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Boundaries Within the *Paepalanthus chiquitensis* Species Complex (Eriocaulaceae)

Marcelo Trovó

Departamento de Botânica, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil

Correspondence: Marcelo Trovó (martrovo@gmail.com)

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ABSTRACT

Four morphotypes with associated names are presented toward a more reliable circumscription of *Paepalanthus chiquitensis*. Morphotype I, associated with the names *P. chiquitensis*, *P. speciosus* var. *bolivianus*, and *P. amoenus* var. *bolivianus*, is restricted to savannas of Bolivia and western Brazil. Morphotype II, associated with the names *P. formosus* and *P. moldenkeanus*, is distributed in Colombia and Venezuela, occurring in high-altitude shrublands and lowland savannas. Morphotype III, associated with the names *P. giganteus* and *P. speciosus* var. *pulverulentus*, is distributed in the Brazilian savannas of Southeast and Central regions. Morphotype IV, associated with the names *P. speciosus* var. *grandifolius* and *P. erectifolius* var. *glabrus*, is restricted to the Diamantina Plateau (Brazil) and adjacencies. Three names previously treated as synonymous with *P. chiquitensis* (*P. speciosus* var. *attenuatus*, *P. speciosus* f. *calvescens*, and *P. speciosus* var. *goyazensis*) are transferred to the synonymy of *P. koernickei*. A lectotype for *P. speciosus* var. *attenuatus* is also provided. Dubious morphological variants are discussed. This proposal intends to provide the basis for a forthcoming detailed taxonomic and nomenclatural revision of *P.* sect. *Diphyomene*, serving also as a guide for a taxonomic sampling in further morphometric and genomic studies.

1 | Introduction

Beyond the debate on whether to split or lump *Paepalanthus* Mart. *nom. cons.* (Eriocaulaceae, Poales) and its allied genera, the most challenging and urgent taxonomic task remains in establishing the species boundaries within a lineage of recent diversification (Christenhusz et al. 2020; Vasconcelos et al. 2020; Andrino et al. 2023, 2025; Stützel et al. 2024). Treated here in its broad sense, *Paepalanthus* s.l. stands out as a species-rich genus comprising around 500 species, exhibiting great morphological variation and a broad geographic distribution, almost exclusively restricted to the Neotropical region (Giulietti and Hensold 1990; Stützel 1998; Giulietti et al. 2012; Bánki et al. 2025).

Since the first studies on the South American Eriocaulaceae, floral merism (trimerous vs. dimerous) was used as an informative character, grounding the classification systems of Bongard (1831), Körnicke (1863), and Ruhland (1903). Although evolving multiple times in *Paepalanthus* (Andrade et al. 2010, 2022; Trovó, Andrade, et al. 2013; Andrino et al. 2021), the dimerous flowers represent a useful character for the genus taxonomy, especially when considered in combination with other reproductive and vegetative characters (Andrino et al. 2023; Stützel et al. 2024). Considering the classification system proposed by Ruhland (1903), the species of *Paepalanthus* with dimerous flowers are sorted into four unrelated categories: *P.* subg. *Thelxinoë* Ruhland, *P.* sect. *Conodiscus* Ruhland, *P.* ser. *Dimeri* Giul., and *P.* sect. *Diphyomene* Ruhland. Additionally, one species with dimerous flowers was recently described as belonging to *P.* subg. *Monosperma* Hensold (Barbosa-Silva et al. 2018).

Within these groups of dimerous flowers, most of the taxonomic and nomenclatural problems derive from the morphological variation of the poorly circumscribed species, as for example, *Paepalanthus chiquitensis* Herzog, *P. elongatus* (Bong.) Körn., and *P. trichophyllus* (Bong.) Körn. (Trovó and Sano 2010; Trovó 2018; Picanço

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et al. 2025; Silva et al. 2025; Silva and Trovó 2026). *Paepalanthus chiquitensis*, as circumscribed by Trovó and Sano (2010), presents wide morphological variation and a broad distribution in the open formations of South America, besides a long list of synonyms (Trovó, Echternacht, and Sano 2013). Within *P.* sect. *Diphyomene*, the species is manly recognized by the robust size of the individuals when compared to the other species and mainly by the bracts of the inflorescence axis decreasing in size from the base to the apex (Trovó 2010; Trovó and Sano 2010). In my unpublished Ph.D. thesis (Trovó 2010), six morphological patterns associated with geographical distribution were informally proposed, pointing out that *P. chiquitensis* deserve further studies, representing a species complex. In this regard, one morphotype from the vicinities of Brasília, Distrito Federal (Brazil) was recently described as a new species (Trovó et al. 2024).

