

# *Astrocaryum minus*, Rediscovered in French Guiana

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## ABSTRACT

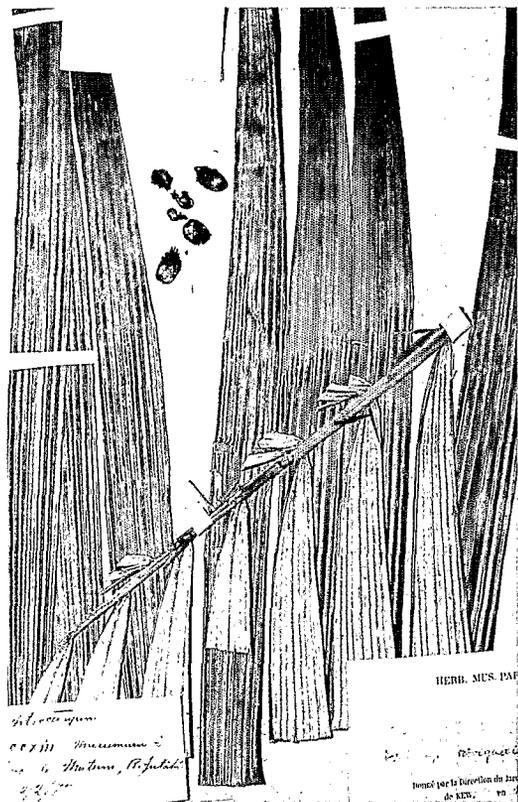
*Astrocaryum minus*, described by Trail (1877), was formerly known from only the type specimen. This taxon was treated as a variety of *A. rodriguesii* Trail by Barbosa Rodrigues (1879, 1903) and as its synonym by Wessels Boer (1965). Kahn and Millán (1992) and Henderson (1995) considered it a synonym of *A. gynacanthum* Martius. *Astrocaryum minus* was collected in French Guiana, near Cayenne, in 1995. Morphological and floral characters of this palm clearly differentiate it from other species within section *Munbaca* and thus support treating it as a distinct species.

Trail (1877:78-79) commented upon the description of *Astrocaryum minus*: "it can hardly be confounded with any species save *Astrocaryum gynacanthum*, or its variety *A. munbaca*. . . . From these it is readily distinguished by its larger size, much longer leaves with more numerous pinnae, and longer spadix. Comparison of examples of the two species shows at once that they are distinct, though it is rather difficult to express the points of difference in a description."

Trail had recognized a new species, but did not clearly differentiate it from other species of the genus. This species, which had not been collected since Trail's journey in Amazonia in 1874, soon fell into synonymy, though Drude (1881: 374) considered it a distinct species and described its variety *terrae-firmae* in *Martius Flora Brasiliensis*. Larger than *A. gynacanthum* Martius and single-stemmed, *A. minus* first became a variety of *A. rodriguesii* Trail (Barbosa Rodrigues 1879, 1903), which is a tall palm up to 20 m in height, and then its synonym (Wessels Boer 1965). The arguments used by these botanists are, however, far from persuasive. Barbosa Rodrigues (1903:76) wrote: "Je considère, dans le

doute, l'*Astrocaryum minus* Trail et sa variété *terrae-firmae* Dr. comme une variété de l'espèce dont je m'occupe [*A. rodriguesii*]", (I consider, in doubt, *Astrocaryum minus* Trail and its variety *terrae-firmae* a variety of the species I am dealing with [*A. rodriguesii*]), but he did not express the botanical reasons which made him doubt species status for *A. minus*. Wessels Boer (1965: 139), based only on vegetative parts of the palm without considering the pistillate flowers, argued that the smaller size of Trail's species was the result of injury by caterpillars "that had gnawed about 1 cm wide holes in the trunk." He concluded: "The differences between *A. minus* and *A. rodriguesii* can be explained satisfactorily by this injury." It is true that such an injury may result in smaller, depauperate leaves and inflorescence, but it cannot change the structure of the flower. If this were possible, most concepts in higher plant systematics and plant evolution would have to be drastically revised.

