Linking Indigenous and Scientific Knowledge to Describe an Edible Palm

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Upon arriving in the territory of the Cacua in the northwest Amazon, the first fruits that the indigenous people offered J.C.C. and R.C.-L. to eat were those of a new species, which they call *táam*. This is the story of how *Attalea taam* was encountered through taste and of the subsequent participatory research program with the Cacua to describe it as a species new to Western science.

What first took J.C.C. and R.C-L. to the Vaupés department of Colombia in 2024 was nothing at all related to *táam*. The aim of our first trip was to document and help preserve the medicinal knowledge of the Cacua indigenous people. The Cacua are one of six traditionally semi-nomadic Makú groups from the northwest Amazon (Becerra 2012), known to anthropologists as the "people with blowguns" (Silverwood-Cope 1990) (Fig. 1). The curare (arrow poison) of these Makú groups was widely esteemed and traded in the region. To date, however, no ethnobotanical monograph on the Cacua exists beyond the scattered

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1. Cacua hunter and co-author Juan Carlos López, with a blowgun. B. The petiole of the juvenile individual of *táam* is used to make the *llerao*, which is a raised drying rack to dry cassava (*Manihot esculenta*).

reports compiled by Schultes (1990) and Becerra (2023). Anticipating the erosion of Amazonian plant knowledge, Richard E. Schultes stated that the Makú's "extensive knowledge of their useful plants merits urgent study" (Schultes & Raffauf 1990). So far, however, only 13 useful species are reported in the literature for the Cacua (Becerra 2023).

