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Attalea taam—a new palm species well known by the Cacua Indigenous people

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Abstract

We describe, illustrate, and map *Attalea taam,* a new palm (Arecaceae) species from the Colombian Amazon that the Indigenous Cacua people eat and call "táam". *Attalea taam* is characterized by the combination of aerial stems with well-marked orange-brown ring-shaped leaf scars, staminate flowers with three stamens with straight anthers and spatulate petals with trichomes in clusters on the adaxial side and ribbed abaxially, and endocarps lacking fibres as seen in a cross-section. It is a dominant canopy species that is key to Cacua food security. Beyond describing a new species, we also extend the known distribution ranges for two *Attalea* species: *A. insignis* ("béi" in Cacua) and *A. septuagenata* ("tah"). Ultimately, our work highlights how participatory research with local communities accelerates taxonomy, knowledge transmission, and promotes equitable and plural science in megadiverse regions.

Key words: Amazon, Colombia, participatory research, taxonomy, traditional knowledge

Introduction

When the traditional knowledge of Indigenous and local people is integrated with scientific or Western knowledge, new ideas and methodologies emerge that may lead to scientific breakthroughs (Copete *et al.* 2023; Morib *et al*. 2025; Jousse *et al.* 2025). For example, traditional knowledge informed a molecular study to separate two distinct species of *Artocarpus* J.R.Forster & G.Forster (1776: 101) (Gardner *et al.* 2022). These species, well known to Indigenous people of Borneo, were formerly misclassified by taxonomists as one species. Furthermore, Afro-Colombian's knowledge led to the description of *Myrcia coquiensis* C.Parra-O., G.P.Daguer & F.Moreno (2024: 308) a species long used locally (Parra *et al*. 2024). The examples are numerous, but the degree of involvement of Indigenous and local people varies significantly across studies. For example, Alexander von Humboldt (von Humboldt & Bonpland 19889) acknowledged a key Indigenous collaborator during his travels in South America: "*He was a Guayqueria of an excellent disposition, sagacious in his observations, and he had been led by intelligent curiosity to notice the productions of the seas as well as the plants of the country... I feel a pleasure in recording in this itinerary the name of Carlos del Pino, who, during the space of sixteen months, attended us in our course along the coasts, and in the inland country.*" However, Carlos del Pino never received the equitable recognition for his knowledge.

Here, we highlight how the integration of knowledge systems (Fig. 1) led us to describe *Attalea taam*, a palm species previously unknown to Western botanists, but which the Indigenous Cacua call "*táam*" (Figs. 2–5). Palms are among the best-known plant families in the Amazon (Henderson *et el*. 1995), so descriptions of new, large species that are ecologically dominant and important for food security, such as the one presented here, are rare (Figs. 5D–6).

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FIGURE 1. Participatory research accelerates taxonomy. A. Participatory botany. B. Participatory ecology. C. Participatory mapping. D. Participatory Indigenous peer review.

The Cacua, with 147 individuals, are among the smallest Indigenous groups of Colombia (DANE 2018). Most Cacua live in Wacará, a community accessible via a two-hour boat ride downriver from Mitú, followed by a two-hour hike from the Vaupés towards the Querarí river (Fig. 6). Until 1960, the Cacua lived a semi-nomadic lifestyle (Silverwood-Cope 1990). Although the Cacua continue to follow traditional gathering and hunting, their transition to a settled lifestyle brings challenges that threaten their livelihoods, such as limited access to food, clean water, and sanitation. At the same time, they have solar panels, satellite internet, and a secondary boarding school, all of which increase their exposure to Western influences. The transition into a sedentary lifestyle for the Cacua is already modifying their traditional ethnobotanical knowledge, including knowledge about wild food consumption. And yet, in-depth ethnobotanical studies with the Cacua are missing, even 35 years after Richard E. Schultes noted that their "*extensive knowledge of their useful plants merits urgent study*" (Schultes & Raffauf 1990).

Attalea Kunth in Humboldt, Bonpland & Kunth (1816: 309) is a palm genus with 30 species distributed in the Americas from Mexico to Bolivia and Paraguay, and Haiti (Henderson 2020). Colombia, with 16 *Attalea* species, is second in terms of species richness, and is only surpassed by Brazil with 20 species (Henderson 2020). For a long time, the currently recognized *Attalea* genus has confused botanists. Glassman (1999) separated the former 65 recognized species into five genera: *Attalea*, *Maximiliana* C.Martius (1824: 131), *Orbignya* C.Martius ex. S.Endlicher (1836–1840: 257), *Scheelea* H.Karsten (1856: 264), and *Ynesa* O.F.Cook (1942: 71). However, phylogenetic studies have shown that these five genera are not monophyletic (Meerow *et al.* 2009; Meerow *et al.* 2015; Freitas *et al.* 2016), and together they are now treated as complexes within *Attalea* (Pintaud 2008; Freitas *et al.* 2016; Rodríguez del Castillo *et al.* 2016). Despite these advances, *Attalea* species remained difficult entities to identify, and a revision of the genus was recommended (Pintaud *et al*. 2016) and later provided by Henderson (2020).