The type of *A. minus*, deposited in Kew and Paris (*Trail 1071, CCXIII*), includes some pistillate flowers (Fig. 1). These have no pedicel; the calyx is deeply cup-shaped to tubular; and the corolla is oblong-urceolate, not tridentate, and clearly longer than or subequal to the calyx. The pistillate flowers of *A. rodriguesii* are borne on pedicels; the calyx and corolla are clearly tridentate, tubular to cone-shaped; and the corolla is shorter than the calyx. *Astrocaryum minus* is, in fact, closer to *A. gynacanthum*, the pistillate flowers of which are not pedicellate and the corolla of which is slightly longer than or subequal to the calyx. Kahn and Millán (1992) considered *A. minus* a synonym of *A. gynacanthum* (not of *A. rodriguesii*), but they did not reject the



1. Isotype of *Astrocaryum minus* in Paris (P). The holotype is deposited in Kew (K). Photo F. Kahn.

idea that it might be a distinct species. Henderson (1995) maintained *A. minus* as a synonym of *A. gynacanthum*.

### ***Astrocaryum minus* Rediscovered**

In 1995, looking for some palm species in the forest of Mont Grand Matoury (elevation 234 m) near Cayenne, we found *Astrocaryum gynacanthum*, *A. paramaca* Martius, *A. murumuru* Martius, and two individuals of a species not known in the Guianas. The vegetative parts of this palm matched very well Trail's description of *A. minus* (Fig. 2); its pistillate flowers are similar to those of the type specimen, and the corolla is clearly longer than the calyx (Fig. 3). This species can easily be separated from *A. gynacanthum* by its single, much larger in diameter, trunk and its longer leaves. Its inflorescence is much longer. The two species differ in the size of their staminate flowers (Table 1) and in the petals, which are slightly reflexed at the apex in *A. minus*

while those of *A. gynacanthum* are strongly reflexed. They also differ in the size and form of their pistillate flowers (Table 2, Fig. 4). These two species are therefore distinguishable in both vegetative parts and floral features. Consequently, *Astrocaryum minus* Trail must be considered as a distinct species.