After two decades of working on living and herbarium specimens related to this species complex and revisiting the concepts in Trovó (2010) and Trovó and Sano (2010), I establish here four morphotypes with additional comments toward a more reliable circumscription of the species. Such advances may provide the basis for a detailed revision of the entire group and aid in guiding a taxonomic sampling for morphometric, genomic, and conservation studies.

2 | Materials and Methods

The nomenclatural and taxonomic proposals presented here follow the rules and recommendations of the current International Code of Nomenclature for Algae, Fungi, and Plants–*ICN* (Turland et al. 2025). They are the result of the analysis of living and herborized specimens, with acronyms following Thiers (2025, continuously updated). When available, the specimens' barcodes are cited according to the specimen label. The species names are treated here within the broad concept of *Paepalanthus* s.l. according to Christenhusz et al. (2020) and Stützel et al. (2024), with the homotypic names presented in Andrino et al. (2023) also cited here. Within each morphotype, the names appear in chronological order in respect to their taxonomic rank. I assume a unified species concept in accordance with de Queiroz (2007) considering the systematic generalization problem (O'Hara 1993) and thus use morphology and geographical distribution as sources of evidence. The distribution map was prepared using the SimpleMappr website (https://www.simplemappr.net/) based on a single occurrence per locality, those corresponding to the selected exsiccate list provided at the end of this manuscript. Missing geographical coordinates were estimated using Google Earth (https://earth.google.com/web/).

3 | Results and Discussion

3.1 | Taxonomic Treatment

3.1.1 | Morphotype I

Paepalanthus chiquitensis Herzog, Repert. Spec. Nov. Regni Veg. 20: 86. 1924 ≡ *Coracoralina chiquitensis* (Herzog) Andrino, Taxon 72: 528. 2023.

Type: Bolivia. Chiquitos: "Häufig in den Kämpen des Cerro de Santiago, 700–800 m," May 1907, *Herzog 114* (holotype L! incomplete [fragmentary], barcode L 0803289).

Epitype: Bolivia. Santa Cruz: "Velasco Province," 19 May 1995, *J. R. Abbott 16850* (epitype designated by Trovó and Sano (2010) SPF! in 2 sheets, barcode SPF101003; isoepitypes FLAS! [image], MO!, barcode MO–1421172).

Paepalanthus speciosus var. *bolivianus* Moldenke, *Phytologia* 28: 467. 1974.

Type: Bolivia. Santa Cruz: "Velasco, 200 m," Jul 1892, *Kuntze s.n.* (holotype NY!, barcode 00102942; isotype US!, barcode 00088401).

Paepalanthus amoenus var. *bolivianus* Moldenke, *Phytologia* 61: 444. 1987.

Type: Bolivia. La Paz: "Iturralde, Sabanna Húmeda, 180 m," 2 Aug 1985, *R. Haase 685* (holotype LL!, barcode 00374656).

Notes: Herzog (1924) described *Paepalanthus chiquitensis* from fragments deposited at L (*Herzog 114*). Trovó and Sano (2010) argued that the original description and the fragmentary type specimen were insufficient to precisely circumscribe the species and designated an epitype from the vicinity of the type locality. Trovó and Sano (2010) also provided a long list of synonyms for the species, interpreting the taxon as having a wide morphological variation and geographical distribution, representing thus a species complex.

The morphotype I, associated with the names *P. chiquitensis* (Figures 1 and 2A), *P. speciosus* var. *bolivianus*, and *P. amoenus* var. *bolivianus*, has a much narrower circumscription and a restricted geographical distribution than the entire species complex as proposed in Trovó and Sano (2010). The circumscription proposed here is largely coincident with the proposition of Herzog (1924), who stated that the taxon was easily distinguished from *P. speciosus* (Bong.) Körn. (≡*P. giganteus* Sano) by the long, glabrous main inflorescence axis bracts, the short spathes, the 10-ribbed, flattened scapes, the large capitula, and the light brown involucral bracts. In fact, the most useful characters for recognizing the species are the stramineous to light-brown triangular involucral bracts, which are usually hidden by the typically wide and globose capitula, and the relatively low number of scapes per individual (usually less than 30). The main inflorescence axis bracts are not always glabrous, but they are glabrescent with a ciliate margin. Although useful for species identification, this last character approximates the morphotype I to morphotype III, so their morphological relationship should be better investigated, as discussed later in this paper. Individuals of morphotype I occur in typical savannas of Bolivia (departments of Santa Cruz and La Paz), and western Brazil (states of Mato Grosso, Mato Grosso do Sul, and Rondônia) (Figure 3).

3.1.2 | Morphotype II

Paepalanthus formosus Moldenke, Bol. Soc. Venez. Ci. Nat. 14: 11. 1952.