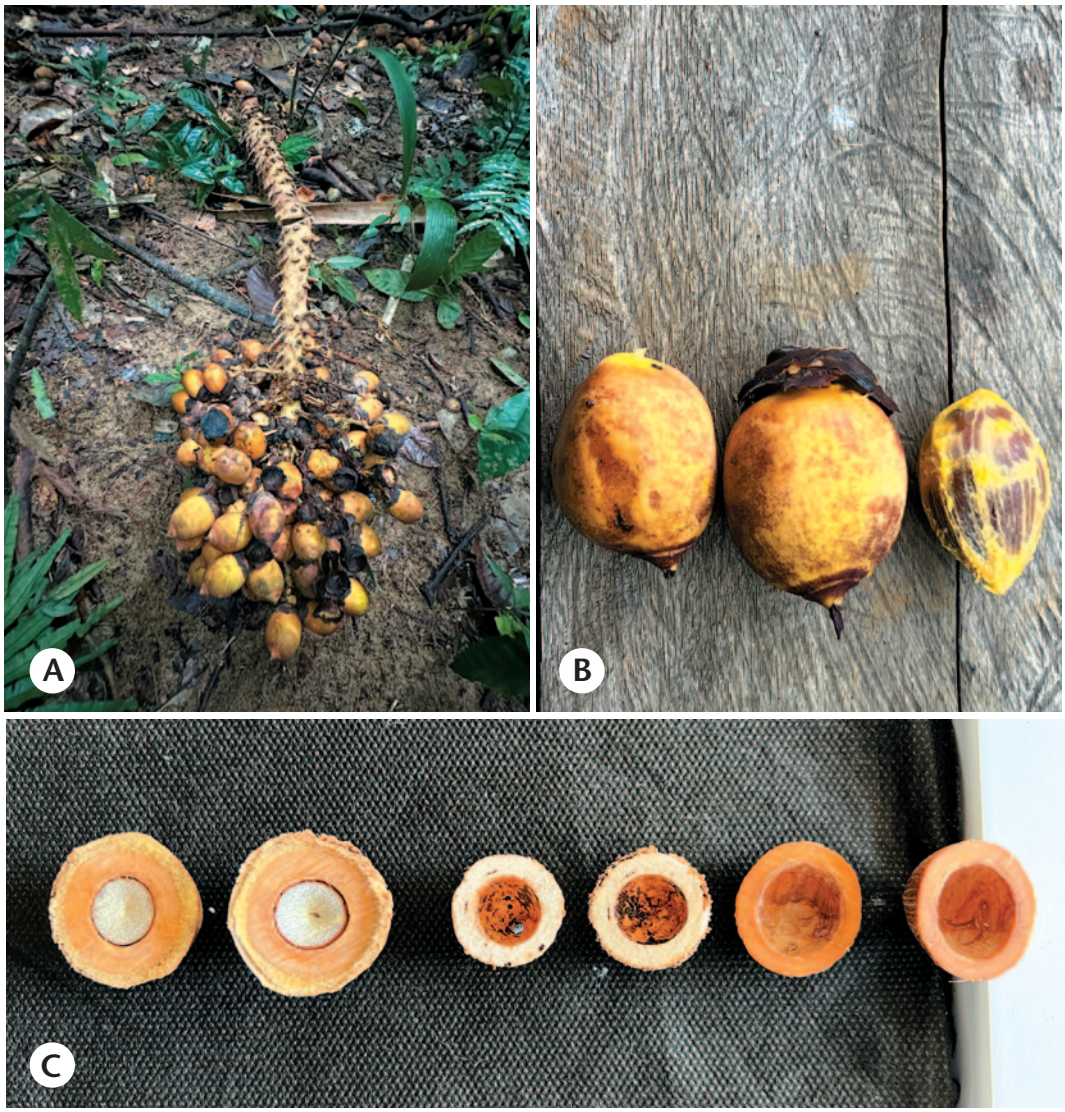
An unknown edible palm fruit

In March 2025, J.C.C. and R.C.-L. arrived at Wacará after a 2-hour flight from Bogotá to Mitú, a 2-hour car ride to the Vaupés river, a boat crossing of the river and a 2-hour hike. By the time we reached Wacará, we were exhausted and dehydrated. It was then that a group of Cacua children and our main Cacua collaborator, Samuel López-Pérez (S.L.-P.), offered J.C.C. and R.C.-L. the yellow, sweet and refreshing fruit of *táam* (Fig. 2). We had never seen this fruit before and were aware of *Attalea butyracea* as the only species of *Attalea* to have an edible mesocarp.

Despite this fortuitous encounter, research initially proceeded as planned—at that time, J.C.C. and R.C.-L. could not have imagined how profoundly *táam* would reshape our research agenda. Still, the daily work continued, conducting ethnobotanical interviews with Cacua elders and collecting plant specimens, with a focus on healing plants. As a result of this work, 45 morphospecies were collected with S.L.-P., J.C.L.-G., D.L.-N., L.L. and H.P. (hereafter "Cacua collaborators"), which they use to treat 18 ailments. The ethnobotany of the Cacua is so under-documented that a single week of participatory research yielded much more information than had been published previously. Still, during these walks we could not but wonder about the unusual palm fruits we tasted on our first day.

On the third day, J.C.C. and R.C.-L and Cacua collaborators made a three-hour hike to summit the Cerro Amanecer. At its base, on the sandier soils, we found a tall-stemmed palm (which the Cacua call *tah*) to be very common (Fig. 3). We identified it as *Attalea septuagenata*, thus extending its known geographic range from the previously known small area along the Mirití-Paraná river in the Colombian Amazon (Galeano & Bernal 2010) to the Vaupés. Thrilled to unravel this new geographic record, we took this opportunity to collect *tah* and show the Cacua how palm specimens are collected and pressed.

Táam was always in our minds during informal discussions with the Cacua and slowly J.C.C. and R.C.-L. started to put the pieces of the *táam* puzzle together. S.L.P. shared that he only



2. Fruits of *Attalea taam*. A. Infructescence. B. Fruits, two intact and the third with edible mesocarp largely removed. C. Fruits cross-section showing the absence of fibers in the endocarp. From left to right. Whole fruit with all parts. The fruit in the middle is an old fruit showing the locule and the fruit at the right shows the endocarp without fibers.

knew of *táam* growing in agricultural plots. Accordingly, we learnt that the plot where we first saw *táam* belonged to a Cacua who migrated from Brazil, raising the possibility that the species may have been introduced. To double check that the species was not already documented in Brazil, we shared photographs of the fruit with our friend professor Henrik Balslev (H.B.) from Aarhus University and asked him for scans of the palm tree flora of Brazil (Lorenzi et al. 2010), which he shared with us. However, no species in existing monographs (Glassman 1999, Lorenzi et al. 2010, Galeano & Bernal 2010, Henderson 2020) matched the morphology of *táam*.

Two days before departing, J.C.C., R.C.-L. and Cacua collaborators hiked to the summit of Cerro Avina, the tallest mountain in the area, which reaches 434 m in elevation. We hiked with three Cacua men and two Cacua women. The ascent was tough and the hike from the base to the summit took nearly an hour, including three pauses to rest. But the views were well worth the effort (Fig. 4). The Cerro Avina is majestic, covered by a stunted or lithophytic flora of no more than eight meters high, where Araceae, Apocynaceae, Bromeliaceae, Clusiaceae, Ericaceae, Myrtaceae, Melastomataceae and Rubiaceae predominate. From the summit, the views encompass the



3. *Attalea septuagenata* habit. Inset. Infructescence.