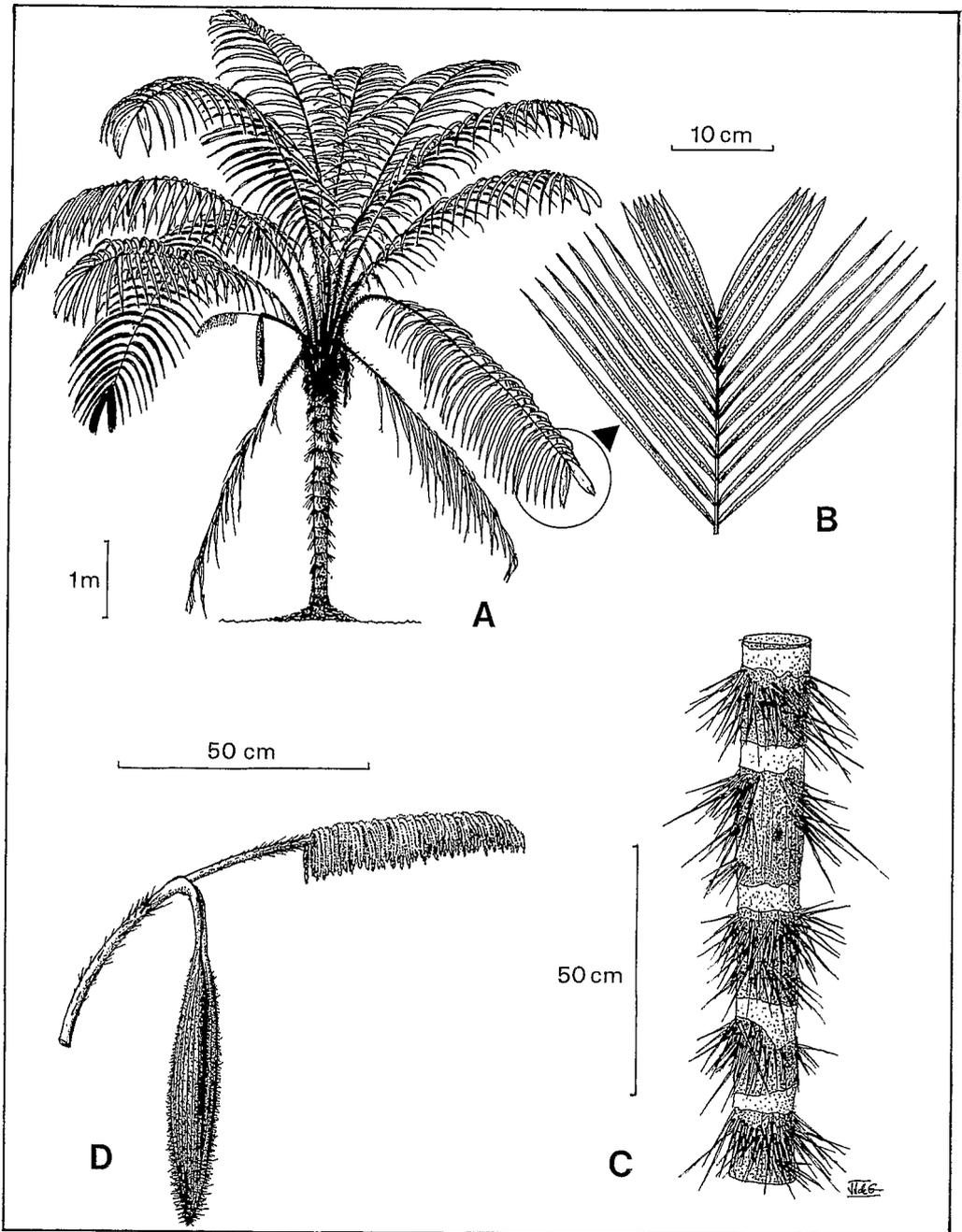
### **Position of *Astrocaryum minus* in the Genus**

Drude (1881) classified *A. minus* and its variety *terrae-firmae* Drude in the section *Ayri*. Barbosa Rodrigues (1903:76) wrote: "M. le professeur Drude la classa dans sa section *Ayri*, dont le faciés et les fruits sont tout à fait différents de ceux de l'*A. gynacanthum*. Il est vrai que l'on ne connaît pas les fruits de l'individu trouvé par M. Trail. Ces fruits seuls pourront faire disparaître le doute." (Professor Drude classified it in his section *Ayri*, the facies and fruits of which are quite different from those of *A. gynacanthum*. It is true that the fruits of the individual found by Mr. Trail are not known. Only the fruits will eliminate the doubt.) The three species, *A. gynacanthum*, *A. paramaca*, and *A. rodriguesii*, are remarkable because of the fruit epicarp, which splits open into several lobes at maturity to display a yellow to orange mesocarp. Burret (1934) classified them in section *Munbaca*.

