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An overview of *Astrocaryum* (Bactridinae, Arecaceae) types from Brazil described by João Barbosa Rodrigues

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Abstract

João Barbosa Rodrigues, a renowned Brazilian botanist, spent years intensively studying Orchidaceae and Arecaceae and oversaw two important institutions in Brazil: the Museu Botânico do Amazonas and the Jardim Botânico do Rio de Janeiro. However, when it comes to his taxonomic studies, there are controversies about the existence of specimens mentioned in the protologues of his new species. For example, for the palm genus *Astrocaryum*, several issues have arisen regarding identifying and designating nomenclatural types of the species he described. Different researchers presumed that the entire collection of types was destroyed after the Museu Botânico do Amazonas closed and due to natural disasters, that affected his collections in city of Rio de Janeiro. Thus, in this study we investigated the names of *Astrocaryum* described by Barbosa Rodrigues. We conducted a comprehensive investigation of Barbosa Rodrigues' works to determine the origin and current location of the possible nomenclatural types associated with the *Astrocaryum* species he described. Additionally, we reviewed the designations proposed by Jan Wessels Boer and Sidney Glassman for these species in the previous century. Based on our thorough search, we confirmed the absence of the specimens mentioned in the protologues of these species. Furthermore, we substantiated the typifications made by Wessels Boer and Glassman, which were based on illustrations by Barbosa Rodrigues. Our findings confirm the assignment of six lectotypes and twelve neotypes for *Astrocaryum* based on the Shenzhen Code.

Key words: illustrations, lectotype, Museu Botânico do Amazonas, neotype, palms

Introduction

Astrocaryum Meyer (1818: 265) is one of the most diverse genera of palm trees in the Neotropical region (Kahn 2008). It comprises approximately 40 species and is distributed from southern Mexico to Brazil and Bolivia (Kahn 2008). The species are widely distributed in the Amazon basin and often form dense populations in swampy areas and riparian and terra firme forests. Moreover, some taxa also occur in the Pacific coast rainforest, Cerrado, Pantanal, and Atlantic Forest (Kahn 2008, Pintaud *et al*. 2008).

For *Astrocaryum*, there is little information about the original specimens of taxa described and published by João Barbosa Rodrigues between 1875 and 1903. Different authors have reported that the specimens cited in the protologues were destroyed or lost (Stafleu & Cowan 1976, Balick *et al*. 1982, Kahn & Millán 1992, Lorenzi *et al*. 2010).

Due to the presumed loss of this material, Wessels Boer (1965) and Glassman (1972) typified species described by Barbosa Rodrigues using illustrations found in the naturalist's works. However, these typifications need to be reevaluated due to inaccuracies observed in other palm genera (Henderson 2011). Moreover, with the recent digitization of biological collections (Gasper *et al*. 2020, Barbosa *et al*. 2022), locating the specimens cited by Barbosa Rodrigues has become easier compared to when Wessels Boer (1965) and Glassman (1972) conducted his review in the previous century.

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For these reasons, in this study we conducted a detailed historical analysis of Barbosa Rodrigues' works to determine the origin and location of the possible nomenclatural types of the *Astrocaryum* species he described. Additionally, when the original specimens indicated by Barbosa Rodrigues were untraceable, we reevaluated the designations made by Glassman (1972) in the *Index of American Palms* and in Wessels Boer (1965) for these species. This review also updates and rectifies information in the references above, strictly adhering to the directives outlined in the International Code of Nomenclature for algae, fungi, and plants (The Shenzhen Code, Turland *et al*. 2018).

Material & Methods

We conducted a detailed analysis of the binomials of *Astrocaryum* cited and described by Barbosa Rodrigues throughout his extensive professional career (Barbosa Rodrigues 1875, 1888, 1891a, 1898, 1902, 1903a, 1903b). To do so, we consulted the information in the protologues of the works mentioned above. We also gathered historical and relevant literature with Barbosa Rodrigues' bibliographic information and about the possible destinations of the original material cited in his works, such as Stafleu & Cowan (1976).

To authenticate the nomenclatural validity of the treated names in this study, we used the POWO (Plants of the World Online, https://powo.science.kew.org/), Flora e Funga do Brasil (http://floradobrasil.jbrj.gov.br/), and Tropicos (https://www.tropicos.org/home) databases, as well as Kahn & Millan (1992) and Henderson *et al*. (1995). Furthermore, we followed the recommendation of Brummitt (2011) for the reestablishment of *Astrocaryum tucuma* Mart. in opposition to *Astrocaryum aculeatum* G.Mey.

In 2022, we conducted *in loco* consultations at the INPA, MG, and RB herbaria (acronyms following Thiers (2024, continuously updated)) to look for plausible specimens collected by the researcher. MG and RB are two of the oldest Brazilian herbaria and were in operation when Barbosa Rodrigues was working (Viana *et al*. 2015, Lanna *et al*. 2018). Notably, the naturalist created the RB herbarium in 1890 (Lanna *et al*. 2018); consequently, we thought it might have some of his specimens. The INPA collection was created a few decades after Barbosa Rodrigues' sojourn in the city of Manaus. Thus, we thought this herbarium might house specimens from the closed museum that Barbosa Rodrigues managed while in the city.

We also reviewed databases, such as JSTOR Global Plants (https://plants.jstor.org/), Reflora (http://reflora.jbrj.gov.br/reflora/herbarioVirtual/), SpeciesLink (https://specieslink.net/), GBIF (https://www.gbif.org/), JABOT (http://jabot.jbrj.gov.br/v3/consulta.php), and the websites of numerous herbaria, to trace potential specimens collected by the researcher that might be deposited in other national and international herbaria.

For the revision of the types, we followed the recommendations of the International Code of Nomenclature for algae, fungi, and plants (The Shenzhen Code, Turland *et al*. 2018). In particular, we followed Articles 9.3, 9.4, and 9.8 that define lectotypes, original material and neotypes, respectively. The guidelines outlined in Articles 9.10–9.13 and 9.22 were also considered.

Throughout this work, we provide homotypic synonyms for the binomials reviewed whenever pertinent, with the currently accepted names based on our research highlighted in bold. To provide a temporal understanding of the works by Barbosa Rodrigues (Barbosa Rodrigues 1875, 1888, 1891a, 1898, 1902, 1903a, 1903b), we organized the species described by each published work and kept the original order of the species published by the naturalist. Furthermore, to provide access to typified and little-known illustrations from the works by Barbosa Rodrigues, we have included reproductions of his "plates" in this article (Figs. 1–13).

Taxonomy

Notes about Astrocaryum Meyer and João Barbosa Rodrigues

The genus *Astrocaryum* was first described as *Avoira* Giseke (1792: 53). However, this name was rejected in favor of *Astrocaryum* (conserved name) that was described in 1818 (Dransfield *et al*. 2008, Kahn 2008). Subsequently, species of this genus were described and published by several foreign naturalists throughout the 19th century, such as Carl Friedrich Philipp von Martius from Germany (1794–1868) who was a pioneer figure and one of the most distinguished scholars of South American palms.

Carl Friedrich Philipp von Martius arrived in Brazil in 1817 and in his works *Historia Naturalis Palmarum* (published in three volumes from 1823 to 1853) and *Palmetum Orbignianum* (published from 1842 to 1847) he described

numerous species (Pintaud *et al*. 2008, Kury & Sá 2009). Another influential naturalist was the Scottish botanist James William Trail (1851–1919) who dedicated 18 months of research to the Amazon River and its tributaries (Sá 1996). His expedition promoted the discovery of new species that increased what was known about the biodiversity in the region. The German Carl Georg Drude was another noteworthy researcher. His continuation of Martius' seminal work, *Flora Brasiliensis*, was of particular significance and provided a robust foundation for comprehending *Astrocaryum* (Pintaud *et al*. 2008). During this continuation, Drude described new species and synthesized the taxonomic knowledge of his time about the group.

Another notable figure that significantly advanced botanical knowledge was the Brazilian João Barbosa Rodrigues (1842–1909). Throughout the final three decades of the 19th century and in the early 20th century, he described many new species and contributed to a better understanding of Brazil's flora (Mori & Ferreira 1987). Supported by the Empire of Brazil (Mori & Ferreira 1987, Sá 2001), Barbosa Rodrigues conducted multiple expeditions and authored a series of studies. These works encompassed the subjects of anthropology, natural history and botany, including memorable works on the families Arecaceae and Orchidaceae (Mori & Ferreira 1987, Brito 2013).

In 1872, Barbosa Rodrigues received funding from the Brazilian government and was dispatched to the Amazon to complete, correct, and expand upon the work *Palmarum* by Martius (Barbosa Rodrigues 1882). Over three and a half years, he traversed the region's interior and meticulously collected specimens and documented valuable information on medicinal, culinary, and architectural applications of the local flora (Mori & Ferreira 1987, Kury & Sá 2009, Leong 2010, Rodrigues 2012). As a result of this and other expeditions (Mori & Ferreira 1987), Barbosa Rodrigues produced one of the most comprehensive works about Brazilian palms, which was published in multiple volumes (Barbosa Rodrigues 1875, 1888, 1898, 1902, 1903a, 1903b). A notable work is *Sertum Palmarum Brasiliensium* that was published in two volumes in 1903. The author meticulously painted 174 watercolors for the publication and described 382 palm species, of which 166 were new (Barros 1942, Mori & Ferreira 1987, Lopes & Sá 2016).

According to Stauffer *et al*. (2016), Barbosa Rodrigues described four genera, 204 species, and 16 varieties of palms as new to science based on material he accumulated during more than 30 years of studying botany. Among the names attributed to the author, 14 species and five varieties refer to *Astrocaryum* (Tropicos 2024). The Tropicos database also mentions two other scientific names. However, one of these names is a later erroneous transcription of Barbosa Rodrigues' work (*Astrocaryum candescens* Barbosa Rodrigues), and one is an illegitimate name (*nom. illeg.*) [*Astrocaryum aculeatum* Barbosa Rodrigues (1875: 20)].

Another important aspect of his career was his contribution to founding and managing the Museu Botânico do Amazonas (Amazon Botanical Museum), the first scientific institution in the Amazonian Province in Brazil. The museum was created in 1883 in the city of Manaus based on Law n. 629 of 18 June 1883 (Lopes & Sá 2016). Barbosa Rodrigues assumed the role of director following the recommendation of Baron de Capanema and Princess Isabel's intermediation. On 14 December 1883, he officially took office and remained the sole researcher and director until the institution closed seven years later (Rodrigues 2012).