The difficulty in identifying species of *Attalea* relates to i) significant morphological variation in its species complexes (Pintaud 2008; Rodríguez del Castillo *et al*. 2016; Pintaud *et al.* 2016), ii) that many species are large and difficult to collect, iii) that herbarium specimens therefore often only contain fragments of individuals and thus offer incomplete information, iv) that *Attalea* have staminate and pistillate inflorescences, but most herbarium collections lack at least one of the sexes, and v) that *Attalea* present a high level of hybridization but few cases have been studied (Balick *et al*. 1987a, 1987b; Henderson & Balick 1991). These problems were addressed in the comprehensive review of *Attalea* by Henderson (2020). Nevertheless, species of *Attalea* remain some of the hardest to identify among the large-sized Neotropical palms. More fieldwork, complete collections, and in-depth phylogenetic research are needed to better understand speciation and evolution in the genus, and subsequently the circumscription and identifying characters of its species.

Materials and methods

Research was conducted in the Colombian Amazon in the forests surrounding the Indigenous Cacua community of Wacará (Mitú municipality, Vaupés department) (Fig. 6). Upon arriving to Wacará, the first thing the Cacua offered J.C.C. and R.C-L. to eat were the yellowish-brown fruits of táam. We were certain it was an *Attalea,* but since species of this genus with edible mesocarps are rare, we were unsure about its identity. The next day, S.L.-P., J.C.L.-G., D.L.-N., L.L., and H.P. (hereafter 'Cacua collaborators') guided J.C.C. and R.C.-L. to an agricultural field where an *Attalea sp.* grows that the Cacua call "yaádh táam", which some Cacua mistook to be táam since both are eaten. Indeed, some Cacua confuse these two species and consider that táam only occurs in agricultural fields, which initially led us to consider táam to be an introduced species from Brazil. However, one of the Cacua elders assured that táam grew in the wild and a young hunter knew where it was fruiting. Finally, on the third day in Wacará we found the species thanks to the help of three Cacua elders and a young Cacua hunter (Figs. 2A, 3A).

We collected the species in the field and recorded all visible characters with the Cacua. In respect of the Cacua's wishes, we only collected one infructescence and left a young infructescence untouched since the Cacua wanted to wait until its maturation to eat its fruits. Once the specimens were collected, Western scientists demonstrated to the Cacua the procedure of how to preserve plant specimens in the field, including pressing plant parts in newspaper, wrapping them in a bundle, wetting the bundle with 70% alcohol to avoid moulding, and storing bundles in a plastic bag until specimens can be dried in the herbarium. We dried and deposited the specimens in the permanent collection of the COL herbarium (herbarium acronym according to Thiers 2025). To identify the species, we consulted Glassman (1999), Galeano & Bernal (2010), Lorenzi *et al.* (2010), and Henderson (2020). We also reviewed the physical collections of *Attalea* at AAU, COL, JAUM, and Z+ZT and the virtual collections of COAH, UDBC, NYBG, and MO. Finally, we photographed the flowers using a digital microscope VHX-X1 at the Department of Systematic and Evolutionary Botany in the University of Zurich.

Once we were familiar with the species, we initiated a participatory ecology process to understand its ecological requirements. The resident Indigenous Cacua participants independently made two hikes in March 2025 to photograph and map more exhaustively táam's distribution. Photos and videos were shared, along with details of the soils where the species occurs. The Cacua made and sent a draft map of where táam grows to the artist Monica Naranjo Uribe (M.N.U.) and communicated with her intensely during one month to refine it. During a third exchange (August 2025), the Cacua and Western scientists made a participatory mapping workshop in Wacará with the entire community. Additionally, M.N.U organised a workshop in the school to integrate Cacua children's knowledge into the map. During this trip, J.C.C., R.C.-L. and the Cacua collaborators collected as many *Attalea* species as we could find and searched for new distribution records.