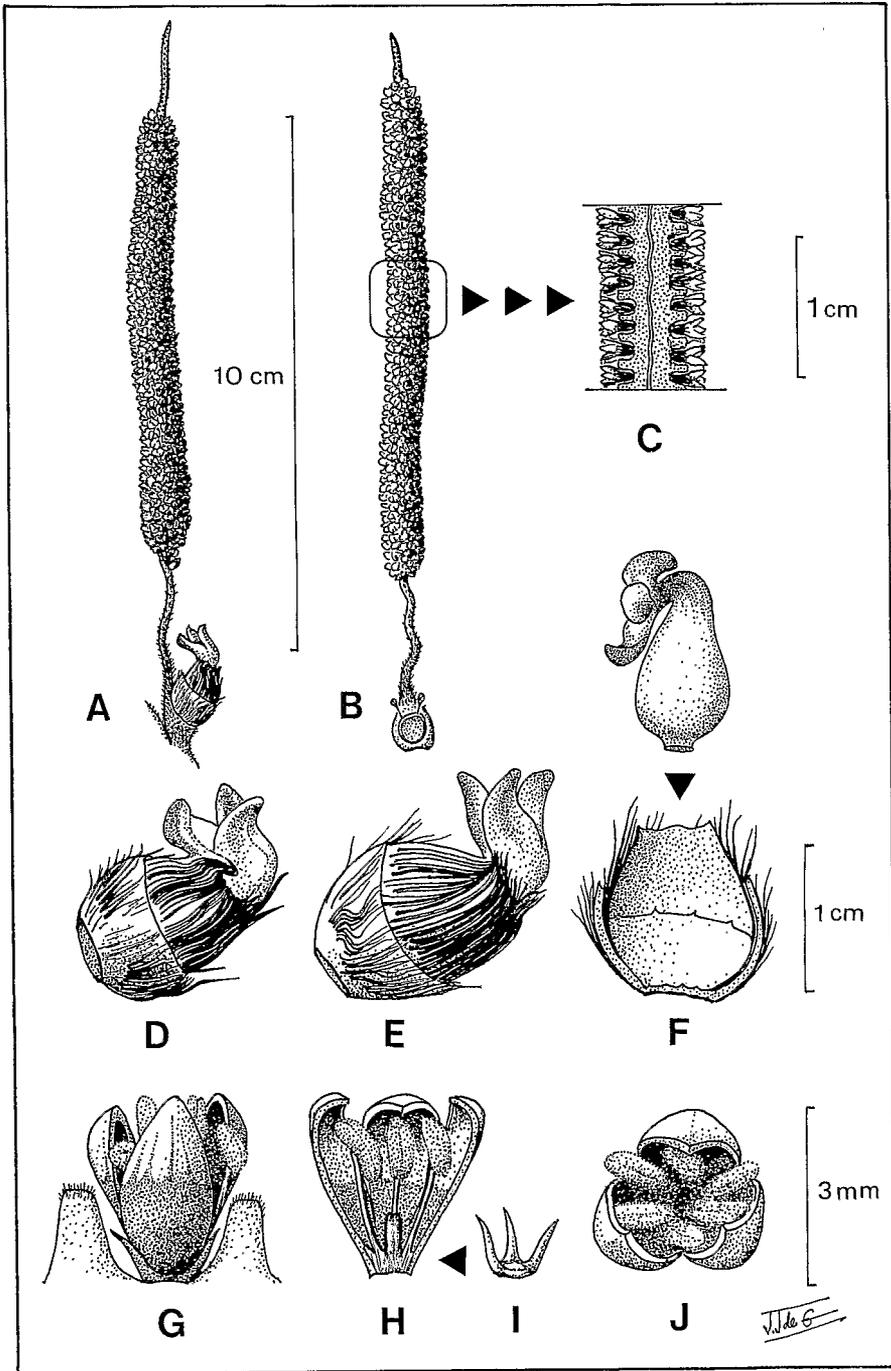
Though the fruit of *A. minus* is still unknown, the characters of the vegetative parts and of the inflorescence clearly suggest a close affinity with section *Munbaca* of subgenus *Monogynanthus*, which is characterized by only one pistillate flower at the base of the rachilla, spines grouped in rings on the trunk, pinnae regularly arranged in one plane, and sheaths of the dead leaves not persisting on the trunk under the crown. An analysis of DNA variation in the genus *Astrocaryum*, using the technique AFLP (amplification fragment length polymorphism), clearly shows affinities of *A. minus* with *A. gynacanthum*, *A. paramaca*, and *A. rodriguesii*. These four species form a group, which is very well separated from the members of the section *Ayri* at the molecular as well as at the morphological level (Kahn and Second, in press).