During his tenure at the institution, he created the journal *Vellosia*, named after Frei José Mariano da Conceição Velloso (1742–1811), which aimed to disseminate information about activities developed at the museum (Lopes 2022). In April 1890, he gave up his ambitious plans for the Museu Botânico do Amazonas due to numerous structural, political, and financial problems. Afterwards, he accepted an invitation to direct the Jardim Botânico do Rio de Janeiro (Rio de Janeiro Botanical Garden) (Leong 2010, Lopes & Sá 2016).

On 25 April 1890, Barbosa Rodrigues was nominated director of the Jardim Botânico do Rio de Janeiro, a position he held until his passing on 6 March 1909. Throughout his tenure, he was pivotal in spearheading the institution's modernization process (Mori & Ferreira 1987). Under his leadership, an integral project for the botanical garden was developed that encompassed constructing an arboretum, greenhouses and nurseries, areas for experiments, laboratories, a library, an herbarium, a botanical school, and a botanical museum (Ihering 1911, Peixoto *et al*. 2012). Thus, at the Jardim Botânico do Rio de Janeiro, Barbosa Rodrigues managed to successfully implement much of what he did not achieve at the Museu Botânico do Amazonas (Rodrigues 2012).

Despite his enormous importance, there is a lot of controversy surrounding Barbosa Rodrigues (Barbosa Rodrigues 1879, 1882, Ihering 1911, Rodrigues 2012). For example, some foreign botanists did not esteem his work well (Barbosa Rodrigues 1882, Mori & Ferreira 1987, Sá 2022). This was also the case for some Brazilians, such as the director of the botany section at the Museu Nacional (National Museum), Ladislau Netto, who questioned his self-taught training and the credibility of his works (Sá 2001, Costa *et al*. 2022, Sá 2022).

The attribution of amateur status to Barbosa Rodrigues further hindered the recognition of his scientific contributions. The institutionalization of disciplines linked to natural history, such as zoology, botany, geology and archaeology, influenced the emergence of disagreements between professional and amateur scientists (Sá 2001), which

contributed to Barbosa Rodrigues having some rivalries throughout his life (Rodrigues 2012). Additionally, some Orchidaceae researchers cast doubt on the existence of the specimens used to describe his new species. As mentioned by Mori & Ferreira (1987), Buzatto *et al*. (2013), and Koch *et al*. (2016), Barbosa Rodrigues did not cite specimens in many situations in his protologues; he only cited localities and flowering times of his new species.

Regarding *Astrocaryum*, original specimens were cited in the new species descriptions, except for two taxa published by Barbosa Rodrigues in 1898 and 1903, as well as for varieties described for some species. However, despite having mentioned the specimens in his works, the fate and location of this material are uncertain due to a lack of information (Balick *et al*. 1982, Kahn & Millán 1992, Lorenzi *et al*. 2010).

Origin and location of the Astrocaryum specimens cited in studies by Barbosa Rodrigues

Based on the information provided in the works *Enumeratio palmarum novarum* (Barbosa Rodrigues 1875), "Palmae Amazonensis Novae" (Barbosa Rodrigues 1888) and other references, it can be deduced that Barbosa Rodrigues archived the specimens of the described palm species in the Museu Botânico do Amazonas herbarium.

Barbosa Rodrigues (1875) collected material of *Astrocaryum acanthopodium* Barbosa Rodrigues (1875: 20), *Astrocaryum farinosum* Barbosa Rodrigues (1875: 21), *Astrocaryum princeps* Barbosa Rodrigues (1875: 22), and *Astrocaryum caudescens* Barbosa Rodrigues (1875: 22) during his first expedition in the Amazon rainforest. This took place between 1872 and 1875 in the Amazon River valley, which predated the foundation of the Museu Botânico do Amazonas in 1883. Porto (1892) pointed out that Barbosa Rodrigues incorporated his personal and private botanical collections from this expedition into the museum's collection after its creation. Some specimens from his first trip to the Amazon are also deposited in the Jardim Botânico do Rio de Janeiro herbarium (RB) (Koch *et al*. 2016). Nevertheless, during the present study, we did not find Arecaceae specimens (including those of *Astrocaryum*) collected by Barbosa Rodrigues in RB.

In "Palmae Amazonensis Novae" (1888, and the second edition from 1891), Barbosa Rodrigues described *Astrocaryum yauaperyense* Barbosa Rodrigues (1888: 48), *Astrocaryum sociale* Barbosa Rodrigues (1888: 48), *Astrocaryum horridum* Barbosa Rodrigues (1891a: 104), *Astrocaryum manaoense* Barbosa Rodrigues (1891a: 105), and five varieties of *Astrocaryum princeps*. He cited specimens for the taxa except for the varieties of *A*. *princeps*. Furthermore, he explicitly indicated that he deposited the material in the Museu Botânico do Amazonas collection ("Herb. Mus. Bot. Amaz."). However, researchers have assumed that when the Museu Botânico do Amazonas closed in 1890 the sets of specimens collected and indicated by Barbosa Rodrigues were lost (Prance 1971, Mori & Ferreira 1987). Numerous political, budgetary, and structural problems resulted in the museum closing (Lopes 2022).

Lopes (2022) cited the Museu Botânico do Amazonas as a classic example of what literature has called a "lost museum". Despite the efforts of numerous specialists to locate them (Prance 1971, Rodrigues 2012, Lopes & Sá 2016, Lopes 2022), the botanical collection, which had almost 10,000 specimens (Barbosa Rodrigues 1892), as well as the ethnographic collection, are not known to be in any institution in Brazil or abroad now.

Officially, the objects of the closed museum became the responsibility of the Secretary of Public Education of Amazonas (Secretaria de Educação Pública do Amazonas) (Lopes & Sá 2016). However, they were probably lost or destroyed over time due to a lack of interest (Rodrigues 2012, Lopes & Sá 2016). In 1897, the collections that would have belonged to the museum were practically non-existent. The old museum building had been transformed into housing for soldiers during revolutionary movements at the beginning of the Republic in 1891–1892. Consequently, the collections were relocated and abandoned within the Liceu Amazonense (Lopes 2022). A part of the museum's library survived in the library of the Liceu Amazonense (current Colégio Amazonense D. Pedro II). Years later, the government transferred the library collection to the Instituto Nacional de Pesquisas da Amazônia, which was founded in 1954. In 1980, the researcher William Rodrigues discovered a single specimen of *Tynanthus igneus* Barbosa Rodrigues (1891b: 50) that was described and collected by Barbosa Rodrigues. The specimen was inside a volume of the journal *Adansonia* and is currently archived in the INPA herbarium as a valuable treasure (Mori & Ferreira 1987, Melo 2004, Leong 2010, Rodrigues 2012).

In his book *Palmae mattogrossenses* (Barbosa Rodrigues 1898), published during his tenure at the Jardim Botânico do Rio de Janeiro, Barbosa Rodrigues indicated specimens in almost all the new descriptions. Furthermore, unlike in his previous works (Barbosa Rodrigues 1875, 1888), he prepared and included illustrations of all treated species. The examined specimen information is only missing for *Astrocaryum leiospatha* var. *subulosum* Barbosa Rodrigues (1898: 59). Explicitly, Barbosa Rodrigues indicated specimens for *Astrocaryum echinatum* Barbosa Rodrigues (1898: 51), *Astrocaryum arenarium* Barbosa Rodrigues (1898: 53), and *Astrocaryum leiospatha* Barbosa Rodrigues (1898: 56). He collected all the cited material during an expedition in the old province of Mato Grosso in 1897. Unfortunately, he did not cite an herbarium for these specimens.

Presumably, these specimens were incorporated into RB. However, we did not find any of these samples while consulting the institution's online platform and the collection in person in 2022. As mentioned in other studies of different taxonomic groups, an alternative and widely accepted possibility is that, as a security measure, Barbosa Rodrigues kept the collection in the basement of his residence, which was on Rua Haddock Lobo in the city of Rio de Janeiro (Rodrigues 2012). As Stauffer *et al*. (2016) pointed out, for reasons still unknown, Barbosa Rodrigues preferred to keep the samples he accumulated in his private collection rather than depositing them in Brazilian or foreign herbaria.

Given this, it is worth asking the following questions: Would Barbosa Rodrigues have adopted such a strategy due to fear that the material would have the same destiny as that in the Museu Botânico do Amazonas collection? Was it a strategy to prevent other researchers from analyzing the specimens and publishing about them before him? See the context of his conflicting history with the British researcher James William Helenus Trail (Sá 2001, Stauffer *et al*. 2016). The Brazilian published a series of protests that alleged James Trail stole his new taxa after they collected together for a few weeks in the Amazon (Barbosa Rodrigues 1879, 1882, Sá 2001). However, as highlighted by Stauffer *et al*. (2016), in the absence of more evidence, it is impossible to determine precisely the motivation that led him not to deposit his private collection in a public institution.

What stands out is the unfortunate loss of Barbosa Rodrigues' collection (Batista *et al*. 2011). Stafleu & Cowan (1976) initially mentioned that the collection was lost in a fire. However, new evidence indicates that the samples were destroyed during a flood (Stauffer *et al*. 2016). According to Buzatto *et al*. (2011), the American orchidologist Oakes Ames obtained this information during a visit to the residence of Dona Constança Pacca in 1915. Dona Constança was Barbosa Rodrigues' companion and widow. During this visit, Ames learned that a large part of the collection had been destroyed in the basement of Barbosa Rodrigues' house during a "terrible tropical flood" in the city.