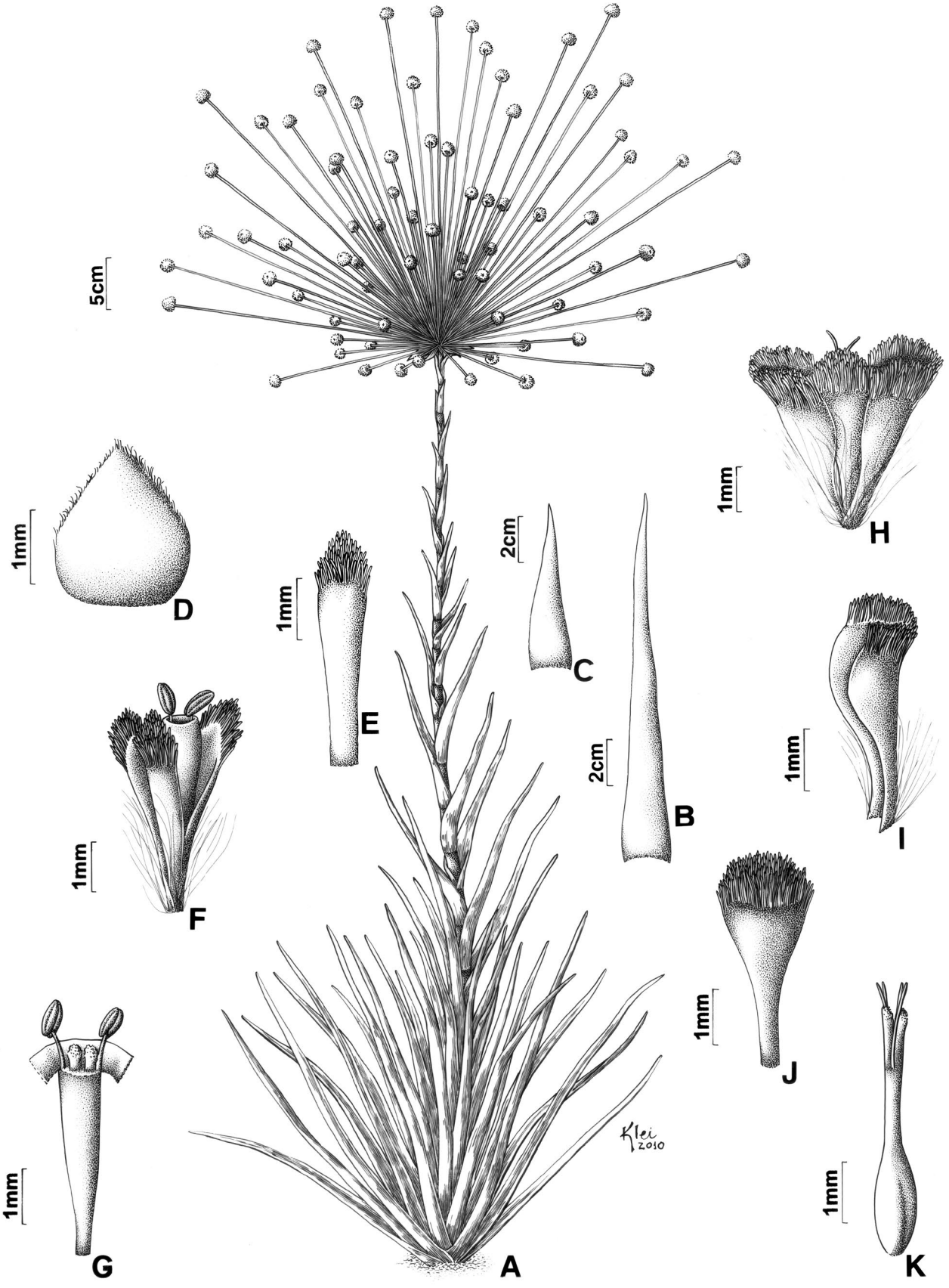


FIGURE 1 | Representative line drawings of the *Paepalanthus chiquitensis* species complex, based on the morphotype I. (A) Habit. (B) Bract from the basal part of the main inflorescence axis. (C) Bract from the upper part of the main inflorescence axis. (D) Involucral bract abaxial surface. (E) Floral bract abaxial surface. (F) Staminate flower. (G) Staminate flower with sepals removed and opened corolla. (H) Pistillate flower. (I) Sepal of the pistillate flower. (J) Petal of the pistillate flower. (K) Gynoecium (line drawings by Klei Souza based on the epitype of *P. chiquitensis*, *Abbott 16850*–SPF).