### **A New Palm Species for the Guianas**

The genus *Astrocaryum* is represented in the Guianas by 11 of the 26 Amazonian species, of which eight (marked with an asterisk) occur in



2. A: *Astrocaryum minus*, single-stemmed palm; B: leaf apex; C: trunk with spines; D: inflorescence. (Drawing J.-J. de Granville)



3. A: rachilla with a single pistillate flower at the base, the distal part with staminate flowers; B: two staminate flowers on each side of the pistillate flower forming a triad at the base of the rachilla; C: longitudinal section in rachilla showing the immersed staminate flowers; D, E: pistillate flower; F: corolla with the adnate staminodial ring inside; G: staminate flower; H: corolla, stamen and pistilodes at the base; I: calyx; J: staminate flower seen from above. (Drawing J-J. de Granville)

Table 1. Comparison of staminate flowers of *Astrocaryum minus* and *Astrocaryum gynacanthum*.

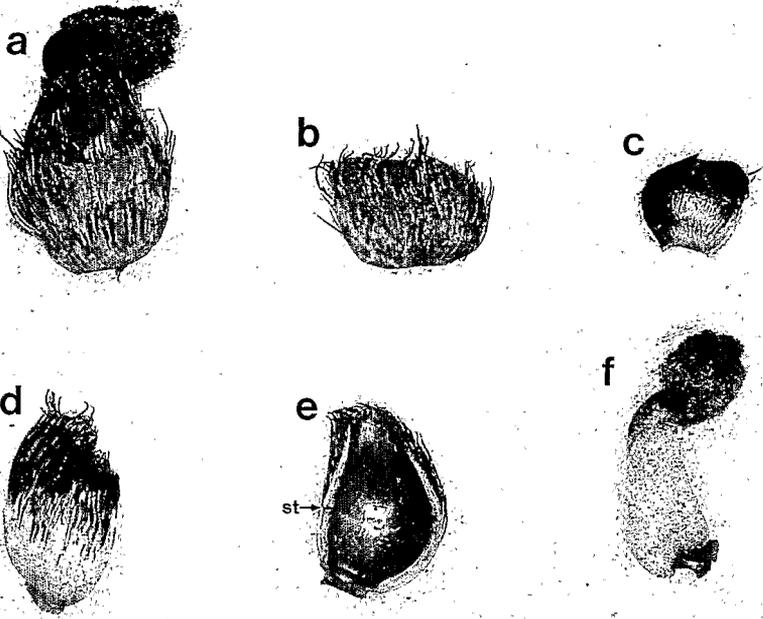
Flower Part	<i>Astrocaryum minus</i> (Granville & Kahn 12921, CAY)	<i>Astrocaryum gynacanthum</i> (Balick et al. 1479, CEN)
Rachilla <sup>1</sup>		
Basal part setose	1.9–3.6 cm	0.9–2.1 cm (1.5 cm) <sup>2</sup>
Distal part <sup>3</sup>	7.4–9.8 cm	3.1–5.0 cm (2.5–3.5 cm) <sup>2</sup>
Apex	1.3–2.2 cm	0.5–1.3 cm
Staminate flower <sup>4</sup>		
Sepals	0.8 ± 0.1 mm (0.6–1.0 mm)	0.5 ± 0.1 mm (0.4–0.6 mm)
Petals	3.3 ± 0.2 mm (2.8–3.6 mm) slightly reflexed at anthesis	2.8 ± 0.2 mm (2.5–3.1 mm) strongly reflexed at the apex at anthesis
Stamens		
Filament	1.7 ± 0.1 mm (1.5–1.9 mm)	2.0 ± 0.1 mm (1.8–2.3 mm)
Anther	1.3 ± 0.1 mm (1.1–1.5 mm)	1.1 ± 0.1 mm (1.0–1.2 mm)
Pistillodes	0.7 ± 0.1 mm (0.5–0.9 mm)	0.8 ± 0.1 mm (0.6–1.0 mm)

<sup>1</sup>Length: extreme values,  $n = 20$ .<sup>2</sup>From Wessels Boer (1965).<sup>3</sup>Part of the rachilla bearing the staminate flowers.<sup>4</sup>Length: mean ± standard deviation (extreme values),  $n = 20$ .Table 2. Comparison of pistillate flowers of *Astrocaryum minus* and *A. gynacanthum*.