In later studies, Barbosa Rodrigues described only three new species of *Astrocaryum*. *Astrocaryum giganteum* Barbosa Rodrigues (1902: 82), which the author discovered in 1872 in Santarém (Pará state), was published in 1902 (Barbosa Rodrigues 1902). In the protologue of this species, Barbosa Rodrigues did not cite a type specimen or the material examined; he only provided an illustration with the characteristics of the palm. The other two species were *Astrocaryum kewense* Barbosa Rodrigues (1903b: 70) and *Astrocaryum burity* Barbosa Rodrigues (1903b: 73), which were published in his work and general synthesis of his studies called *Sertum Palmarum Brasiliensium* (Barbosa Rodrigues 1903b). Like *A. giganteum*, Barbosa Rodrigues did not cite a type specimen or the material examined in the protologue of *A. burity*. He only provided a watercolor illustration in the publication. For *A. kewense*, he indicated only one specimen of a gathering of Auguste Glaziou (n. 22279) deposited in the Kew Herbarium (K). Among all the *Astrocaryum* species described by Barbosa Rodrigues, this species is the only one that has a material collected by another naturalist. During our searches, we also found duplicate specimens of the gathering in the MO and P herbarium.

As noted, Barbosa Rodrigues had a meaningful career and contributed to discovering many new species, including some *Astrocaryum*. However, the loss of the original specimens that all these names are based on, and the lack of indicating a type, compromises and leaves many of these taxa without established identities (Batista *et al*. 2011).

Although we conducted a thorough historical review and searched for his specimens in the possible herbaria, we did not find original specimens of species described by Barbosa Rodrigues. This was also found for other groups studied by Barbosa Rodrigues (Buzatto *et al*. 2011, 2013).

Given this, what would be the best way to deal with the species described by Barbosa Rodrigues that have no traceable specimens? Following Turland *et al*. (2018), specialists have proposed designating the original illustrations in the Barbosa Rodrigues protologues as lectotypes and paintings in subsequent works by the author as neotypes (Prance 1971, Castro & Singer 2018). This would provide a reference point for future taxonomic studies and allow these species names to be based on reliable and verifiable evidence.

Barbosa Rodrigues was an accomplished botanical illustrator who prepared illustrations of practically all the species he described (Ormindo 2012). Consequently, recent and similar typification works of the species described and illustrated by him were made for different genera of Orchidaceae (Menine Neto & Docha Neto 2009, Smitd & Borba 2009, Meneguzzo *et al*. 2010, Batista *et al*. 2011, Buzzatto *et al*. 2011, 2013, Koch *et al*. 2016, Castro & Singer 2018), Aristolochiaceae (Brito 2013, Freitas *et al*. 2016), Burmaniaceae (Brito 2013), and Passifloraceae (Feuillet 2010). A study of Arecaceae (Stauffer *et al*. 2016) based on a review of the work *Palmae novae Paraguayenses*, published by Barbosa Rodrigues (1899), was also conducted.

For these reasons, and mainly due to not finding the specimens reported by Barbosa Rodrigues, we confirmed the typifications of the illustrations previously made by Wessels Boer (1965) and Glassman (1972). However, here we rename Glassman's and Wessels Boer's types following the norms recommended by Turland *et al*. (2018), specially the Art. 9.10.

In total, we formalized six lectotypes (Art. 9.3) for the *Astrocaryum* binomials based on illustrations in the protologues of the original material by Barbosa Rodrigues. In addition, we confirmed twelve neotypes (Art. 9.8) when the illustrations were in works published by the author after the initial publication of the protologues. Additional details about our review of the nomenclatural types of *Astrocaryum* from the works of Barbosa Rodrigues are below.

Types of the names published by Barbosa Rodrigues (1875)—*Enumeratio palmarum novarum quas valle fluminis Amazonum inventas et ad sertum palmarum*.

1. *Astrocaryum acanthopodium* Barbosa Rodrigues (1875: 20). Type:—BRAZIL. [Pará state]: in altis montibus ad fluvium Trombetas, s.d., *Barbosa Rodrigues* ("Barb. Rod. hb. Palm. n. 350"—probably destroyed). Neotype [designated by Wessels Boer (1965: 135) as "lectotype", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 76B).

= ***Astrocaryum paramaca*** Martius (1844: 88).

Notes:—Barbosa Rodrigues (1875) described *Astrocaryum acanthopodium* from a specimen he collected on the Trombetas River, in Pará State, Brazil. Based on substantial historical data, the specimen was deposited in the Museu Botânico do Amazonas herbarium but later destroyed after the museum closed (Porto 1892, Prance 1971, Mori & Ferreira 1987). Isotypes of the material were not found, and the protologue does not cite any other original material. However, a few years after the species was published, Barbosa Rodrigues (1903b) published an illustration of the taxon (Fig. 1), which was initially designated as "lectotype" by Wessels Boer (1965). Here, we recognize this illustration as a neotype, in accordance with Art. 9.8 and 9.10 of Turland *et al*. (2018). Currently, the species is considered a synonym of *Astrocaryum paramaca,* according to Kahn & Millan (1992), Henderson *et al*. (1995), and POWO (2024).

2. ***Astrocaryum farinosum*** Barbosa Rodrigues (1875: 21). Type:—BRAZIL. s.l., s.d., *Barbosa Rodrigues* ("Barb. Rod. hb. Palm. n. 338"—probably destroyed). Neotype [designated by Wessels Boer (1965: 132) as "lectotype", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 78).

Notes:—Barbosa Rodrigues (1875) described *Astrocaryum farinosum* from a specimen he collected and deposited in his collection "Barb. Rod. hb. Palm. n. 338". Based on the literature, his collections from this period were deposited in the herbarium at the Museu Botânico do Amazonas and were subsequently destroyed after the museum closed (Porto 1892, Prance 1971, Mori & Ferreira 1987). Isotypes of the material were not found, and the protologue does not cite other original material. However, a few years after the species was published, Barbosa Rodrigues (1903b) included an illustration of the taxon in his magnum opus *Sertum Palmarum Brasiliensium* (Fig. 2), which was later designated as the "lectotype" by Wessels Boer (1965). This is erroneous designation that is corrected here to neotype under Art. 9.8 and 9.10. Currently, the species is considered valid according to Kahn & Millan (1992), Kahn (2008), and POWO (2024).

3. *Astrocaryum princeps* Barbosa Rodrigues (1875: 22). Type:—BRAZIL. s.l., s.d., *Barbosa Rodrigues* ("Barb. Rod. hb. Palm. n. 219"—probably destroyed). Neotype [designated by Wessels Boer (1965: 126) as "lectotype", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 73).

= ***Astrocaryum tucuma*** Martius (1824: 77).

Notes:—*Astrocaryum princeps*, included as a synonym of *Astrocaryum tucuma* by Kahn & Millan (1992), Henderson *et al*. (1995) and Kahn (2008), was described by Barbosa Rodrigues (1875) based on a specimen he collected and deposited in his collection "Barb. Rod. hb. Palm." The specimen was deposited in the Museu Botânico do Amazonas herbarium and likely destroyed after the museum closed (Porto 1892, Prance 1971, Mori & Ferreira 1987). Isotypes of the material were not found, and the protologue does not cite any other original material. However, a few years after the species was published, Barbosa Rodrigues (1903b) included an illustration of the taxon (Fig. 3), which was later designated as the "lectotype" by Wessels Boer (1965). Here, we recognize this illustration as a neotype (see Art. 9.8 and 9.10).

FIGURE 1. Neotype of *Astrocaryum acanthopodium* (Section B). [Barbosa Rodrigues 1903b: Tab. 76].

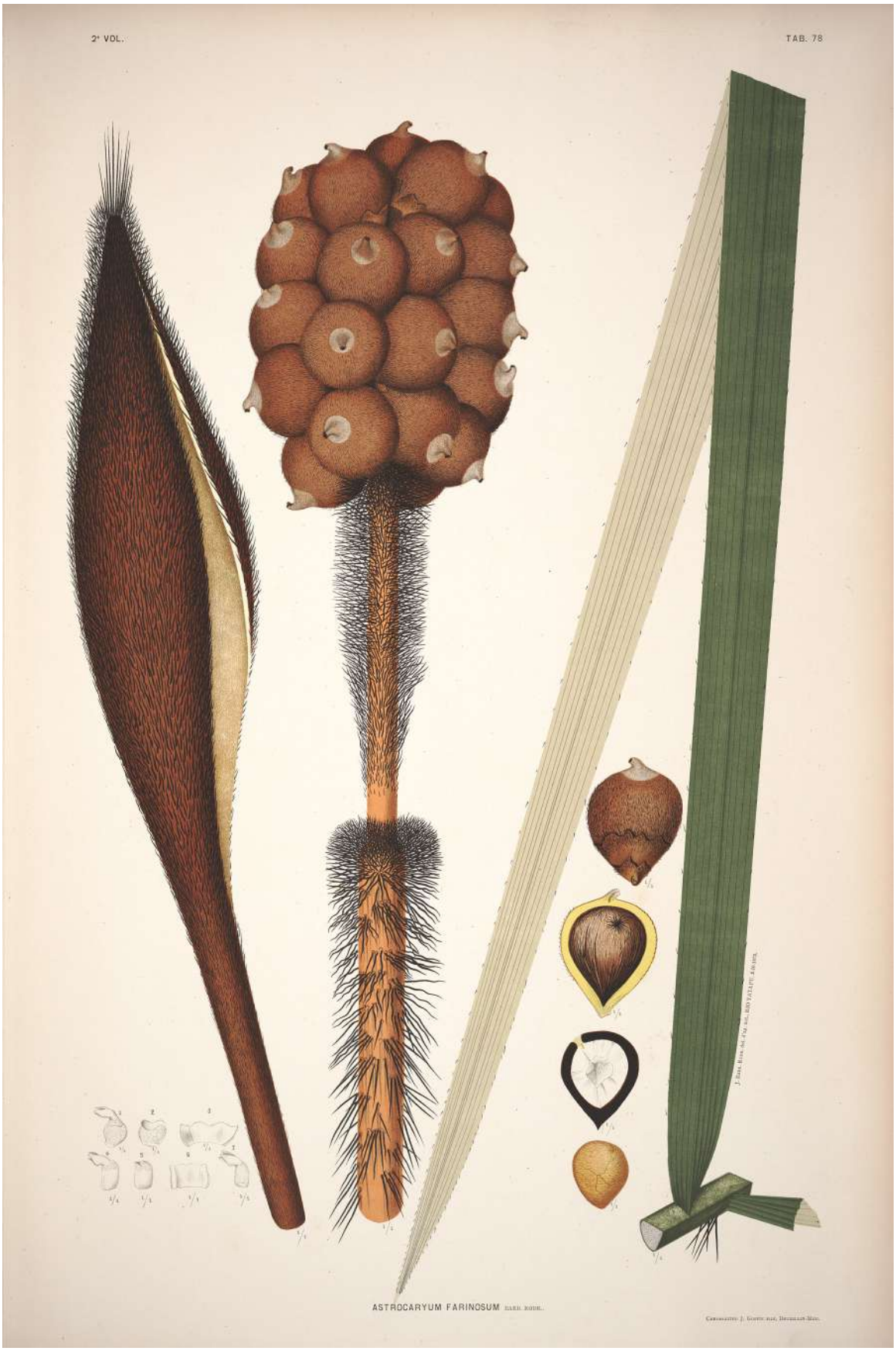

FIGURE 2. Neotype of *Astrocaryum farinosum.* [Barbosa Rodrigues 1903b: Tab. 78].