The writing of the manuscript was a participatory process (Fig. 1). Three key steps were taken to ensure that Cacua views were represented in the publication. First, a draft manuscript written by the non-Cacua authors was translated into Spanish and shared with the Cacua co-authors by email and WhatsApp. Second, a presentation was made by J.C.C. in August 2025 to socialise the manuscript with all community members. Third, Tiberio Gallego (secretary of the community) read the manuscript aloud in Cacua, and a feedback session was held. Overall, this process, which we refer to as the 'Indigenous peer review', was necessary for improving the manuscript and map, as for integrating the entire community in the work.

Taxonomy

Attalea taam Copete, López-Pérez, Isaza, Balslev & Cámara-Leret ***sp. nov.*** (Figs. 2–5)

Type:—**COLOMBIA. Vaupés department, Mitú municipality.** Road from Wacará to Cerro Amanecer, 1°14'33.5" N; 69°58'22.4" W, 174 m. *29 March 2025.* Juan Carlos Copete Maturana, Samuel López Pérez, David López Navarro, Hernando Pavón, Luciano López, Carolina Isaza & Rodrigo Cámara-Leret *92* (holotype: COL).

Additional specimens examined:—**COLOMBIA. Vaupés department, Mitú municipality.** Road from Wacará to Caño espina, 1°14' 01.3" N, 69°58'47.8" W, 177 m. *15 August 2025.* Juan Carlos Copete Maturana, Rodrigo Cámara-Leret, Ingrid Olivares, Mónica Naranjo, David López Navarro, Hernando Pavón, Luciano López, Samuel López Pérez, Juan Carlos López, Carolina Isaza *97* (paratype: COL, SINCHI, Z+ZT).

Main characters. This species is easily recognized by its stem with well-marked orange-brown ring-shaped leaf scars, erect staminate inflorescences, staminate flowers in dyads and arranged along the adaxial side of the rachillae, staminate flowers with only three stamens with straight anthers, staminate petals spatulate, united at the base, and coriaceous, petal margins with clustered trichomes on the adaxial surface, abaxial surface ribbed, and endocarp lacking fibers in cross section (Figs. 2–5).

Palm solitary, stem 1.5–23 m tall, with crown of erect not drooping leaves. **Stem** 29–90 cm diameter, with well-marked orange-brown ring-shaped leaf scars and sometimes covered by leaf sheaths. **Leaves** 15–20 per stem, 10–12 m long; leaf sheath 123–150 cm long, 45 cm wide, ribbed, enveloping the stem, with brown and hard fibers at the edges; petiole 1.5–3 m long in juveniles and 50–81 cm long in adults, ribbed; sometimes without petiole when the palm is very high; rachis 10 m long, with white dots on the abaxial surface; pinnae 125 per side, alternate, arranged in one plane, apex margins covered by ferruginous indument. Basal pinnae 70–80 cm long, 1.5–3 cm wide; middle pinnae 114–150 cm long, 4.5–6 cm wide; distal pinnae 5–20 cm long, 0.5–1.6 cm wide. **Staminate inflorescence** erect; peduncular bract 180 cm long, 23 cm wide, brown; peduncle 90 cm long, 5 cm wide, with yellow indument in the basal part and green at the apex; staminate rachillae more than 100, those at the base and middle of the rachis 18 cm long and 1 cm wide, arranged around the rachis, staminate flowers in dyads, arranged along the abaxial side of the rachillae (absent on the adaxial side), staminate petals three, 6 mm long, 2 mm wide, spatulate, united at the base, and coriaceous, the margins and adaxial surface covered by clustered trichomes, and the abaxial side ribbed or nerved, stamens three with evisión anthers and shorter than the petals; **Pistillate inflorescence** pendulous, 85 cm long, 9 cm wide; rachillae more than 100, 12 cm long, 2 cm wide, arranged all around rachis; pistillate flowers 2 cm long, 1 cm wide, cream, pistillate petals three 2 cm long, 1 cm wide, sepals three 1.5 cm long, 0.7 cm wide and stigma three. **Fruits** ovate 5.5 cm long, 3.5 cm diameter, yellowish-brown, ovate, with darker brown apex, 6–8 fruits per rachilla, persistent pistillate perianth, 1.5 cm long, brown; epicarp yellow with brown trichomes, mesocarp yellow-orange, endocarp 3 cm long, 2 cm wide, totally covered by abundant, adherent fibers, and three superficial and sunken opercula; endocarp in cross-section 0.4 cm wide, without fibers, 1 seed, 2 cm long, 1.5 cm wide.

Etymology: The epithet honours the common name of this species in Cacua language.

Distribution: Only known from the Cacua land (Fig. 6).