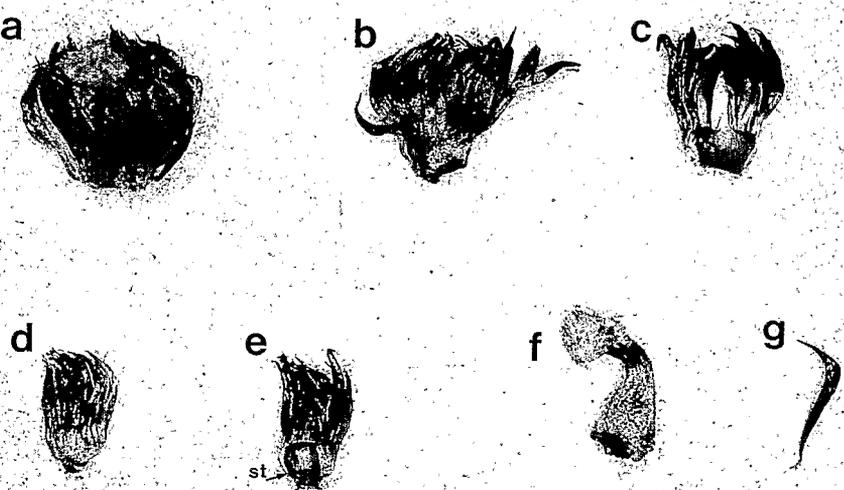
Flower Part	<i>Astrocaryum minus</i> (Granville & Kahn 12921, CAY) <sup>1</sup>	<i>Astrocaryum gynacanthum</i> (Scarlot 5, CEN) <sup>1</sup>
Calyx length	8.0 ± 0.6 mm (6.4–9.1 mm)	3.0 ± 0.2 mm (2.7–3.3 mm) (1–3 mm) <sup>2</sup> ; (4 mm) <sup>3</sup>
Calyx shape	deep cup-shaped, spines twisty and slightly flattened, not hiding the floral parts, 4.8–9.5 × 0.2–0.4 mm <sup>4</sup>	wide-mouthed cup-shaped, spines very twisty and flattened, hiding the floral parts, 7.8–12.5 × 1.1–2.3 mm <sup>4</sup>
Corolla length	11.5 ± 0.6 mm (10.3–12.5 mm)	3.3 ± 0.2 mm (3.0–3.6 mm) (1–4 mm) <sup>2</sup> ; (3 mm) <sup>3</sup>
Corolla shape	oblong-urceolate, spines twisty, 5.9–8.6 × 0.2–0.4 mm <sup>4</sup>	wide-mouthed cup-shaped, spines twisty and flattened, 4.8–8.6 × 0.6–1.4 mm <sup>4</sup>
Staminodial ring height	4.7 ± 0.7 mm (3.8–6.6 mm)	0.9 ± 0.2 mm (0.5–1.1 mm) (1 mm) <sup>2,3</sup>
Gynoecium length <sup>5</sup>	15.0 ± 1.3 mm (12.3–17.5 mm)	7.9 ± 1.3 mm (6.3–10.3 mm) (9–10 mm) <sup>2</sup>
Gynoecium diameter <sup>6</sup>	7.1 ± 0.3 mm (6.7–7.7 mm)	4.4 ± 0.3 mm (3.9–5.5 mm) (4–5 mm) <sup>2</sup>
Gynoecium shape	± cone-shaped, round in cross section, external wall of ovary smooth ± pilose with minute indumentum	pear-shaped, ± oval in cross section, external wall of ovary with longitudinal ridges, covered in brown to whitish hairs
Stigma length	8.2 ± 1.3 mm (6.3–10.5 mm)	4.3 ± 0.6 mm (3.4–5.6 mm) (5–6 mm) <sup>2</sup>