FIGURE 3. Neotype of *Astrocaryum princeps.* [Barbosa Rodrigues 1903b: Tab. 73].

FIGURE 4. Neotype of *Astrocaryum caudescens.* [Barbosa Rodrigues 1903b: Tab. 66].

FIGURE 5. Neotype of *Astrocaryum caudescens* (Section A). [Barbosa Rodrigues 1903b: Tab. 67].

4. *Astrocaryum caudescens* Barbosa Rodrigues (1875: 22). Type:—BRAZIL. [Pará state]: in regione sita ad cataractas fluvii Trombetas, s.d., *Barbosa Rodrigues* ("Barb. Rod. hb. Palm. n. 225"—probably destroyed). Neotype [designated by Glassman (1972: 14) as "type", here corrected]:—Illustrations in Barbosa Rodrigues (1903b: Tab. 66B and 67A).

= *Astrocaryum tucuma.*

Notes:—*Astrocaryum caudescens* is among the many synonyms of *Astrocaryum tucuma* (Kahn & Millan 1992, Henderson *et al*. 1995, POWO 2024). In the protologue, Barbosa Rodrigues (1875) cited a specimem deposited in his collection "Barb. Rod. hb. Palm.". The literature also indicates that the "Barb. Rod. hb. Palm." collection from that time was deposited in the Museu Botânico do Amazonas herbarium (Porto 1892, Prance 1971, Mori & Ferreira 1987). In our search for original material, we found no palm specimen of the taxon collected by Barbosa Rodrigues. Considering the lack of other original material found during our search, we recommend retaining the typification made by Glassman (1972) of the illustration in Barbosa Rodrigues' subsequent publication (Figs. 4 and 5) called "*Sertum Palmarum*" (Barbosa Rodrigues 1903b). We now recognize the illustration as a neotype.

Types of the names published by Barbosa Rodrigues (1888, 1891a)—"Palmae Amazonensis novae".

5. *Astrocaryum yauaperyense* Barbosa Rodrigues (1888: 48). Type:—BRAZIL. Prov. Amazonas [Amazonas state]: flum. Yaupery [Jauaperi] ad Rio Negro, s.d., *Barbosa Rodrigues* ("Herb. Mus. Bot. Amaz. n. 141"—probably destroyed). Neotype [designated by Glassman (1972: 21) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 80A).

= *Astrocaryum murumuru* Martius (1824: 70).

Notes:—*Astrocaryum yauaperyense* is a synonym of *Astrocaryum murumuru* according to Kahn & Millán (1992) and POWO (2024). In the protologue of *A. yauaperyense*, Barbosa Rodrigues (1888) only mentioned a single specimen collected from "Rio Jauaperi to Rio Negro" in the Amazonas province and deposited in the Museu Botânico do Amazonas herbarium (Porto 1892, Prance 1971, Mori & Ferreira 1987). Glassman (1972) designated the illustration (Fig. 6) of the species featured in Barbosa Rodrigues' renowned work *Sertum Palmarum Brasiliensium* from 1903 as the "type" (Barbosa Rodrigues 1903b). Considering the absence of any other original material found during our search, we confirm Glassman's designation of the illustration as a neotype.

6. ***Astrocaryum sociale*** Barbosa Rodrigues (1888: 48). Type:—BRAZIL. Prov. Amazonas [Amazonas state]: Igarapé Tarumá-mirí [Tarumá-mirim] in Rio Negro, s.d., *Barbosa Rodrigues* ("Herb. Mus. Bot. Amaz. n. 567"—probably destroyed). Neotype [designated by Wessels Boer (1965: 132) as "lectotype", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 79A).

Notes:—Barbosa Rodrigues (1888) described *Astrocaryum sociale* based on a specimen collected in the Amazonian region of Brazil ("Herb. Mus. Bot. Amaz. n. 567"). The type specimen was obtained from Igarapé Tarumá-Mirim, near the city of Manaus, by the Rio Negro, and was also deposited in the herbarium at the Museu Botânico do Amazonas (Porto 1892, Prance 1971, Mori & Ferreira 1987). Wessels Boer (1965) designated an illustration (Fig. 7) published decades later by Barbosa Rodrigues (1903b) as the lectotype of this species due to the absence of the specimen. Our extensive investigations failed to locate any other original material of this taxon. For this reason, following the Code of Nomenclature for algae, fungi, and plants (Turland *et al*. 2018), we uphold Wessels Boer's designation of Barbosa Rodrigues' illustration as the neotype, correcting the use of the term lectotype according to Art. 9.10.

7. *Astrocaryum princeps* var. *aurantiacum* Barbosa Rodrigues (1888: 49). Type:—not designated and no specimens cited. Neotype [designated by Glassman (1972: 19) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 79B).

= *Astrocaryum tucuma*.

Notes:—All four varieties of *Astrocaryum princeps* (var. *aurantiacum*, var. *flavum*, var. *sulphureum*, and var. *vitellinum*) described by Barbosa Rodrigues are synonyms of *Astrocaryum tucuma* (Kahn & Millán 1992, POWO 2024). In the

case of *Astrocaryum princeps* var. *aurantiacum*, Barbosa Rodrigues (1888) did not designate a type, and no other original material is cited in the protologue. Glassman (1972) designated an illustration (Fig. 7) published decades later by Barbosa Rodrigues (1903b) as the type for this variety. Given that we did not find other original material of this taxon, it is essential to confirm Glassman's designation of the Barbosa Rodrigues illustration as the neotype, following the Code of Nomenclature for algae, fungi, and plants (Turland *et al*. 2018).

FIGURE 6. Neotype of *Astrocaryum yauaperyense* (Section A). Neotype of *Astrocaryum princeps* var. *sulphureum* (Section B). Neotype of *Astrocaryum princeps* var. *flavum* (Section C). [Barbosa Rodrigues 1903b: Tab. 80].

8. *Astrocaryum princeps* var. *flavum* Barbosa Rodrigues (1888: 50). Type:—not designated and no specimens cited. Neotype [designated by Glassman (1972: 19) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 80C).

= *Astrocaryum tucuma*.

Notes:—Barbosa Rodrigues (1888) did not designate any type and did not cite any other original material in the protologue of *Astrocaryum princeps* var. *flavum*. However, the naturalist included an illustration of this taxon (Fig. 6) in his work *Sertum Palmarum Brasiliensium* (Barbosa Rodrigues 1903) some years after the original publication. Glassman (1972) designated this illustration as the "type" for the variety. Here, we recognize this illustration as a neotype.

9. *Astrocaryum princeps* var. *sulphureum* Barbosa Rodrigues (1888: 50). Type:—not designated and no specimens cited. Neotype [designated by Glassman (1972: 20) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 80B).

= *Astrocaryum tucuma*.

Notes:—In his original publication of *Astrocaryum princeps* var. *sulphureum*, Barbosa Rodrigues (1888) did not designate a type or cite any other original material. However, in a later work, Barbosa Rodrigues (1903b) included an illustration of this variety (Fig. 6), which was designated as the "type" by Glassman (1972). We recognize this illustration as a neotype following the guidelines outlined by Turland *et al*. (2018).

10. *Astrocaryum princeps* var. *vitellinum* Barbosa Rodrigues (1888: 50). Type:—not designated and no specimens cited. Neotype [designated by Glassman (1972: 20) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 79C).

= *Astrocaryum tucuma.*

Notes:—Barbosa Rodrigues (1888) did not designate a type or provide any other original material in the *Astrocaryum princeps* var. *vitellinum* protologue. In this case, Glassman (1972) typified the illustration (Fig. 7) of this variety in Barbosa Rodrigues (1903b). Here, we acknowledge this illustration as a neotype.

11. *Astrocaryum horridum* Barbosa Rodrigues (1891a: 104). Type:—BRAZIL. Rio Javary [Javari], s.d., *Barbosa Rodrigues* ("Herb. Mus. Bot. Amaz. n. 720"—probably destroyed). Neotype [designated by Glassman (1972: 17) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 81A).

= *Astrocaryum javarense* (Trail 1877: 77) Drude (1881: 372).

Notes:—Kahn & Millan (1992), Henderson *et al*. (1995), and POWO (2024) list *Astrocaryum horridum* as a synonym of *Astrocaryum javarense*. In the protologue, Barbosa Rodrigues (1888) mentioned a single specimen collected on "Rio Javari" and deposited in the Museu Botânico do Amazonas herbarium. To address that this material was lost (Porto 1892, Prance 1971, Mori & Ferreira 1987), Glassman (1972) designated the illustration (Fig. 8) in Barbosa Rodrigues' renowned work *Sertum Palmarum Brasiliensium* from 1903 as the "type" (Barbosa Rodrigues 1903b). Considering no other original material was discovered during our thorough investigation, we recognize Glassman's designation of the illustration as a neotype.

12. *Astrocaryum manaoense* Barbosa Rodrigues (1891a: 105). Type:—BRAZIL. Prov. Amazonas [Amazonas state]: in Manáos [Manaus] ad Rio Negro, s.d., *Barbosa Rodrigues* ("Herb. Mus. Bot. Amaz. n. 701"—probably destroyed). Neotype [designated by Glassman (1972: 18) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1903b: Tab. 71A).

FIGURE 7. Neotype of *Astrocaryum sociale* (Section A). Neotype of *Astrocaryum princeps* var. *aurantiacum* (Section B). Neotype of *Astrocaryum princeps* var. *vitellinum* (Section C). [Barbosa Rodrigues 1903b: Tab. 79].

FIGURE 8. Neotype of *Astrocaryum horridum* (Section A). [Barbosa Rodrigues 1903b: Tab. 81].