Ecology: A. *taam* grows in mature well-drained *terra firme* forests. Seven species of *Attalea* co-occur in the locality (*A. insignis, A. luetzelburgii, A. maripa, A. sagotti, A. microcarpa, A. septuagenata,* and *Attalea sp.*), but táam only co-occurs with *A. sagotti and A. maripa. Táam* is one of the most abundant canopy palms in *terra firme* soils and can be dominant in the same soil type as *A. maripa*. Another species that reaches similar levels of abundance is *A. septuagenata* (tah in Cacua), but tah prefers sandier soils at the base of hills. To better illustrate the differences among these co-existing species, we provide all vegetative and reproductive characters (Table 1). The high species richness in the area suggests that the Vaupés may be the centre of diversification of the "Orbignya-like" clade (Freitas *et al.* 2016). However, understanding the geographic and ecological drivers of its diversification (Olivares *et al.* 2025), require further research.

Phenology and dispersal: *Attalea taam* flowers and fruits from January to March. The fruits reach maturity after up to a year. They are eaten by several animals that possibly act as dispersers: a squirrel (*Sciurus igniventris* Wagner), mottle-face tamarin (*Saguinus inustus* Schwartz), lowland paca (*Cuniculus paca* L.), Amazonian parrotle (*Nannopsittaca dachilleae* O'Neill, Munn & Franke), brown capuchin (*Sapajus apell*a L.), yellow-crowned amazon (*Amazonas ochrocephala* Gmelin), South American raccoon (*Procyon cancrivorus* Cuvier), scarlet macaw (*Ara macao* L.), and collared Peccary (*Pecari tajacu* L.).

TABLE 1. Comparison of *Attalea taam* with co-occurring and morphologically similar species. **Attalea microcarpa* Mart. has been treated as a doubtful name (Glassman 1999; Henderson 2020). However, Galeano & Bernal (2010) recognise it as a species.

	taam	***cohune***	***cuatrecasana***	***guianensis***	***luetzelburgii***	***maripa***	***microcarpa****	***sagotti***	***septuagenata***	***insignis***	***sp***
Cacua names	táam	N/A	N/A	N/A	yaádh táam de sabaneta	johyop	yaádh táam	yaádh táam	tah	béi	yaádh táam
Vouchers	*JCC et al. # 92, 97*				JCC *et al.* # 94				*JCC et al. # 65, 95*	*JCC et al. # 96*	*JCC et al. 98, 99*
Stem	Aerial	Aerial	Acaulescent	Acaulescent	Acaulescent	Aerial	Acaulescent	Acaulescent	Aerial	Acaulescent	Aerial
Leaf number	15-20	18 (15–24)	8 (5–12)	11 (8–16)	6 (5–6)	16 (8– 25)	6–16	10 (7–16)	19	9 (5–11)	16
Fibers on leaf sheath	Few, hard	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Abundant
Staminate flowers arrangement	Abaxial surface	Spirally arranged	Spirally arranged	Irregularly arranged	Abaxial surface	Spirally arranged	Spirally arranged	Spirally arranged	Abaxial surface	Spirally arranged	+/- Abaxial surface
Staminate petal shape	Spatulate, base united	Spatulate, base free, apex recurved	Spatulate, base free, apex recurved	Linear, base free, apex not curved	Linear, base united, apex recurved	Linear, base free, apex not curved	Spatulate petals, base free, apex not curved	Spatulate, base free, apex recurved	Lanceolate, base free, apex not curved	Linear, free, not curved at the apices	Urceolate, base united
Petal trichomes	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Petal surface adaxially/ abaxially	Ribbed abaxial	Smooth adaxial	Smooth adaxial	Ribbed adaxial	Smooth adaxial	Ribbed adaxial	Smooth adaxial	Smooth adaxial	Ribbed adaxial	Ribbed adaxial	Smooth
Stamen number	3	27 (19–34)	21 (19–23)	6	6	6	18	11 (9–16)	55 (39–70)	6	10
Anther shape	Straight	Coiled and twisted	Coiled and twisted	Straight	Coiled and twisted	Straight	Twisted	Coiled and twisted	Straight	Straight	Coiled
Flower length (mm)	6	8.9 (5.2–13.0)	10.7 (7.3–15.5)	10.2 (8.8–11.7)	6.6 (5.5–8.0)	9.5 (6.0–13.3)	7–10	7.2 (5.2–9.8)	16.1 (15.3–16.8)	11.8 (10.0–15.8)	5
Fibres in endocarp cross-section	None	Abundant, scattered	Abundant	None or few	None or few	None or few	N/A	None or few	Abundant, scattered	Abundant, scattered	None
Seed number	1	1-several	Several	1-several	1	2	6–16	1	1-several	2 (2–3)	1