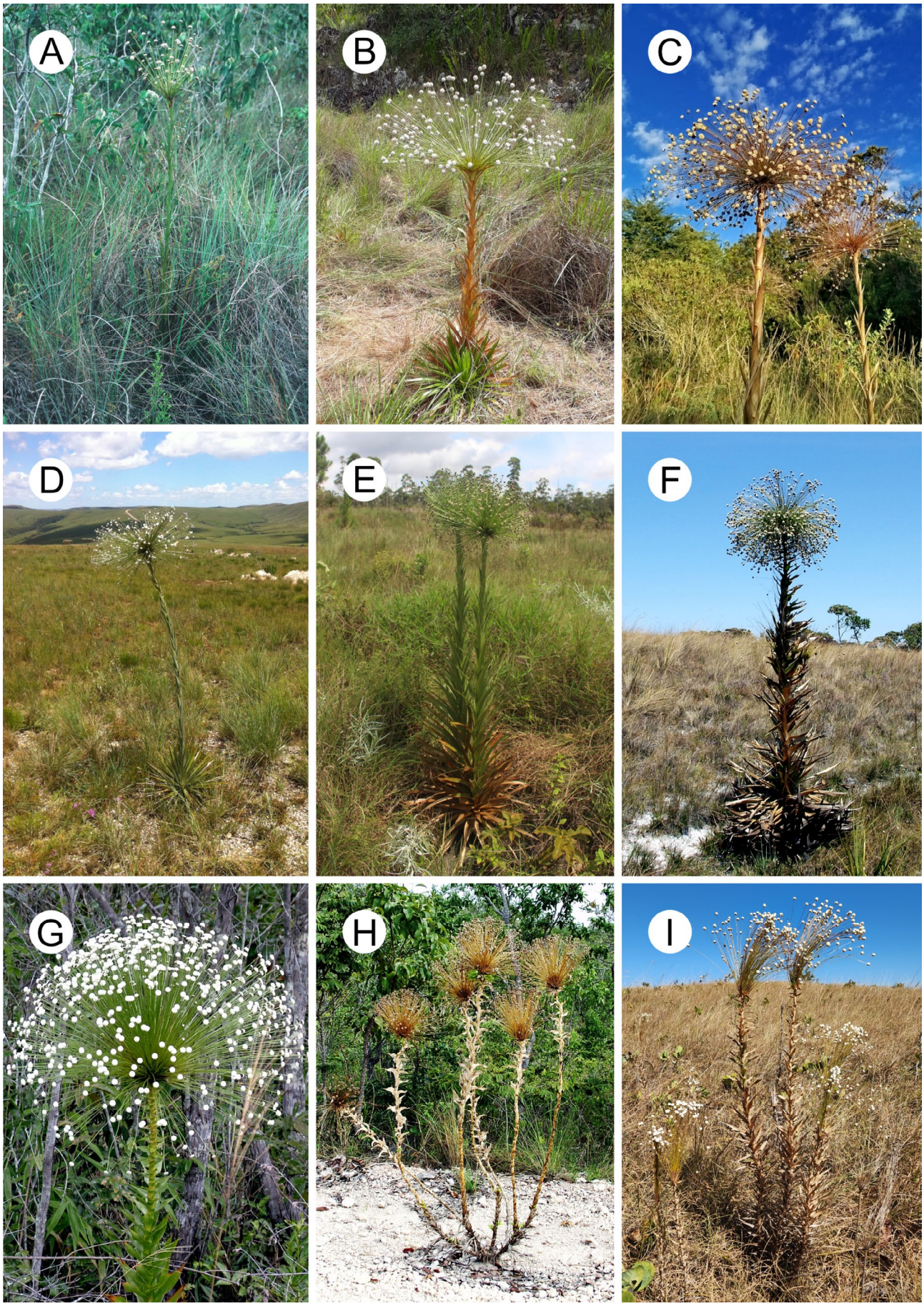


FIGURE 2 | Legend on next page.

FIGURE 2 | Representative photos of the morphotypes belonging to the *Paepalanthus chiquitensis* species complex and *P. koernickei*. (A) Morphotype I, Iturralde (Bolivia). (B) Morphotype II, San José Del Guaviare (Colombia). (C–E) Morphotype III, São Paulo, Serra da Canastra, and Brasília (Brazil), respectively. (F–G) Morphotype IV, Diamantina (Brazil). (H–I) *Paepalanthus koernickei* (Chapada dos Veadeiros [teratogenic branched individual] and Niquelândia [Brazil]), respectively (photos: (A) James Solomon. (B) Angelica María Batista Morales [available with no copyright from inaturalist.org, license code CC0]. (C) Sandra Bexiga Gianetti. (D–I) Marcelo Trovó).