Cacua's magnificent lands. The Cacua explained the key geographic markers of their territory and this would later guide and inspire us when making the species' distribution map, as described below. When the sun became unbearable, we retreated to the forest interior to share a lunch of three tuna cans and a bag of *farina* (a toasted, coarse, grain-like flour produced from grated bitter cassava root). Beyond experiencing the unique flora and views, this hike was a turning point for the story of *táam* for it was here that one of the two Cacua women told us that *táam* grows in the wild and Hernando Pavón, a Wanano



4. Cerro Avina. A. View from Cerro Avina of the Indigenous Cacua territory, where at least seven species of *Attalea* grow. B. Summit of Cerro Avina, an important site in Cacua mythology.

collaborator settled in Wacará, went so far as to bet his daily wage that we would find *táam* in the forest the next day! Lunch was followed by a ceremony of *mambe* (roasted coca leaves, ground and mixed with *Cecropia* ashes), *rape* (tobacco snuff) and *ambil* (tobacco paste), and



5. A. Cacua collaborators. B. David López-Navarro, eating the mesocarp of *táam*.

we returned in high spirits to Wacará encouraged by the prospect of encountering *táam* the next day.

Finding *táam* in the forest

On our last day in Wacará, three elders and a young hunter accompanied J.C.C. and R.C.-L. into the forest (Fig. 5). With quiet confidence, they guided us along a narrow trail toward the habitat of *táam*, a place they knew well. The walk took about 45 minutes, the path winding through dense vegetation and uneven terrain. When we finally reached the site and saw the palm (Fig. 6), we stopped in amazement. It was enormous and striking, unlike anything that we had encountered. Our surprise quickly turned into joy and laughter and we embraced one another, excited by the possibility that we were looking at a species new to science. The young Cacua hunter J.C.L.-G. skillfully climbed the tall trunk to collect a leaf and an inflorescence, so we could prepare a proper botanical specimen.

As we began taking measurements and notes, J.C.L.-G showed us how the petiole of a young individual of *táam* could be crafted into a traditional tool called a *llerao* (Fig. 1B), which is used to dry cassava and prepare cassava bread. Watching the process connected the plant not only to the forest but also to daily life and subsistence.

Later, one of us (J.C.C.) asked whether we could collect an immature fruit bunch. The request was met with silence, and the men exchanged concerned looks. Sensing their hesitation, R.C.-L. gently suggested that we avoid cutting the unripe fruits since that would compromise the Cacua's food. Accordingly, we collected an infructescence that had already been harvested and left on the ground a few days earlier.

The Cacua collaborators, J.C.C. and R.C.-L. spent the rest of the afternoon photographing the palm, searching for additional individuals and hearing about its many uses and the animals that feed on its fruits. As the light began to fade, we returned to Wacará, where we carefully pressed and preserved the specimens, ending the day with a sense of discovery and gratitude.

Working together

Even after J.C.C. and R.C.-L. left Wacará, the team of Cacua and western researchers continued working together. While the Cacua made several hikes to locate more populations of *táam*, J.C.C studied its floral morphology at the Department of Systematic and Evolutionary Botany of the University of Zurich and Carolina Isaza (C.I.), Universidad Militar Nueva Granada, Colombia, examined some of the characters in the voucher specimen. Next, R.C.-L., J.C.C. and H.B discussed the new characteristics of the palm tree during a Zoom meeting, and all authors agreed that it was a new species. After that, J.C.C. and R.C.-L. developed a draft manuscript, which was shared with all the co-authors who contributed to an improved version of it. From these investigations, J.C.C.,



6. *Attalea taam.* The individual from which the type specimen was gathered.

R.C.-L, C. I and H.B found several remarkable floral characters of *táam*, which, together with other vegetative characters convinced us of the novelty of the species. Unlike other *Attalea* species, *táam* has an orange stem, male flowers with three stamens (Henderson [2020] reports 5–70 as the range for *Attalea*), staminate petals that are spatulate and covered with clustered trichomes on the adaxial surface, the abaxial petal surface is ribbed and its endocarp is lacking fibers in cross section.