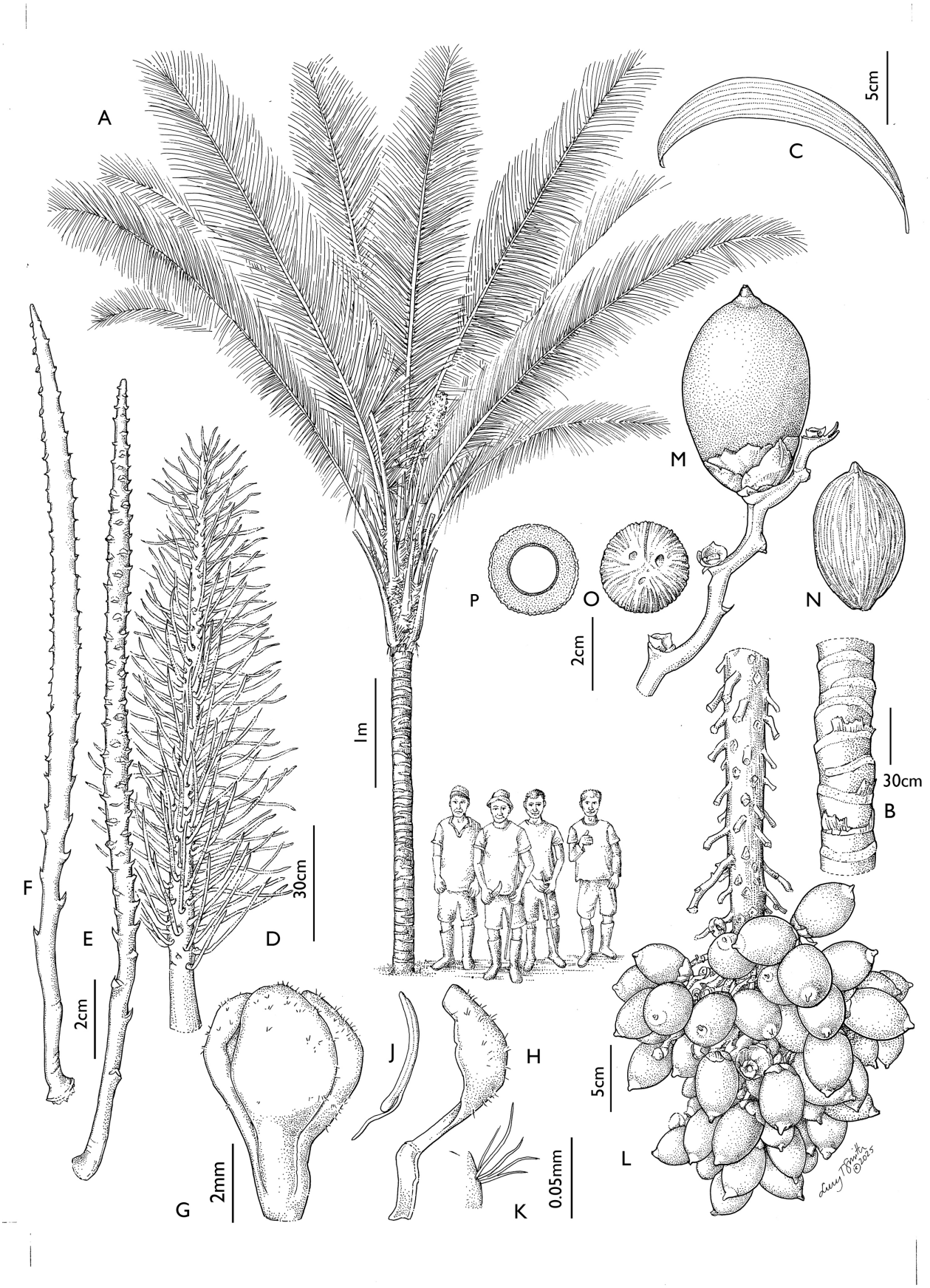

FIGURE 2. Illustration of key characters of *Attalea taam.* A. Habit and Cacua collaborators B. Stem. C. Seedling leaf. D. Male inflorescence. E–F. Male rachillae. G. Male flower. H. Male petal. J. Stamen. K. Trichomes. L. Mature infructescence. M. Rachilla with one fruit. N. Fruit without epicarp. O–P. Fruit in cross-section. Illustration: Lucy Smith.

FIGURE 3. Vegetative morphology of *Attalea taam*. A. Habit. B. Stem showing well-developed ring-shaped leaf scars and orange colour. C. Leaf sheath with small, tough fibres. D. Leaf.