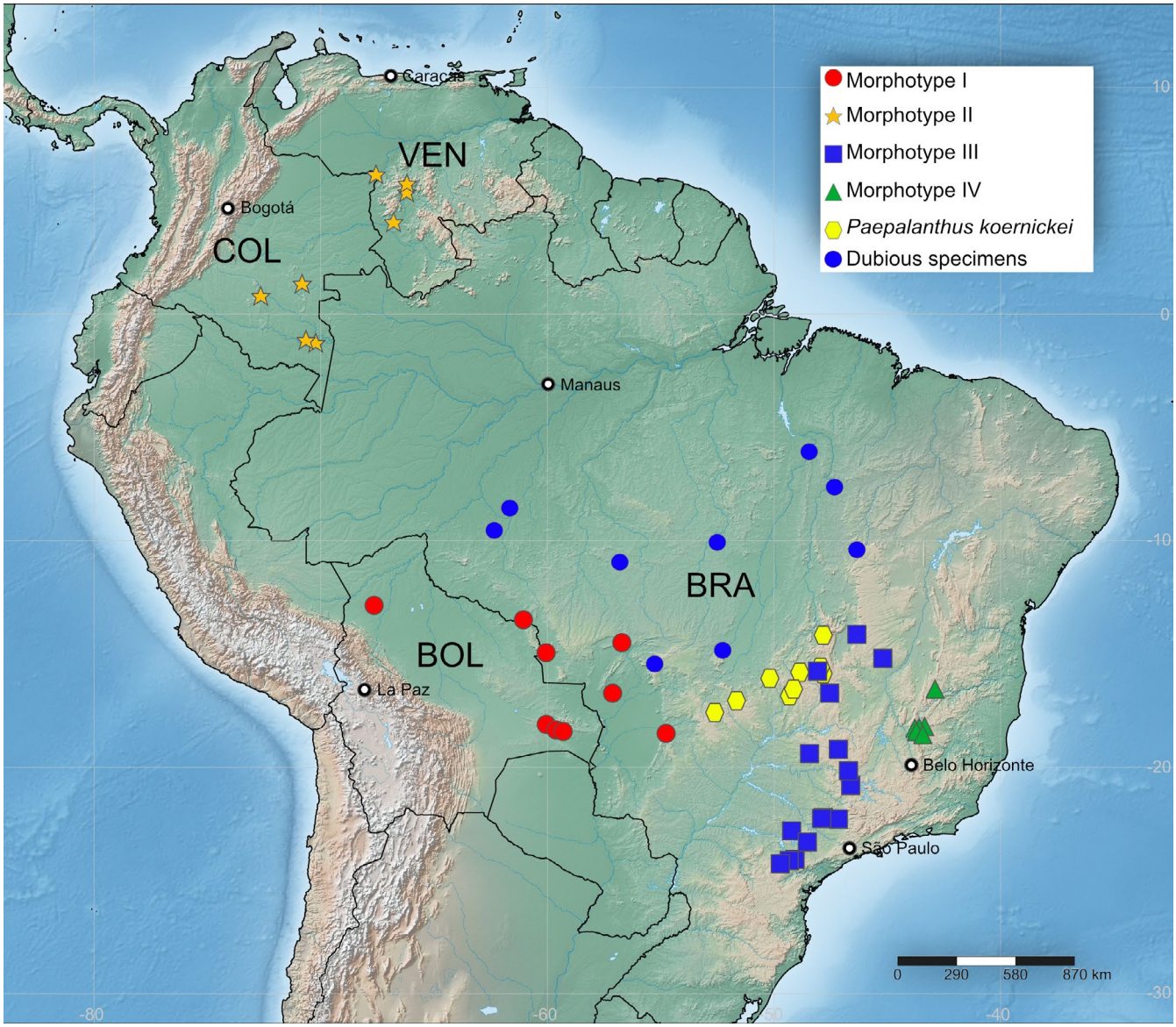


FIGURE 3 | Geographic distribution of the morphotypes of *Paepalanthus chiquitensis* and *P. koernickei*. Morphotype I, red circles. Morphotype II, orange stars. Morphotype III, blue squares. Morphotype IV, green triangles. *Paepalanthus koernickei*, yellow hexagons. Dubious specimens considered within the *P. chiquitensis* species complex, blue circles.

Type: Venezuela. Amazonas: "Cerro Guanay, alt. 2000 m," 4 Feb 1951, *B. Maguire & al. 31754* (holotype NY!, barcode 00102859).

Paepalanthus moldenkeanus R.E. Schultes, Bot. Mus. Leafl. 16: 187. table 23, 24. 1954.