Once the species was well delimited, R.C.-L. and J.C.C contacted Lucy Smith (L.S.) at the

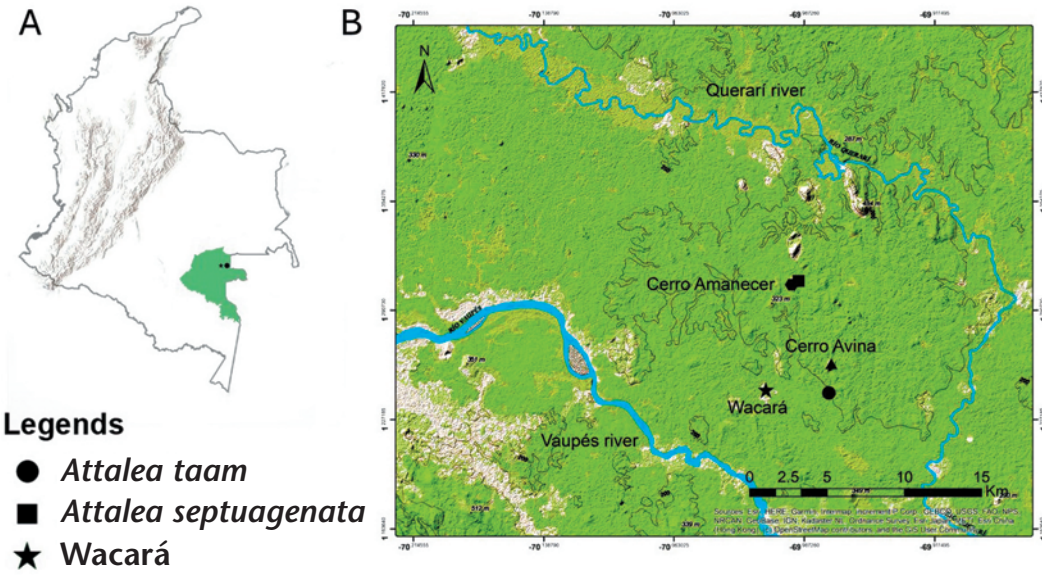
Royal Botanic Gardens, Kew and asked her to illustrate the species, crossing our fingers that she would agree. We were thrilled to hear her positive response. After sharing with L.S. the draft manuscript and field and microscopy photographs, we waited for her first draft. This was not the first time we had collaborated with L.S. and we knew her work would be absolutely perfect. Later, L.S., J.C.C and R.C.-L. met online to review the illustration and to double-check some terms. For example, we had recorded stellate hairs, but as pointed out by L.S., these were clustered trichomes. Finally, we received the final illustration. We were extremely pleased with its quality, level of detail and unique composition with the Cacua next to the palm. This is the first illustration of a new palm species that includes the indigenous co-investigators alongside the palm.

Having a draft manuscript and illustration, we started work on the distribution map of *táam*. Our first drafts were generic maps showing the department boundaries in Colombia and a dot showing the location of *táam* (Fig. 7). While informative, these did not reflect the participatory work behind the paper and paled in beauty with Lucy's illustration. One day, whilst driving back to Zürich from the Swiss Alps, R.C.-L. and J.C.C reflected on how unique it would be to make a participatory map like those of Mónica Naranjo Uribe (www.nomada-ediciones.com), who we had met a few years ago. That evening, we wrote to M.N.U., describing the story of *táam*, the research with the Cacua and the illustration by Lucy. To our joy, M.N.U. immediately replied and agreed enthusiastically to embark on this collaboration. We then contacted Samuel López-Pérez, our main Cacua collaborator, and he made a preliminary map showing the distribution of *táam* in their lands, which M.N.U. refined over several drafts. Once the map was drafted, we set a date in August 2025 to return to Wacará to share the manuscript and illustration and run a participatory mapping workshop with M.N.U. and the Cacua (Figs. 8 & 9). This trip would turn out to be one of the most rewarding experiences of our careers.

"Indigenous peer review"

Our third visit to Wacará took place in August 2025. New members of our team included the artist M.N.U. and palm ecologist Ingrid Olivares, based at the University of Zurich. The first day, we met with the community in the ceremonial house and shared a traditional communal breakfast at 6:30 a.m. of cassava bread, chili stew (*manicuera*) and beverages made from *Oenocarpus bataua*. After breakfast, J.C.C. presented the results of our investigations since March, showing the unique morphology of *táam* (Fig. 8). Next, the Spanish version of the manuscript was translated into Cacua on the spot by the secretary of Wacará. Then came a feedback session where the Cacua pointed out some omissions or inconsistencies

7. Conventional maps. A. Study area in Colombia, Vaupés department (green). B. Typical map showing species distributions alongside the limited geographic knowledge available for Amazonia from official sources.