= ***Astrocaryum tucuma***.

Notes:—*Astrocaryum manaoense* was treated as a synonym of *Astrocaryum tucuma* by Kahn & Millan (1992), Henderson *et al*. (1995), and POWO (2024). In the protologue, Barbosa Rodrigues (1888) mentioned a single specimen that was collected in the city of Manaus and deposited in the Museu Botânico do Amazonas herbarium (Porto 1892, Prance 1971, Mori & Ferreira 1987). However, the original specimen that served as the basis of the description is believed to have been lost after the herbarium closed at the end of the 19th century, as noted by Prance (1971), Mori & Ferreira (1987), Rodrigues (2012), Lopes & Sá (2016), and Lopes (2022). Glassman (1972) designated the illustration (Fig. 9) in Barbosa Rodrigues' renowned work *Sertum Palmarum Brasiliensium* from 1903 as the "type" (Barbosa Rodrigues 1903b). Considering no other original material was found during our search, we confirm Glassman's designation of the illustration as a neotype.

Types of the names published by Barbosa Rodrigues (1898)—*Palmae Mattogrossenses novae vel minus cognitae quas collegit descripsit et iconibus*.

13. ***Astrocaryum echinatum*** Barbosa Rodrigues (1898: 51). Type:—BRAZIL. Prov. Mato Grosso [Mato Grosso state]: Serra da Chapada, s.d., *Barbosa Rodrigues 221* (probably destroyed). Lectotype [designated by Glassman (1972: 16) as "type", here corrected]: Illustration in Barbosa Rodrigues (1898: Tab. XVII).

Notes:—Barbosa Rodrigues (1898) described *Astrocaryum echinatum* based on a specimen he collected (*Barbosa Rodrigues 221*), which was likely deposited in his personal collection at his residence in the city of Rio de Janeiro (Rodrigues 2012). According to Buzatto *et al*. (2011) and Stauffer *et al*. (2016), this collection was destroyed during a bad flood in the city. The only remaining original material consists of an illustration of the species in the protologue (Fig. 10), which was later designated as the "type" by Glassman (1972). Considering no other original material was discovered during our thorough investigation of the herbaria, we recognize Glassman's designation of the illustration as a lectotype, following the Code of Nomenclature for algae, fungi, and plants (Turland *et al*. 2018). Currently, this species is considered valid according to Kahn & Millan (1992), Kahn (2008), and POWO (2024).

14. ***Astrocaryum arenarium*** Barbosa Rodrigues (1898: 53). Type:—BRAZIL. Prov. Mato Grosso [Mato Grosso state]: Serra da Chapada, s.d., *Barbosa Rodrigues 214* (probably destroyed). Lectotype [designated by Glassman (1972: 15) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1898: Tab. XVIII).

Notes:—The taxonomic identity of this species remains uncertain. Despite *A*. *arenarium* being considered valid according to POWO (2024), it is often categorized as dubious or potentially extinct (Lorenzi *et al.* 2010). About the type, as with all other previously reported species, the specimen indicated in the protologue of *Astocaryum arenarium* was probably destroyed. Based on substantial historical information, the material was deposited in the personal collection of Barbosa Rodrigues, which was subsequently lost during a bad flood in the city of Rio de Janeiro (Glassman 1972, Stafleu & Cowan 1976, Batista *et al*. 2011, Buzatto *et al*. 2011, Rodrigues 2012, Stauffer *et al*. 2016). Consequently, the only remaining original material is an illustration (Fig. 11) of the species in the protologue (Barbosa Rodrigues 1898), which Glassman designated as the type. Here, we recognize this illustration as a lectotype, following the guidelines outlined by Turland *et al*. (2018).

15. *Astrocaryum leiospatha* Barbosa Rodrigues (1898: 56). Type:—BRAZIL. Prov. Mato Grosso [Mato Grosso state]: s.l., s.d., *Barbosa Rodrigues 206* (probably destroyed). Lectotype [designated by Glassman (1972: 18) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1898: Tab. XIX, Fig. A).

= ***Astrocaryum huaimi*** Martius (1844: 86).

Notes:—Barbosa Rodrigues (1875) described *Astrocaryum leiospatha* based on a specimen he collected (*Barbosa Rodrigues 206*) in the former province of Mato Grosso. Possibly, the specimen was deposited in Barbosa Rodrigues' collection at his residence in the city of Rio de Janeiro (Rodrigues 2012). There are several mentions in the literature that his personal collection was lost (Glassman 1972, Stafleu & Cowan 1976, Batista *et al*. 2011) due to a major flood that destroyed it in the basement of his house (Buzatto *et al*. 2011, Stauffer *et al*. 2016). Given this, Glassman (1972) designated the illustration (Fig. 12) in the protologue as the type of *A. leiospatha*. Our search found no other

original material except for the illustration mentioned above. For this reason, we endorse Glassman's designation of the Barbosa Rodrigues illustration as the lectotype, following Turland *et al*. (2018). Currently, the species is considered a synonym of *Astrocaryum huaimi* according to Kahn & Millan (1992), Henderson *et al*. (1995), and POWO (2024).

FIGURE 9. Neotype of *Astrocaryum manaoense* (Section A). Lectotype of *Astrocaryum burity* (Section B). [Barbosa Rodrigues 1903b: Tab. 71].

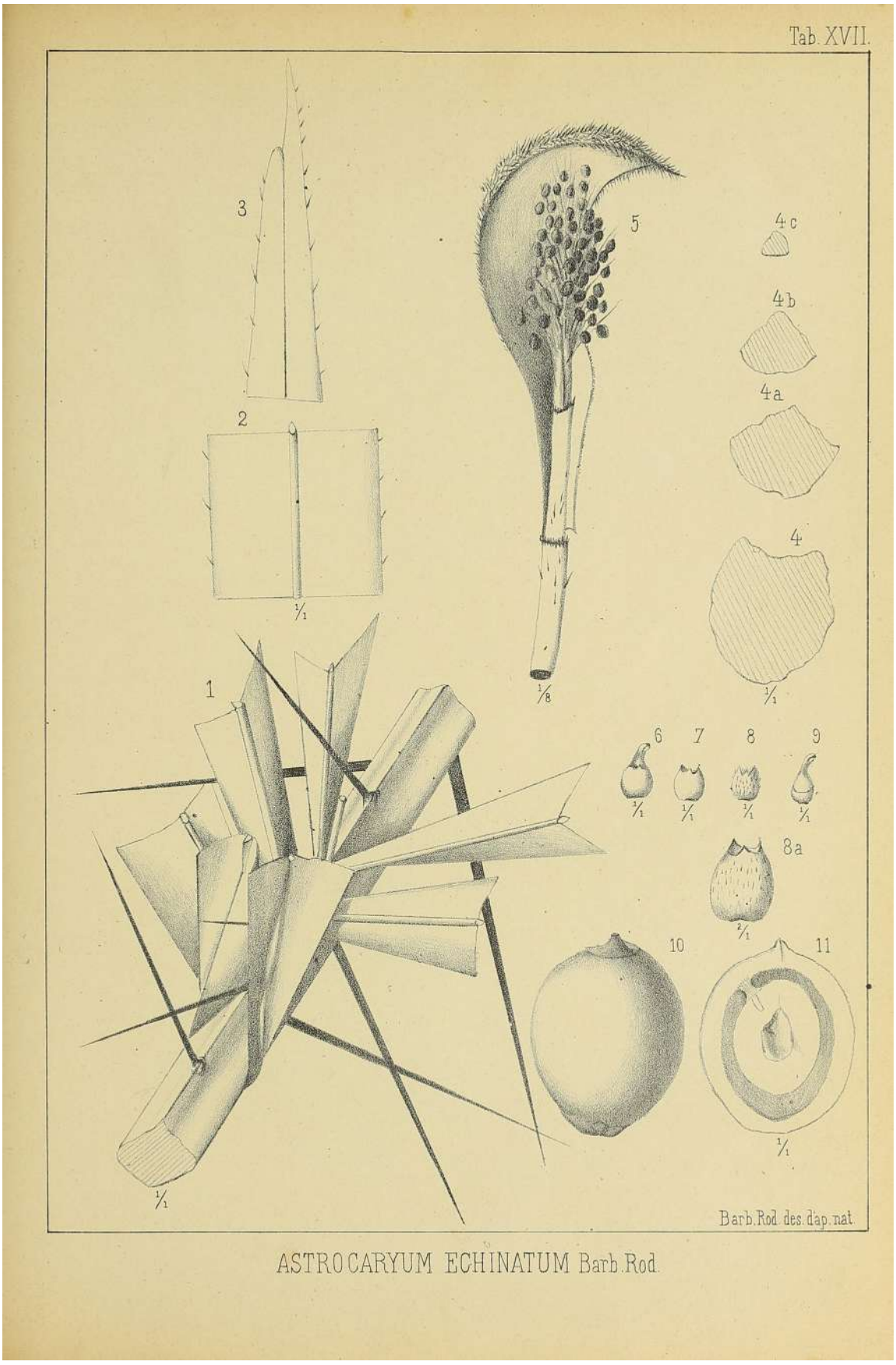

FIGURE 10. Lectotype of *Astrocaryum echinatum*. [Barbosa Rodrigues 1898: Tab. XVII].