Type: Colombia. Vaupés: "Quartzite savannah near headwaters, 900–1000 feet," 4–5 Oct 1951, *R. E. Schultes & I. Cabrera 14351* (holotype GH! in 2 sheets [image], barcodes 00028924, 00028925; isotypes COL! in two sheets [image], barcodes COL000006922, COL000006922, F! in two sheets [image], barcodes F0045789F, F0045790F, WIS! in two sheets [image], barcodes v 0254377 WIS, v 0254378 WIS).

Notes: *Paepalanthus formosus* was described by Moldenke (1952) from specimens gathered in the highlands of the Amazonian mountains in Venezuela. Moldenke (1952) distinguished the species mostly by its darker capitula and dark involucral bracts. Following a personal communication with Ana Maria Giulietti Harley, Hensold (1999) cited *P. moldenkeanus* R.E. Schultes, a

species described from the sandy savannas of Vaupés (Colombia), as synonymous with *P. formosus*, also commenting that both may be considered conspecific with the central Brazilian species. Trovó and Sano (2010) placed these two names under the synonymy of *P. chiquitensis*, considering the enlarged circumscription of this species in South America.

The morphotype II of *P. chiquitensis* (Figure 2B) follows the proposal of Hensold (1999). The holotype and the protologue of *Paepalanthus formosus* and *P. moldenkeanus* are quite similar, and the distinguishing color characters cited by Moldenke (1952) may be partially compromised by deriving from very old individuals. Analyzing the additional scarce specimens corresponding to those names and some images available on the internet (inaturalist.org), some morphological variation can be indeed observed. Specimens from the highlands of Venezuela tend to be taller (reaching up to 1.8 m), with inflorescence composed of more numerous and longer spathes and scapes, and with shorter and narrower bracts covering the main inflorescence axis. Those differences are here understood as variations of the same entity. The morphotype II is distributed mostly in Colombia and Venezuela, occurring both in high altitude shrublands on sandstone plateaus, and lowlands sandy savannas (Figure 3). This apparent allopatric distribution may be an artifact of sampling, as the extensive Colombian savannas are somehow connected to the savannas at the base of the Venezuelan mountains where it occurs. In this respect, the specimen *Steyermark 113826* (MO) was collected in lowlands savannas of Venezuela, closer to the mountains.

The morphological distinction of the morphotype II from the morphotype I is morphologically subtle, especially considering the smaller specimens from the lowlands of Colombia. Schultes (1954), when describing *P. moldenkeanus* (morphotype II) from such lowlands, mentions the stramineous triangular involucral bracts and the globose capitula, which are key features to the recognition of specimens belonging to the morphotype I. The original descriptions of the floral characters of those entities are also quite similar, so the main differences rely on the comparative and fragile characters such as the size of the individuals and the size and number of scapes and spathes. Those morphotypes are allopatrically distributed, with more than 1500 km separating the closest populations, representing seemingly isolated lineages. Their inclusion into an integrative study considering the full range of their morphological variation and geographical distribution would be relevant to clarify their boundaries.

3.1.3 | Morphotype III

Paepalanthus giganteus Sano, Taxon 53: 106. 2004 ≡ *Eriocaulon speciosum* Bong., Mém. Acad. Imp. Sci. St.-Pétersbourg, Ser. 6 Sci Math. 1: 636. 1831 ≡ *Paepalanthus speciosus* (Bong.) Körn., in Martius & Eichler, Fl. Bras. (3)1: 315. table 39. 1863, *nom. illeg.* non Gardner (1843) ≡ *Dupatya speciosa* (Bong.) Kuntze, Revis. Gen. Pl. 2: 746. 1891.

Type: Brazil. São Paulo: "In campis Batataes," Jun 1834, *Riedel 2300* (neotype designated by Trovó and Sano (2010) LE! in 2 sheets, barcodes LE00006210, LE00006211; isoneotypes B!, barcode B 100272348, G! in two sheets, barcode G00099170, K!, barcode K000640116, NY!, barcode 00102661, P!, barcode P00716689).

Paepalanthus speciosus var. *pulverulentus* Moldenke, *Phytologia* 10: 489. 1964.

Type: Brazil. Goiás: "Cristaleira elev. 1250 m," 30 Mar 1963, *Pereira 7476* (holotype: LL! in 2 sheets; isotype: HB! in two sheets, barcode HB000026298).