(e.g., the animals that feed on *táam*). Finally, M.N.U. projected the first draft of the map to spark the participatory mapping phase. Immediately, several Cacua started discussing and drawing on the ground what resembled rivers and hills. Eventually, it transpired that the map needed major adjustments; the Cacua believed that it had to be redrawn. Having worked with several different indigenous groups of the Colombian Amazon, M.N.U. had come prepared. She unrolled a large sheet of paper for the Cacua to redraw from scratch the map in a process that took several hours. One Cacua led the drawing of the map, while his peers provided input on the orientation and names of the hills and creeks.

During our stay at Wacará J.C.C., R.C.-L., I.O. and M.N.U did three things to expand the information presented in the map. First, M.N.U. made a workshop with the school children to illustrate the plants and animals that grow in the Cacua's territory. Second, we conducted several in-depth interviews with Cacua elders on the geography and biodiversity of the region. Third, we made a full-day trip to Cerro Madre Monte that required spending the night in a temporary house. This trip allowed us to locate five additional populations of *táam*, which were not previously depicted on the map. The day before leaving, we hiked with the Cacua elders and children to the summit of the Cerro Amanecer. There, M.N.U. displayed the map and the Cacua elders explained to the youth the geography of the territory.

Overall, this process, which I.O. coined as the "indigenous peer-review," enabled us to share the draft manuscript within communities well before submitting it to an academic journal and to obtain feedback from indigenous contributors. It was not only a necessary step for improving the manuscript and map, but also for socializing the work with all Cacua residents of Wacará.

The last part of this wonderful history was when, on 30 September 2025, we submitted the paper to *Phytotaxa* and two months later, received positive comments from two reviewers. Then, we addressed all comments to improve the manuscript and resubmitted it. On December 31, 2025, we received the

8. Peer review by the Cacua indigenous people. A. J.C.C. Sharing the manuscript. B. Tiberio Gallego, reading the manuscript in Cacua language. C. Participatory mapping workshop.





9. Participatory map from Wacará, showing the location of *táam* and other geographic features of the region. Note that the first 15 enumerated items on the map are species of palms.

news that the paper was accepted and the paper was published on January 23, 2026. (Copete et al. 2023).

What *táam* taught us

Continuous engagement with the Cacua to locate, collect, map and disseminate *táam* led to three key insights. First, that alternative approaches to how taxonomists collaborate with local partners in the field are not only possible but highly valuable. Historically, many palm species were described by taxonomists without fully involving in the entire research process their Indigenous and local field assistants on whose lands collections were made. For example, Alfred Russell Wallace worked with thousands of assistants who himself reported as providers of key information on species limits, geographic distributions and uses, yet none were co-authors in his publications (van Wyhe, 2018; Copete et al. 2023). Practical constraints—such as the tradition among taxonomists of not revisiting the same sites—and historical sociopolitical realities likely shaped these approaches. However, more collaborative and inclusive methodologies are increasingly feasible and beneficial in contemporary research contexts. Furthermore, they are increasingly advocated to redress the colonial legacies of taxonomy and natural history collections (Park et al. 2023).

In this study, we implemented a participatory approach to describe a species long recognized by Indigenous and local communities. The process included four stages: participatory taxonomy, ecology, geography and indigenous peer review. Ongoing collaboration with the Cacua led to their inclusion as co-authors of the manuscript and species description, illustrating a model for more inclusive and ethically engaged taxonomic research. Second, we emphasize the value of participatory mapping, which can significantly enhance scientific understanding while also supporting knowledge transmission within communities. As demonstrated through the *táam* map, this approach improved our understanding of the species' distribution and ecology, helping to address the Wallacean information shortfall (lack of knowledge about species' geographic distributions) and Prestonian information shortfall (lack of knowledge about species abundances) (Hortal et al. 2015). It also provided opportunities to engage younger community members and deepen our appreciation of Cacua cultural knowledge. Finally, we highlight the importance of an indigenous peer review process—defined here as sharing manuscript drafts with communities well in advance of submission to academic journals—as a key component of ethical and intercultural research when the species was collected and described based on traditional knowledge. We highlight these cases but it is important to clarify that for species described as new based on herbarium specimens, it is less feasible to apply the methodology described here. Moreover, we acknowledge that funding and logistical constraints can pose challenges. In our case, rather than focusing exclusively on academic dissemination, we prioritized returning to Wacará to conduct the indigenous peer review. Together, these experiences taught us that sustained and community-centered engagement can both advance palm taxonomy and reorient scientific practice toward more ethical, inclusive and meaningful forms of knowledge production.

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