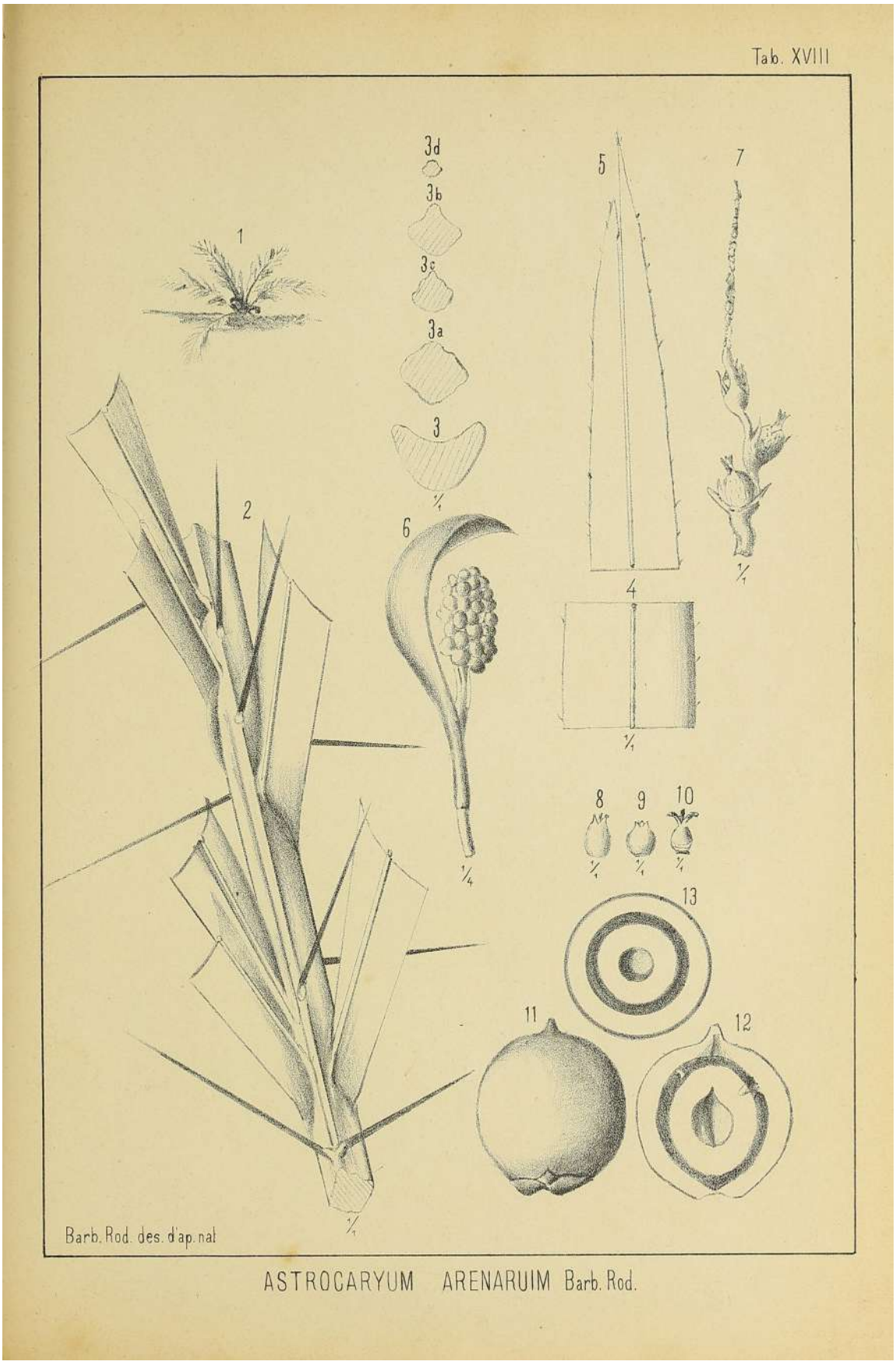

FIGURE 11. Lectotype of *Astrocaryum arenarium*. [Barbosa Rodrigues 1898: Tab. XVIII].

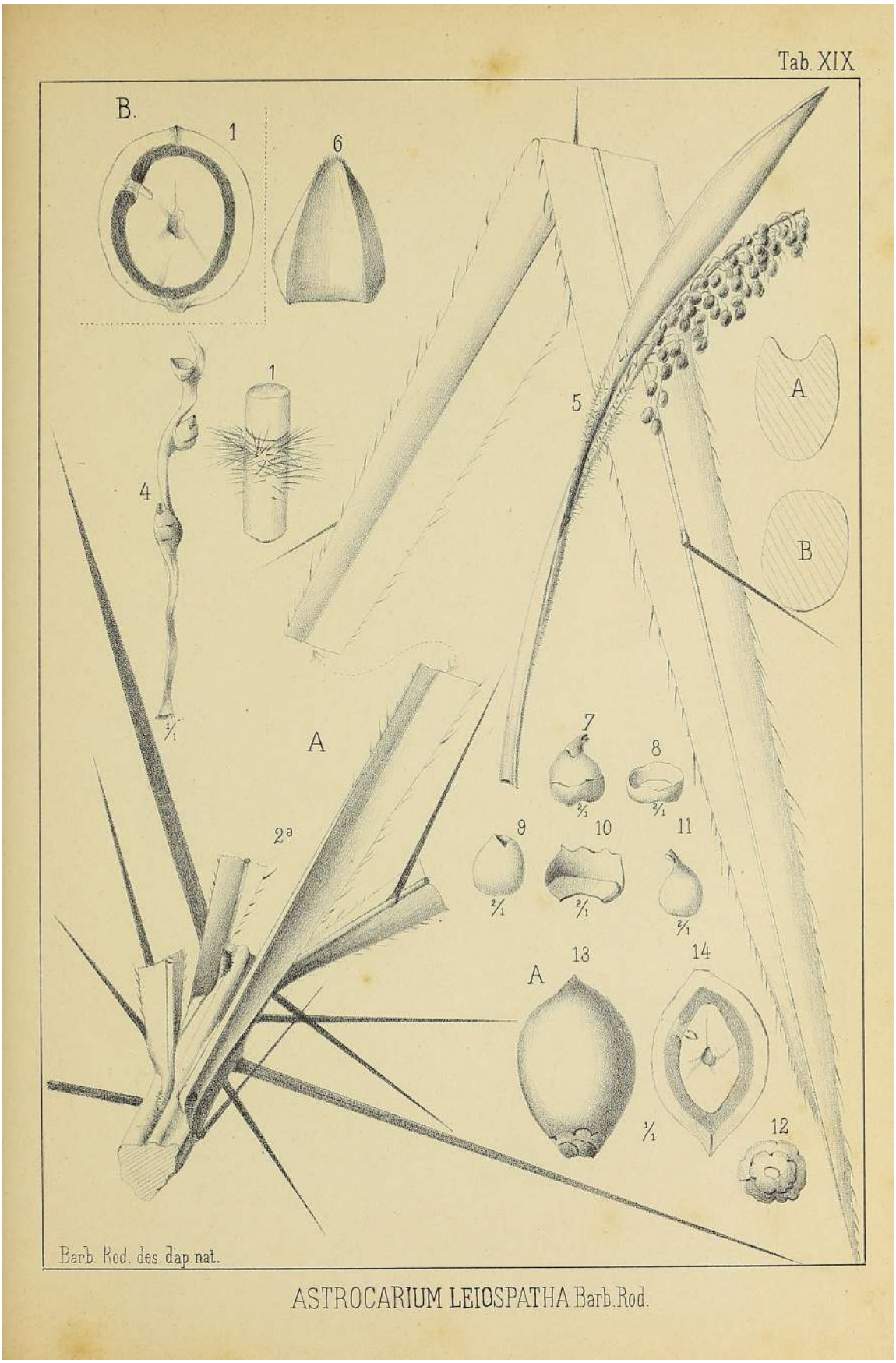

FIGURE 12. Lectotype of *Astrocaryum leiospatha* (Section A). Lectotype of *Astrocaryum leiospatha* var. *subulosum* (Section B). [Barbosa Rodrigues 1898: Tab. XIX].

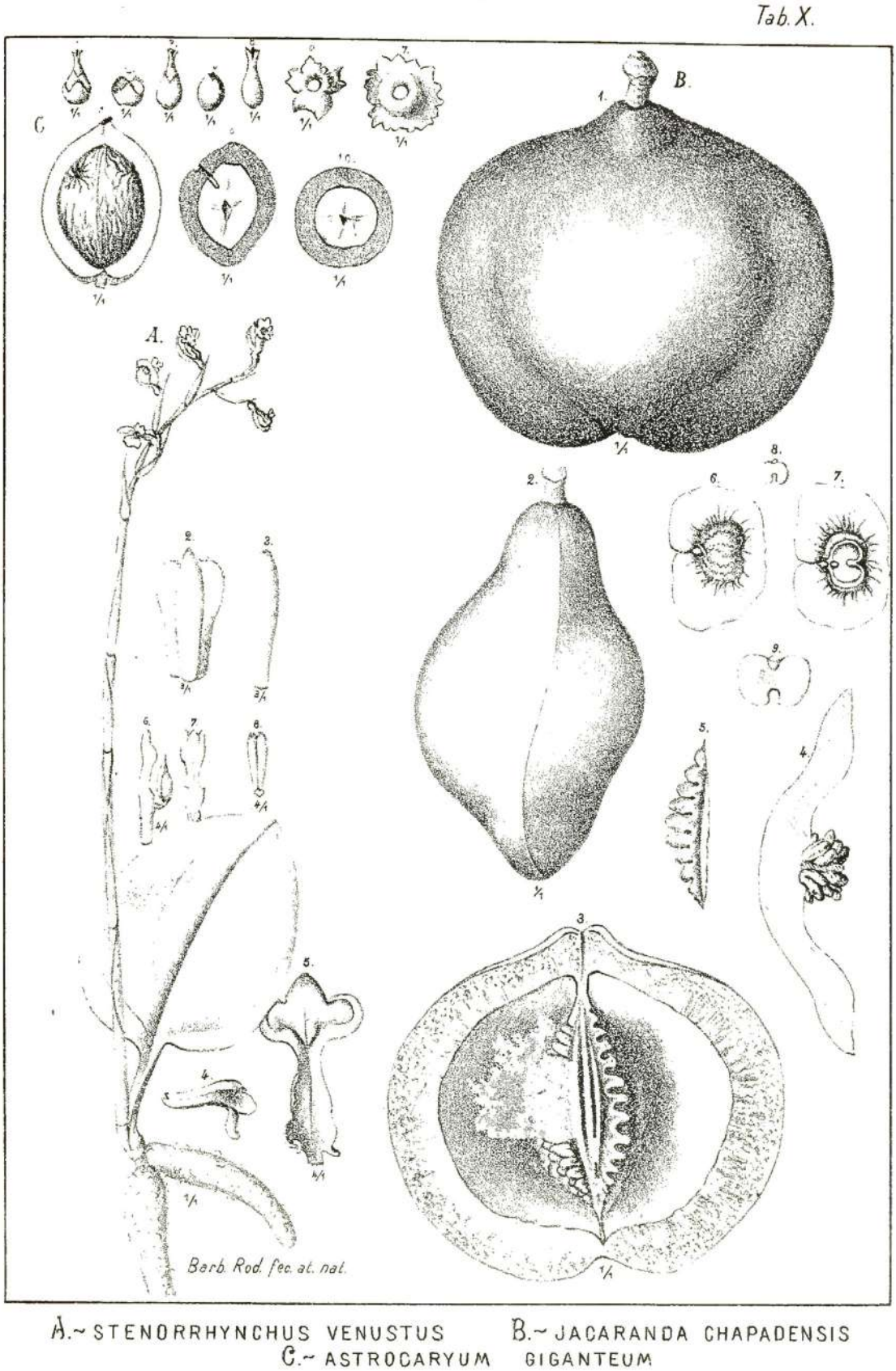

FIGURE 13. Lectotype of *Astrocaryum giganteum* (Section C). [Barbosa Rodrigues 1902: Tab. X].