Notes: *Paepalanthus speciosus* was a name in use for many years, featuring in the most relevant and historical treatments of the family (e.g., Körnicke 1863; Ruhland 1903; Silveira 1928). The name was spotted as illegitimate by homonymy (non *P. speciosus* Gard.) and Sano (2004) proposed the new name, *P. giganteus*. Both Sano (2004) and Moldenke (1976) interpreted the collection *Riedel 2300*, collected in São Paulo (Brazil) and housed at LE, as the holotype of the basionym. Trovó and Sano (2010) pointed out that this collection was gathered a few years after the name publication and indicated the specimen as a neotype with its corresponding isoneotypes.

It is worth noting the existence of the additional specimen *Riedel 320* at LE, collected in São Paulo a few years before the name publication. Such specimen has no apparent annotations provided by August Bongard and the information presented in the protologue of *Eriocaulon speciosum*, besides vague, does not precisely match the specimen label. A further in-person analysis of the *Paepalanthus* specimens at LE and the cited unpublished plate (if that exists) may be of benefit to evaluate if the specimen *Riedel 320* was the only one available for the species description in Bongard (1831) and if it was really seen by August Bongard. In this scenario, the neotype should be superseded, and the cited specimen should be treated as the holotype in conformity with the *ICN* (Arts. 9.19).

Besides the nomenclatural imbroglio involving these names and types, the circumscription of the taxon was also a matter of debate, with many varieties proposed under *Paepalanthus speciosus* (Körnicke 1863; Ruhland 1903; Silveira 1928; Moldenke 1964, 1974, 1983), and its inclusion in the synonym list of *P. chiquitensis* (Trovó and Sano 2010). The morphotype III is considered here with a narrower circumscription and with a more restricted geographical distribution. From the discussed original specimens regarding the name *P. giganteus*, there is not much morphological confusion, as both collections, *Riedel 320* and *Riedel 2300*, were collected in close, typical savannic habitats in the state of São Paulo and thus correspond to the very same morphotype (Figure 2C). However, some variation is found along its distribution. It is mostly recognized by its robust size with specimens usually reaching more than 1.7 m, with the main inflorescence bracts pilose and ciliate, gradually becoming erect from the rosette to the apex, inflorescence with numerous scapes (usually more than 100), and wide capitula with very dark involucral bracts. This morphotype III is restricted to the savannas of Brazil (Figure 3), occurring in the states of Paraná, São Paulo, Minas Gerais (Figure 2D), Goiás, and the Federal District (Figure 2E).

Specimens from the typical savannas of eastern Mato Grosso, Brazil (e.g., the Nova Xavantina region) may also belong to this morphotype, as they share strong morphological similarities, but also some variation in size and pilosity of the main inflorescence axis and its bracts. Additionally, the morphological variation represented by specimens from northern Mato Grosso, northern Rondônia, northern Tocantins, and southern Pará and Amazonas, growing in open formations, shares some morphological similarities to morphotype III, but its consistently recurved and congested main inflorescence axis bracts, besides its usually smaller habit and narrower capitula, may be interpreted as a distinct entity. Those two morphological variants are considered dubious specimens, still retained in the *Paepalanthus chiquitensis* species complex, also related to morphotype I.

Finally, some unusually very robust (usually higher than 2.5 m) individuals occur in more typical *cerrado s.str.* formations around the Almécegas Waterfalls and behind the ICMBio director house and the scientific lodging, both in Chapada dos Veadeiros region. Those are related to the morphotype III but may represent a distinct new species. Its relation to the specimens occurring in adjacent open formations (*campos limpos*) and its relation to specimens of the morphotype III occurring in the Serra da Canastra (Minas Gerais state) still deserve further investigation.

3.1.4 | Morphotype IV

Paepalanthus erectifolius var. *grandifolius* Silveira, Floral. Mont. 1: 192. 1928.

Type: Brazil. Minas Gerais: "In campis in Chapada do Couto," Apr 1918, *Silveira 711* (holotype R! in two sheets, barcode R000181852).

Paepalanthus erectifolius var. *glabrus* Silveira, Floral. Mont. 1: 192. 1928.

Type: Brazil. Minas Gerais: "In campis prope Itambé do Serro," May 1908, *Silveira 499* (holotype R!). *syn nov.*

Notes: Silveira (1928) described *Paepalanthus erectifolius* var. *glabra* and *P. erectifolius* var. *grandifolia*. Trovó and Sano (2010) corrected the orthography of both varieties and placed them in the synonymy of *P. chiquitensis*. Both varieties are considered part of the same biological entity, which is geographically restricted to the Diamantina Plateau (Minas Gerais state, Brazil) and adjacent areas (Figure 3). This morphotype may be treated at the species level, given its isolated geographical distribution, but its distinguishing set of morphological traits is not fully reliable. Silveira (1928), when describing his two varieties, called attention to the robust size of the individuals, which usually have very glabrous leaves, main inflorescences axis bracts, spathes, and scapes. Besides these useful characters, this morphotype IV (Figure 2F) may also be recognized by the main inflorescence axis bracts gradually decreasing in size from the rosette to the apex, becoming patent (Figure 2G) and the numerous scapes subtending hemispherical to cylindrical capitula.