<sup>1</sup>Mean ± standard deviation (extreme values),  $n = 20$ .<sup>2</sup>From Kahn and Millán (1992).<sup>3</sup>From Henderson (1995).<sup>4</sup>Extreme values; the largest spine of calyx and corolla was measured for each flower.<sup>5</sup>Stigma length not included.<sup>6</sup>The widest part of the gynoecium is measured.

**A**



**B**



French Guiana. Identification keys to these species are found in Kahn and Millán (1992) and Kahn and Ferreira (1995):

Subgenus *Pleiogynanthus*: *A. acaule* Martius, *A. aculeatum* Meyer, *A. jauari* Martius\*, *A. vulgare* Martius\*

Subgenus *Monogynanthus*

Section *Munbaca*: *A. gynacanthum*\*, *A. minus*\*, *A. paramaca*\*, *A. rodriguesii*\*

Section *Ayri*: *A. farinosum* Barbosa Rodrigues, *A. murumuru*\*, *A. sciophilum* (Miquel) Pulle\*.

The presence of *A. minus* on Mont Grand Matoury (52°21'W, 4°52'N) is noteworthy because the type specimen was collected in the Jutaf River valley located in western Amazonia, much nearer to Peru than to French Guiana. The place reported by Trail as "Barreiras do Mutum" may refer to the confluence with the Mutum River (approx. 68°06'W, 4°24'S). *A. minus* had never before been collected in French Guiana in spite of intensive botanical expeditions having been made for the last 30 years (Hoff and Cremers 1996). And, we never encountered a collection of this species in herbaria (BH, G, IAN, INPA, K, MPEG, NY, P, US) except for the type specimen.

Owing to its extreme rarity, *Astrocaryum minus* must be considered an endangered species. The construction of a new road to the top of the mountain, where a military hertzian relay will be soon built (Commandement Supérieur des Forces Armées de Guyane 1995), traverses the site where the palms grow. Fortunately, the road has been detoured around this population of *A. minus*, thereby protecting the only known Guianan population of this species. Moreover, the vegetation of Mont Grand Matoury, one of the last patches of primary forest near Cayenne, was declared a protected habitat ("Arrêté de Protection de Biotope" in April 1994 (de Granville and Sanite 1995).

### Conclusion

Johnson (1996:6) concluded, "It is remarkable that lumping occurred in palms of all cate-

gories of threat, but with the highest percentage in the group of Unknown, Insufficiently known but suspected to be threatened, and Rare palms. Many of these palms are known from their type collection only, or are otherwise rare and taxonomically not well defined." *Astrocaryum minus* was collected on February 2, 1875 and 120 years passed before it was rediscovered. This example should teach taxonomists that they must be very careful before lumping taxa that are insufficiently known. In doubtful cases, the rule to follow is to maintain the former poorly known taxa until new data from new collections are obtained.

### Identification Key to Species in the Section *Munbaca* of the Subgenus *Monogynanthus*

- 1a. Pistillate flower with a short pedicel; fruit pedicellate [2]
  - 2a. Trunk subterranean. Inflorescence erect ..... [*Astrocaryum paramaca*]
  - 2b. Trunk well developed. Inflorescence pendent ..... [*Astrocaryum rodriguesii*]
- 1b. Pistillate flower without a pedicel; fruit not pedicellate ..... [3]
  - 3a. Multi-stemmed palm, the trunks 3.5–7 cm in diameter. Leaves with less than 50 pinnae per side. Pistillate flowers 8–11 mm long; calyx and corolla armed with flattened spines that hide the floral parts; staminodial ring 1 mm high ..... [*Astrocaryum gynacanthum*]
  - 3b. Single-stemmed palm, the trunks 10–15 cm in diameter. Leaves with more than 50 pinnae per side. Pistillate flowers 13–20 mm long; calyx and corolla armed with spines that do not hide the floral parts; staminodial ring 4–6 mm high ..... [*Astrocaryum minus*]