16. *Astrocaryum leiospatha* var. *subulosum* Barbosa Rodrigues (1898: 59). Type:—not designated and no specimens cited. Lectotype [designated by Glassman (1972: 18) as "type", here corrected]:—Illustration in Barbosa Rodrigues (1898: Tab. XIX, Fig. B).

= *Astrocaryum huaimi*.

Notes:—Similar to *Astrocaryum leiospatha*, this variety has also been determined to be a synonym of *Astrocaryum huaimi* (Kahn & Millán 1992, POWO 2024). In his original *Astrocaryum leiospatha* var. *subulosum* publication, Barbosa Rodrigues (1888) did not designate a type or provide a set of specimens. However, he included an illustration (Fig. 12) of this variety in the protologue, which was later designated as the "type" by Glassman (1972). This illustration is here recognized as a lectotype following the guidelines by Turland *et al*. (2018).

Types of the names published by Barbosa Rodrigues (1902)—"Contributions du Jardin Botanique de Rio de Janeiro par son directeur J. Barbosa Rodrigues—III".

17. ***Astrocaryum giganteum*** Barbosa Rodrigues (1902: 82). Type:—not designated and no specimens cited. Lectotype [designated by Glassman (1972: 20) as "type", here corrected]: Illustration in Barbosa Rodrigues (1902: Tab. X, Fig. C).

Notes:—The protologue of *A. giganteum* (Barbosa Rodrigues 1902) lacks any indication of the type or other specimens. However, an original illustration by Barbosa Rodrigues (Fig. 13) is in the article. This illustration was designated as the "type" by Glasmann (1972). Here, we confirm Glassman's designation of the illustration as a lectotype, following the guidelines outlined by Turland *et al*. (2018). Currently, the species is considered valid according to Kahn (2008), Lorezin *et al.* (2010), POWO (2024), and Vianna (2024).

Types of the names published by Barbosa Rodrigues (1903b)—*Sertum Palmarum Brasiliensium, ou relation des palmiers noveaux du Bresil, découverts, déscrits et dessinés d'après nature—volume II*.

18. *Astrocaryum kewense* Barbosa Rodrigues (1903b: 70). Type:—BRAZIL. Province of Goyas: inter Barreira do Veado & Morro Redondo, 1895/1896, *Glaziou 22279* (holotype K image!, isotypes MO image!, P image!).

Notes:—*Astrocaryum kewense* stands out for being the only *Astrocaryum* species described by Barbosa Rodrigues that still has specimens remaining today. The type materials were collected by Auguste Glaziou (the gathering *Glaziou 22279*), a renowned French researcher, in the former province of Goyaz, while he was studying the location for the new capital of the country for the Brazilian government (Barbosa Rodrigues 1903). Glaziou deposited one specimen of this gathering in the Kew Herbarium (K). This only specimen of the K herbarium was cited by Barbosa Rodrigues in the protologue of *A. kewense* (Barbosa Rodriugues 1903b). Following the guidelines of McNeill (2014), we established this specimen as the holotype of *A. kewense*. In our investigations, we also found isotypes in the Missouri Botanical Garden Herbarium (MO) and Muséum National d'Histoire Naturelle Herbarium (P). The taxonomic identity and validity of this species are currently considered uncertain, according to POWO (2024) and Vianna (2024).

19. *Astrocaryum burity* Barbosa Rodrigues (1903b: 73). Type:—not designated and no specimens cited. Lectotype [designated by Glassman (1972: 15) as "type", here corrected]: Illustration in Barbosa Rodrigues (1903b: Tab. 71B).

Notes:—The taxonomic identity of this species is still uncertain; it falls into the category of names not yet attributed to a known taxon (POWO 2024, Tropicos 2024, Vianna 2024). The protologue of *A. burity* (Barbosa Rodrigues 1903b) consists of a brief diagnostic description but does not indicate the type specimen. However, Barbosa Rodrigues included an original illustration (Fig. 9) in the protologue, which Glassman (1972) designated as the "type" due to the absence of other original material. To adhere to the International Code of Nomenclature (Turland *et al*. 2018), we propose upholding Glassman's designation as the lectotype for this species.

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References

Balick, M.J., Anderson, A.B. & da Silva, M.F. (1982) Palm taxonomy in Brazilian Amazônia: the state of systematic collections in regional herbaria. *Brittonia* 34: 463–477.

Barbosa, M.R.V., Vieira, A.O., Peixoto, A.L., Canhos, D.A.L., Stehmann, J.R., Menezes, M. & Maia, L.C. (2022) Building Networks to Promote Knowledge of Brazil's Biodiversity: The experience of the INCT—Virtual Herbarium. *Biodiversity Information Science and Standards* 6: e91462.
https://doi.org/10.3897/biss.6.91462

Barbosa Rodrigues, J. (1875) *Enumeratio palmarum novarum: quas valle fluminis Amazonum inventas et ad sertum palmarum: collectas, descripsit et iconibus illustravit*. Brown & Evaristo, Sebastianópolis, 43 pp.

Barbosa Rodrigues, J. (1879) *Protesto-appendice ao enumeratio palmarum novarum*. Typographia Nacional, Rio de Janeiro, 49 pp.

Barbosa Rodrigues, J. (1882) *Les Palmiers: observations sur la monographie de cette famille dans la flora Brasiliensis*. Imprimerie du Messager du Brésil, Rio de Janeiro, 53 pp.
https://doi.org/10.5962/bhl.title.159772

Barbosa Rodrigues, J. (1888) Palmae Amazonensis novae. *Vellosia* 1: 33–56.

Barbosa Rodrigues, J. (1891a) Palmae Amazonensis novae—2ª ed. *Vellosia* 1: 91–112.

Barbosa Rodrigues, J. (1891b) Eclogae plantarum novarum—2ª ed. *Vellosia* 1: 1–88.

Barbosa Rodrigues, J. (1892) Descripção do museu. *Vellosia* 2: 81–83.

Barbosa Rodrigues, J. (1898) *Palmae Mattogrossenses: novae vel minus cognitae quas collegit descripsit et iconibus*. Telegraphia Leuzinger, Rio de Janeiro, 88 pp.

Barbosa Rodrigues, J. (1899) *Palmae novae Paraguayenses: quas descripsit et iconibus illustratavit*. Telegraphia Leuzinger, Rio de Janeiro, 66 pp.

Barbosa Rodrigues, J. (1902) Contributions du Jardin Botanique de Rio de Janeiro par son directeur J. Barbosa Rodrigues—III. *Contributions du Jardin botanique de Rio de Janeiro* 1: 59–88.

Barbosa Rodrigues, J. (1903a) *Sertum Palmarum Brasiliensium, ou relation des palmiers noveaux du Bresil, découverts, déscrits et dessinés d'après nature*, vol. 1. Veuve Monnom, Brussels, 140 pp.

Barbosa Rodrigues, J. (1903b) *Sertum Palmarum Brasiliensium, ou relation des palmiers noveaux du Bresil, découverts, déscrits et dessinés d'après nature*, vol. 2. Veuve Monnom, Brussels, 114 pp.

Barros, W.D. (1942) Barbosa Rodrigues—naturalista brasileiro. *Rodriguésia* 6: 3–8.

Batista, J.A.N., Bianchetti, L.B., González-Tamayo, R., Figueroa, X.M.C. & Cribb, P.J. (2011) A synopsis of new world *Habenaria* (Orchidaceae) I. *Harvard Papers in Botany* 16: 1–47.
https://doi.org/10.3100/025.016.0101

Brito, A.T. (2013) Lectotypification of *Aristolochia alpestris* (Aristolochiaceae) and *Monostychosepalum monanthum* (Burmanniaceae): two obscure brazilian species dscribed by João Barbosa Rodrigues (1842–1909). *Harvard Papers in Botany* 18: 237–239.
https://doi.org/10.3100/025.018.0216

Brummit, R.K. (2011) Report of the Nomenclature Committee for Vascular Plants: 62. *Taxon* 60: 226–232.
https://doi.org/10.1002/tax.601024

Buzatto, C.R., Singer, R.B., Romero-González, G.A. & van den Berg, C. (2011) Typifications and New Synonymies in *Capanemia* (Orchidaceae, Oncidiinae). *Novon* 21: 28–33.
https://doi.org/10.3417/2009058

Buzatto, C.R., Singer, R.B., Romero-González, G.A., van den Berg, C. & Salazar, G.A. (2013) Typifications and taxonomic notes in species of Brazilian *Goodyerinae* and *Spiranthinae* (Orchidaceae) described by José Vellozo and Barbosa Rodrigues. *Taxon* 62: 609–621.
https://doi.org/10.12705/623.10

Castro, J.B. & Singer, R.B. (2018) Nomenclature and taxonomy of Brazilian *Gomesa* species (Orchidaceae: Oncidiinae) described by João

Barbosa Rodrigues. *Taxon* 67: 1187–1193.
https://doi.org/10.12705/676.16

Costa, D.L.L., Curty, M.F.N.S. & Barberena, F.F.V.A. (2022) João Barbosa Rodrigues: a compilation of his remarkable trajectory as a scientist and main contributions to orchidology. *Rodriguésia* 73: e00222022.
https://doi.org/10.1590/2175-7860202273098

Dransfield, J., Uhl, N.W., Asmussen, C.B., Baker, W.J., Harley, M.M. & Lewis, C.E. (2008) *Genera Palmarum: the evolution and classification of palms*. Kew Publishing, Royal Botanic Gardens, Kew, 732 pp.