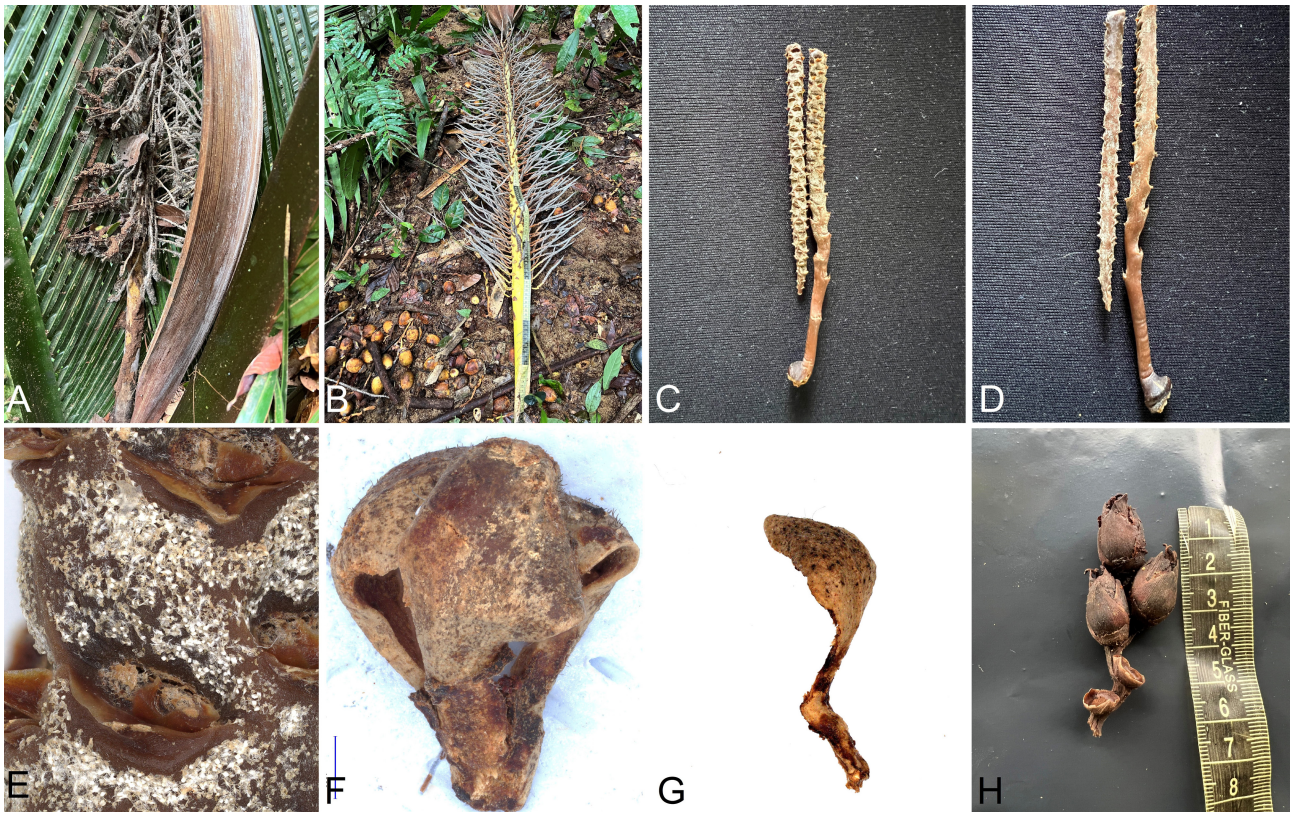

FIGURE 4. Flowers of *Attalea taam*. A. Erect staminate inflorescence. B. Staminate inflorescences without flowers. C. Staminate rachilla with flowers only along the abaxial side. D. Staminate rachilla with the adaxial side lacking flowers. E. Rachilla with male flowers in dyads. F. Staminate flower. G. Staminate flower with spatulate petals having trichomes in groups. H. Rachilla with female flowers.