### Acknowledgments

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4. A: pistillate flower of *Astrocaryum minus*; B: pistillate flower of *Astrocaryum gynacanthum* (a: flower entire, b: calyx outside, c: calyx inside, d: corolla outside, e: corolla inside with the staminodial ring (st), f: gynoecium, g: spine). Photo F. Kahn.

of the mountain. We are indebted to Dr. Scott Mori who reviewed the manuscript.

#### LITERATURE CITED

- BARBOSA RODRIGUES, J. 1879. *Protesto-Appendice ao Enumeratio palmarum novarum*. Rio de Janeiro: 1-48, 2 pl.
- . 1903. *Sertum palmarum brasiliensium*. Bruxelles: Imprimerie Monnom, 2 vol.
- BURRET, M. 1934. Die Palmengattung *Astrocaryum* G. F. W. Meyer. *Repert. Spec. Nov. Regni Veg.* 35: 114-158.
- COMMANDEMENT SUPERIEUR DES FORCES ARMEES DE GUYANE. 1995. Aménagement d'une voie d'accès au sommet du Mont Grand Matoury. *Direction Mixte des Travaux de Guyane, Quartier Loubère, Cayenne*, 20 pp., cartes (restricted).
- DRUDE, O. 1881. *Palmae in Martius Flora Brasiliensis*. 3: 374.
- DE GRANVILLE, J.-J. AND G. CREMERS. 1995. Notice d'Impact sur le Mont Grand Matoury: Etude Botanique (convention ORSTOM/O.N.F.). Report duplicated at ORSTOM, Cayenne, 25 pp., 2 fig.
- AND L. SANITE. 1995. Protected areas and human activities in French Guiana. *In: National Parks without People? The South American experience*. S. & T. AMEND Ed., I.U.C.N./Parques Nacionales y Conservación Ambiental, Quito: 259-285, 4 maps, 7 phot.
- HENDERSON, A. 1995. *The palms of the Amazon*. Oxford University Press, New York.
- HOFF, M. AND G. CREMERS. 1996. *Index des noms de lieux de récoltes botaniques en Guyane française*. Sylvolab-Guyane, Kourou.
- JOHNSON, D. (ed.) AND THE IUCN/SSC PALM SPECIALIST GROUP. (1996). *Palms: their conservation and sustained utilization, status survey and conservation action plan*. IUCN, Gland, Switzerland and Cambridge, UK.
- KAHN, F. AND B. MILLAN. 1992. *Astrocaryum* (Palmae) in Amazonia. A preliminary treatment. *Bull. Inst. fr. ét. andines* 21: 459-531.
- AND E. J. L. FERREIRA. 1995. A new species of *Astrocaryum* (Palmae) from Acre, Brazil. *Candollea* 50: 321-328.
- AND G. SECOND. In press. *The genus Astrocaryum in Amazonia: classical taxonomy and DNA analysis*. *Mem. New York Bot. Gard.*
- OFFICE NATIONAL DES FORÊTS. 1995. Notice d'impact relative à l'installation d'un relais hertzien au Mont Grand Matoury. *Direction Régionale de Guyane; Groupe Technique de Cayenne*; 34 pp, 10 annexes (restricted).
- TRAIL, J. W. H. 1877. Description of new species and varieties of palms collected in the valley of the Amazon in north Brazil in 1874. *Journal of Botany* 15: 75-81.
- WESSELS BOER, J. G. 1965. *The indigenous palms of Suriname*. E. J. Brill, Leiden.