Drude, O. (1881) Palmae. *In*: Martius, C.F.P. von & Eichler, A.W. (Ed.) *Flora Brasiliensis* 3 (2). F. Fleischer, Munich and Leipzig, pp. 251–460.

Feuillet, C. (2010) Folia Taxonomica 19. Typifications in *Dilkea* (Passifloraceae). *Journal of the Botanical Research Institute of Texas* 4: 615–617.

Freitas, J., Alves-Araújo, A. & González, F. (2016) Lectotypifications and new synonyms of *Aristolochia* (Aristolochiaceae) described by the Brazilian botanist João Barbosa Rodrigues. *Anales del Jardín Botánico de Madrid* 73: e0302016.
https://doi.org/10.3989/ajbm.2401

Gasper, A.L., Stehmann, J.R., Roque, N., Bigio, N.C., Sartori, A.L.B. & Grittz, G.S. (2020) Brazilian herbaria: an overview. *Acta Botanica Brasilica* 34: 352–359.
https://doi.org/10.1590/0102-33062019abb0390

Giseke, P.D. (1792) Ardo I. Palmae. *In*: Giseke, P.D. & Fabricii, J.C. (Eds.) *Praelectiones in ordines naturales plantarum*. B.G. Hoffmann, Hamburg, pp. 21–122.

Glassman, S.F. (1972) *A revision of B.E. Dahlgren's index of American palms. Phanerogamarum Monographiæ Tomus VI*. J. Cramer Verlag, Lehre, 294 pp.

Henderson, A. (2011) A revision of *Desmoncus* (Arecaceae). *Phytotaxa* 35: 1–88.
https://doi.org/10.11646/phytotaxa.35.1.1

Henderson, A., Galeano, G. & Bernal, R. (1995) *Field Guide to the Palms of the Americas*. Princeton University Press, New Jersey, 352 pp.

Ihering, H. (1911) João Barbosa Rodrigues. *Revista Museu Paulista* 8: 23–38.

Kahn, F. (2008) The genus *Astrocaryum* (Arecaceae). *Revista Peruana de Biología* 15 (supl. 1): 31–48.
https://doi.org/10.15381/rpb.v15i3.2851

Kahn, F. & Millán, B. (1992) *Astrocaryum* (Palmae) in Amazonia. A preliminary treatment. *Bulletin de l'Institut Français d'Études Andines* 21: 459–531.
https://doi.org/10.3406/bifea.1992.1071

Koch, A.K., Ilkiu-Borges, A.L. & de Barros, F. (2016) Nomenclatural notes on species of *Macradenia* (Orchidaceae) described by João Barbosa Rodrigues. *Taxon* 65: 349–351.
https://doi.org/10.12705/652.12

Kury, L. & Sá, M.R. (2009) Flora brasileira: um percurso histórico. *In:* Martins, A.C. (ed.) *Flora brasileira: história, arte & ciência*. Casa da Palavra, Rio de Janeiro, pp. 18–57.

Lanna, J.M., da Silva, L.A.E., Morim, M.P., Leitman, P.M., Queiroz, N.O., Filardi, F.L.R., Dalcin, E.C., Oliveira, F.A. & Forzza, R.C. (2018) Herbarium collection of the Rio de Janeiro Botanical Garden (RB), Brazil. *Biodiversity Data Journal* 6: e22757.
https://doi.org/10.3897/BDJ.6.e22757

Leong, L. (2010) *João Barbosa Rodrigues e o Museu de Botânica do Amazonas*. Editora Valer, Manaus, 112 pp.

Lopes, M.M. (2022) The circulation of collections: Barbosa Rodrigues' Amazon Botanical Museum. *Rodriguésia* 73: e00182022.
https://doi.org/10.1590/2175-7860202273095

Lopes, M.M. & Sá, M.R. (2016) A museum in the heart of Amazonia: one man's laboratory. *Museum History Journal* 9: 77–92.
https://doi.org/10.1080/19369816.2015.1118259

Lorenzi, H., Noblick, L.R., Kahn, F. & Ferreira, E. (2010) *Flora Brasileira: Arecaceae (Palmeiras)*. Instituto Plantarum, Nova Odessa, 368 pp.

Martius, C.F.P. von (1823–1837) *Historia Naturalis Palmarum 2: Genera et species*. Weigel, Leipzig, 152 pp. [pp. 70–78 published in 1824]

Martius, C.F.P. von (1842–1847) Palmetum orbignianum: Descriptio palmarum in Paraguaria et Bolivia crescentium, secundum Alc. de Orbigny exempla, schedulas et icons digessit. *In*: d'Orbigny, A.D. (Ed.) *Voyage dans l'Amerique meridionale, vol. 7 (3), Palmiers.* Bertrand, Paris, pp. 1–140. [pp. 86–89 published in 1844]

McNeill, J. (2014) Holotype specimens and type citations: General issues. *Taxon* 63: 1112–1113.
https://doi.org/10.12705/635.7

Melo, R., Rebêlo, G. & Rodrigues, W. (2004) Entrevista: William Rodrigues—começamos da estaca zero. *Acta Amazonica* 34.
https://doi.org/10.1590/S0044-59672004000400003

Meneguzzo, T.E.C., Bianchetti, L.B. & Proença, C.E.B. (2010) Typifications of Brazilian names of the genus *Encyclia* (Orchidaceae).

Neodiversity 5: 18−22.

Menini Neto, L. & Docha Neto, A. (2009) Redescoberta e tipificação de *Octomeria leptophylla* Barb.Rodr. (Orchidaceae), micro-orquídea endêmica de Minas Gerais, Brasil. *Rodriguésia* 60: 461–465. https://doi.org/10.1590/2175-7860200960216

Meyer, G.F.W. (1818) *Primitiae Florae Essequeboensis: adjectis descriptionibus centum circiter stirpium novarum, observationibusque criticis*. Sumptibus H. Dieterich, Göttingen, 316 pp.

Mori, S.A. & Ferreira, F.C. (1987) A distinguished Brazilian botanist, João Barbosa Rodrigues (1842–1909). *Brittonia* 39: 73–85. https://doi.org/10.2307/2806978

Ormindo, P. (2012) João Barbosa Rodrigues—cientista ilustrador. *Revista Brasileira de História da Ciência* 5 (suppl.): 51–59.

Peixoto, P., Guedes-Bruni, R.R., Haverroth, M. & Silva, I.M. (2012) Saberes e práticas sobre plantas: a contribuição de Barbosa Rodrigues. *Revista Brasileira de História da Ciência* 5 (suppl.): 22–30.

Pintaud, J.C., Galeno, G., Balslev, H., Bernal, R., Borchsenius, F., Ferreira, E., Granville, J.J., Mejía, K., Millán, B., Moraes, M., Noblick, L., Stauffer, F.W. & Kahn, F. (2008) Las palmeras de América del Sur: diversidad, distribución e historia evolutiva. *Revista Peruana de Biología* 15 (suppl. 1): 7–29. https://doi.org/10.15381/rpb.v15i3.2662

Porto, J.C. (1892) Histórico do Museu Botânico do Amazonas. *Vellosia* 2: 61–80.

POWO (2024) *Plants of the World online*. Facilitated by the Royal Botanic Gardens, Kew. Available from: http://www.plantsoftheworldonline.org/ (accessed 10 April 2024)

Prance, G.T. (1971) An index of plants collectors in Brazilian Amazonia. *Acta Amazonica* 1: 25–65. https://doi.org/10.1590/1809-43921971011025

Rodrigues, W.A. (2012) Barbosa Rodrigues e os estudos botânicos na Amazônia. *Revista Brasileira de História da Ciência* 5 (suppl.): 31–40.

Sá, M.R. (1996) *James William Helenus Trail: a British naturalist in nineteenth-century Amazonia.* Theses. Durham University, Durham, 243 pp.

Sá, M.R. (2001) O botânico e o mecenas: João Barbosa Rodrigues e a ciência no Brasil na segunda metade do século XIX. *História, Ciências, Saúde—Manguinhos* 8: 899–924. https://doi.org/10.1590/S0104-59702001000500006

Sá, M.R. (2022) The construction of a scientific biography: João Barbosa Rodrigues, a 19th-century naturalist. *Rodriguésia* 73: e00362022. https://doi.org/10.1590/2175-7860202273101

Smidt, E.C. & Borba, E.L. (2009) Nomenclatural notes on neotropical *Bulbophyllum* (Orchidaceae). *Rodriguésia* 60: 633–639. https://doi.org/10.1590/2175-7860200960309

Stafleu, F.A. & Cowan, R.S. (1976) *Taxonomic literature: A selective guide to botanical publications and collections with dates, commentaries and types. 2nd Edition—Volume I: A–G*.. Bohn, Scheltema & Holkema, Utrecht, 1136 pp.

Stauffer, F., Ramella, L., Ferreira, E. & Noblick, L. (2016) Lectotipificación de los nombres descritos por J. Barbosa Rodrigues en la obra "Palmae novae Paraguayenses". *Candollea* 71: 105–115. https://doi.org/10.15553/c2016v711a13

Thiers, B. (2024) [continuously updated] *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. Available from: http://sweetgum.nybg.org/ih/ (accessed 28 April 2024)

Trail, J.W.H. (1877) Descriptions of new species and varieties of palms collected in the valley of the Amazon in north Brazil in 1874. *Journal of Botany, British and Foreign* 15: 75–81.

Tropicos (2024) *Tropicos.org*. Missouri Botanical Garden. Available from: http://tropicos.org/ (accessed 8 April 2024)

Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F. (Eds.) (2018) *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017*. Regnum Vegetabile 159. Koeltz Botanical Books, Glashütten. https://doi.org/10.12705/Code.2018

Vianna, P.L., Ilkiu-Borges, A.L. & Sotao, H.M.P. (2015) Herbário João Murça Pires, Pará (MG). *Unisanta BioScience* 4: 77–81.

Vianna, S.A. (2024) *Astrocaryum in* Flora e Funga do Brasil. Jardim Botânico do Rio de Janeiro. Available from: https://floradobrasil.jbrj.gov.br/FB15670 (accessed 8 April 2024)

Wessels Boer, J.G. (1965) *Flora of Suriname. Palmae.* E.J. Brill, Leiden, 172 pp.