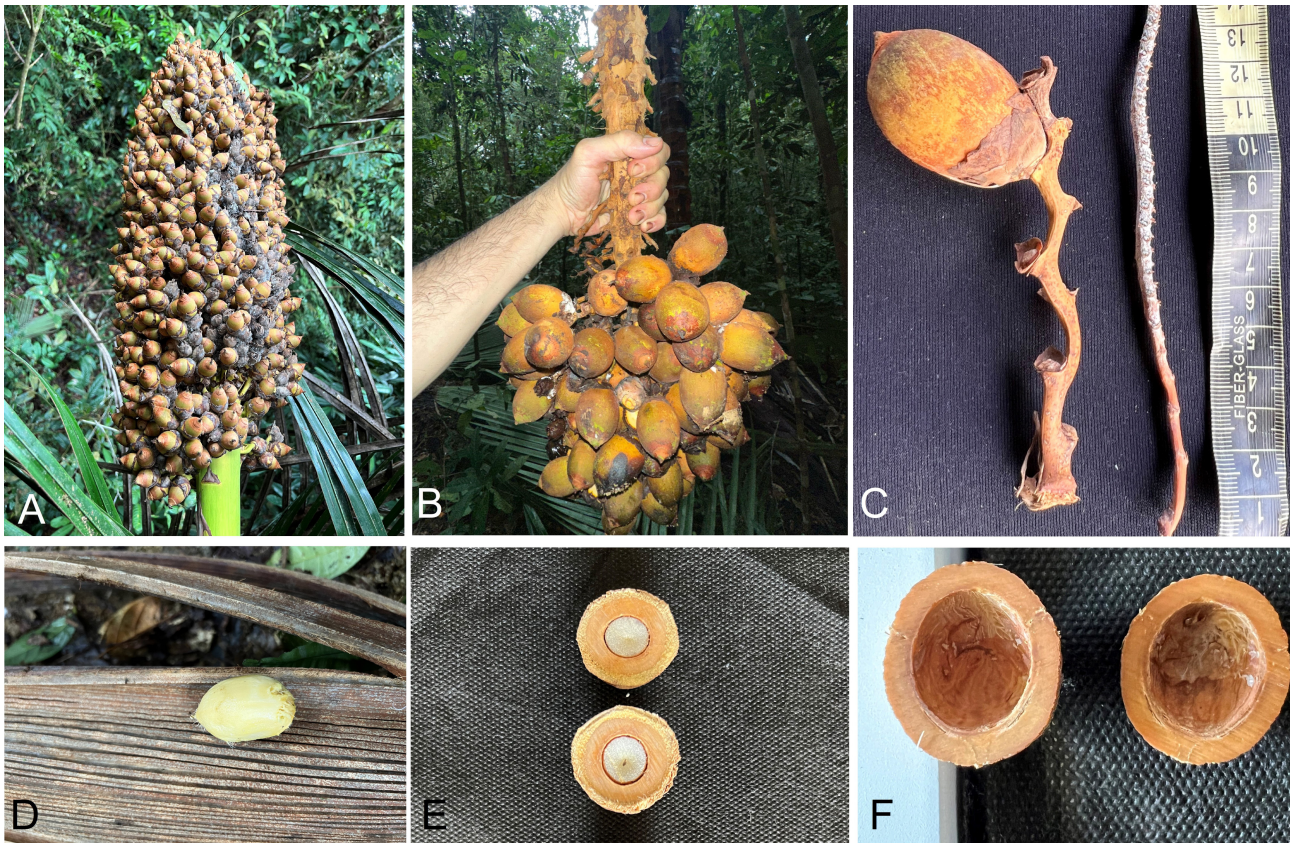

FIGURE 5. Fruits of *Attalea taam*. A. Immature infructescence. B. Mature. infructescence. C. Fruit with a brown apex. D. Edible mesocarp. E–F. Fruit cross-section showing the absence of fiber bundles in the hard endocarp.

