *coronata*)
74. *S.* × *serroana* (*glaucescens* × *romanzoffiana*)

75. *S.* × *teixeiriana* (*oleracea* × *romanzoffiana*)
76. *S.* × *tostana* (*schizophylla* × *coronata*)
77. *S. comosa* × *S. elata*
78. *S. pleioclada* × *S. glaucescens*
79. *S. loefgrenii* × *S. romanzoffiana*

*= taxa not yet found in Brazil

List of Exsiccatae

Exsiccate lacking a collector number (s.n.) are included if the specimen can be otherwise identified with a herbarium accession number (e.g. US-1705631) or a Field Museum negative number (e.g. F neg. 18564). The herbarium collections with herbarium accession numbers and Field Museum negative numbers are always inside square brackets. The specimen is also included if the collector always collected the same species multiple times, if there is only one record for that collector, or the collection represents a type. To avoid misidentifications, exsiccatae are not included if the collector has multiple s.n. collections of many different palm species.

Abrahao 109 (20).
Abreu, T.L.S. 74 (20).
Aguiar, S.F.N. 110 (22).
Albuquerque 10 (28); 67/3 (28).
Allem, A.C. 883 (13).
Allen, P.H. 3277 (43); 3352 (43).
Almeida, E. de F. 145 (20).
Almeida, S.P. 60, 72 (22).
Alves, E.S. 5 (52).
Alves, T.M.A. 55 (20).
Amaral, A. Jr. 3141 (12); 265397 (20).
Amorim Neto, L. 1263 (4); 2745 (14).
Amorim, A.M. 1191 (57).
Anderson, A.B. 2202 (62).
Anderson, W.R. 7175 (15); 7939, 8178 (20); 9712 (13); 10247 (22); 36881 (13).
Andrade 12 (20); s.n. [BHCB-8883, BHCB-8885] (16).
Andrade-Lima 66-4723 (10); 70-6078 (64); 72-6877 (13); 73-7371, 81-9018 (12).
Andreata, R.H.P. 553, 687, 690, 692, 693, 695, 699, 729, 945 (52).
Anunciação, E.A. 85 (52).
Aragaki, S. 256 (20).
Arantes, A.A. 151 (34).
Araújo, A.O. 158 (21).
Araujo, A.P. de 90 (14); 96 (61); 193 (57); 289 (26); s.n. (14).
Araújo, D. 1330 (40).
Araújo, G. 378 (13).
Arbo, M.M. 252 (52); 4028 (20); 4235 (16).
Arbocz, G. 1528 (20).
Archer, W.A. 4078 (21); 4086 (38).
Arechavaleta, J. s.n. (52).
Arenhart, N. 9 (13).
Argent, G.C.G. 6488 (13); 6694 (20).
Arraes, M.G. 7014 (26).
Arzolla, F.A.R.D.P. 1529 (27).
Assis, A.M. 1864 (51).

Ávila, N. 311 (27).
Azevedo, I.N.C. 25 (13).
Azevedo, T.I.N. de 340 (52).
Baitello, J.B. 782, 784 (27).
Balansa, B. 2711 (7); 2714, 2715 (52); 4776 (7).
Baldini, R.L. 21935 (20).
Balee, W.L. 1920 (12); 2303 (28); 5030 (8).
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