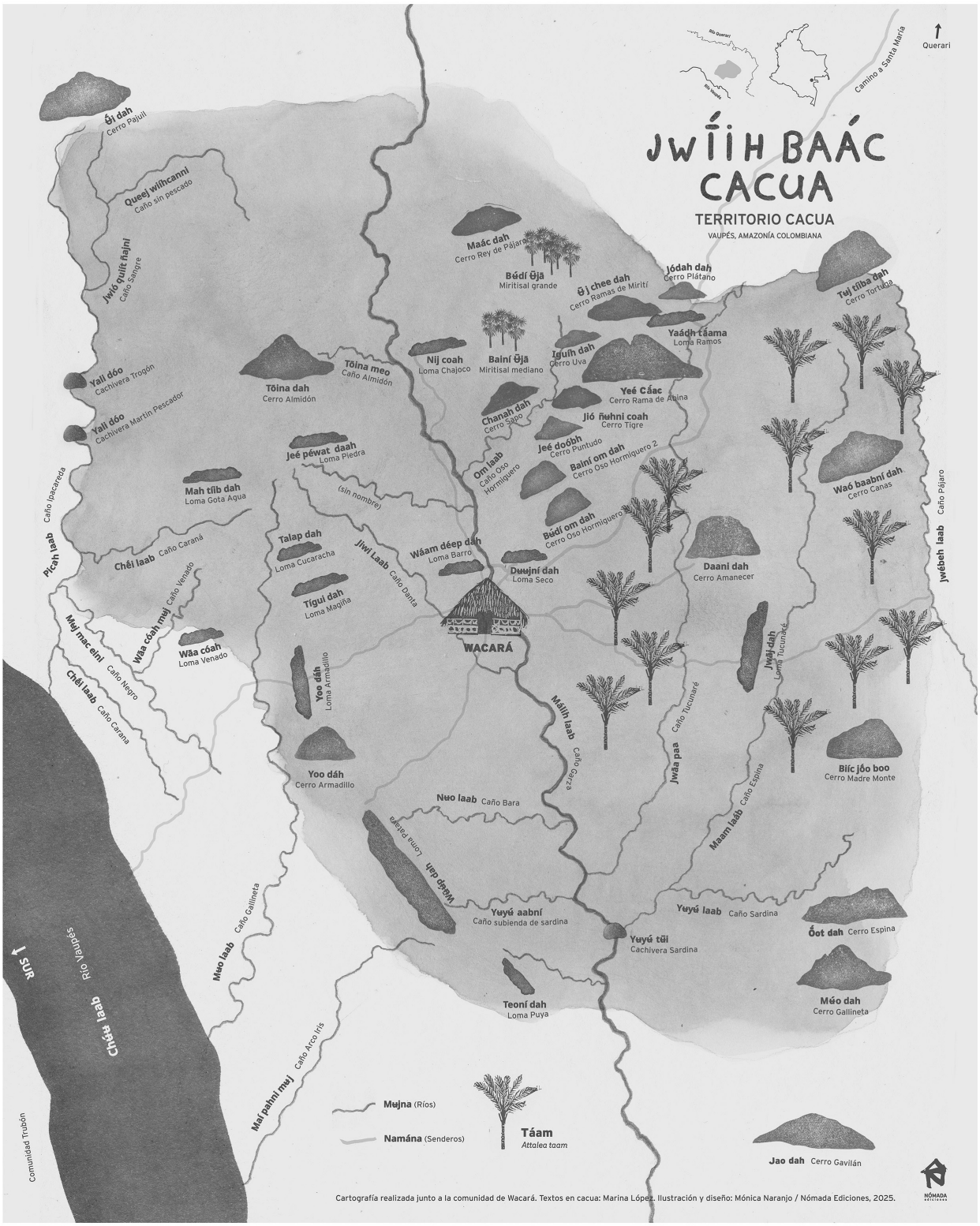

FIGURE 6. Participatory map showing the distribution of *Attalea taam* in the Colombian Amazon. Upper right: Map of Colombia, showing the Cacua Indigenous land between the Vaupés and Querarí rivers, Vaupés department. Left: Detailed map of the type locality showing Cacua names written by Marina López (bold font), translated Spanish names (regular font) for the rivers and mountains, and trails near where *A. taam* grows. Illustration: Monica Naranjo Uribe and Cacua people of Wacará.

Uses: The Cacua people use the petiole of *A. taam* to make a raised drying rack called "llerao" to dry cassava (*Manihot esculenta* Crantz), eat the sweet mesocarp (raw or cooked), and thatch houses with the leaves.

Notes: *Attalea taam* resembles a group of species (*A. cohune, A. cuatrecasana, A. guianensis, A. sagotti, A.*

luetzelburgii), which have staminate petals with curved apices; some of these species also lack staminate flowers along the adaxial side of the rachillae (Table 1). In COL, Bernal *et al.* 3607 was collected nearby (Colombia, VAUPÉS, Municipio de Mitú, río Vaupés, Naná, 175 m, 01° 00' N, 69° 55' W. Bosque de tierra firme. 24 noviembre 2004) and identified as *Attalea butyracea* (Mutis ex L.f) Wess. Boer. Nevertheless, Bernal *et al.* 3607 is not *Attalea butyracea*, but may be *A. taam.* However, due to the lack of male and female flowers in Bernal *et al.* 3607, it is not possible to identify it to species level.

New distribution records: We present two new distribution records. The first, is a new record of *Attalea septuagenata* A.Dugand (1953: 3) for the Vaupés department (*Copete et al. 65, 95*) (Table 1). *A. septuagenata* was previously known from a small area on the Río Mirití Paraná, in the Colombian Amazonas department (Galeano & Bernal 2010; Henderson 2020). Like táam, *A. septuagenata* is important for the Cacua for food security and is very abundant locally. Finally, we extend the distribution of *Attalea insignis* (Martius) C.Drude in Engler & Prantl (1887: 80) in Colombia to the eastern Vaupés department (*Copete et al. 96*).

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