3.1.5 | Additional Nomenclatural Changes

Paepalanthus koernickei (Ruhland) Trovó (in Trovó & Sano), Phytotaxa 14: 53. 2010 ≡ *Paepalanthus speciosus* var. *koernickei* Ruhland, in Engler, Pflanzenr. 13 (IV.30): 187. 1903 ≡ *Coracoralina koernickei* (Ruhland) Andrino, Taxon 72: 528. 2023.

Type: Brazil. Minas Gerais: "In campis Catalão–Paracatu," Sep 1834, *Lund 566* (holotype C! in 2 sheets, barcodes C10011016, C10011017).

= *Paepalanthus speciosus* var. *attenuatus* Moldenke, *Phytologia* 28: 466. 1974.

Type: Brazil. Goiás: "Chapada dos Veadeiros," 22 Mar 1971, *H. S. Irwin & al. 32935* (lectotype, here designated LL! barcode 00374805; isolectotypes F!, barcode F0093144F [image], LL!, barcode 0374806, P!, barcode P00716688). *syn nov.*

= *Paepalanthus speciosus* f. *calvescens* Moldenke, *Phytologia* 28: 467. 1974.

Type: Brazil. Goiás: "Prov. de Goyaz," May–Jul 1884, *Weddell 2133* (holotype NY!, barcode 00102943; isotypes P! barcode P00716699, P! in two sheets, barcodes P00716700, P00716701). *syn nov.*

= *Paepalanthus speciosus* var. *goyazensis* Moldenke, *Phytologia* 52: 414. 1983.

Type: Brazil. Goiás: "Chapada dos Veadeiros," 16 Apr 1956, *E. Yale Dawson 14271* (holotype LL!, barcode 00374807). *syn nov.*

Notes: *Paepalanthus koernickei* (Figure 2H–I) can be recognized by its amplexicaul, recurved to patent, and usually very glabrous bracts of the main inflorescence axis, those being roughly of the same size along the axis, and its relatively narrower capitula with very dark involucral bracts. As such, the species does not belong to the *P. chiquitensis* species complex, although its morphological and phylogenetic relations deserve further studies. This circumscription includes the morphological variation represented by the type specimens of *P. speciosus* var. *attenuatus*, *P. speciosus* var. *goyazensis*, and *P. speciosus* f. *calvescens*. With the addition of these synonyms, the species is distributed in the Federal District (Brasília) and Goiás state (Chapada dos Veadeiros, Caldas Novas, Cavalcante, Cristalina, Niquelândia, the Serra Dourada, and adjacent areas) (Figure 3). Individuals of this species are usually found at the edges of gallery forests or in *cerradão* formations intermixed with small trees, and more rarely growing in open formations.

Moldenke (1974) described *Paepalanthus speciosus* var. *attenuatus* having as source the collection *H. S. Irwin et al. 32935* from the *Chapada dos Veadeiros* and stated that the type was deposited at his personal herbarium in Plainfield, New Jersey. His personal herbarium is now housed at the LL herbarium, where there are two specimens corresponding to this collection, both consisting of part of an inflorescence. These are to be considered different specimens rather than a single gathering mounted on

two sheets, as is frequently seen for complete specimens belonging to *P.* sect. *Diphyomene*. This interpretation is reinforced by the specimen at F, which is also part of an inflorescence, and is the same interpretation given by Harold Moldenke, who attached distinct labels to the specimens, one as "type" and the other as "isotype" in 1974 and 1978, respectively. According to the rules of the current *ICN* (Arts. 9.3 and 9.11), I select the specimen at LL with barcode 00374805 as the lectotype, as it is in good condition and carries the "type" label attached by Harold Moldenke himself.

3.2 | Final Remarks

Species delimitation is especially challenging within lineages of recent diversification and considerable morphological plasticity (O'Hara 1993; Kunz 2012). Using alpha-taxonomy to circumscribe such taxa is dependent on one's expertise and a personal interpretation of the morphological variation of a given group. This traditional set of methods has therefore its limitations and the results should be seen as hypotheses to be tested using different integrative methods (de Queiroz 2005, 2007). The morphotypes presented here should be subject to testing considering the great morphological variation of this group, the scarcity of specimens from some localities and morphological variants, and the many hybrids and damaged specimens observed in the field and in herbaria. Unfortunately, many of the specimens available are often incomplete, lacking the basal parts of the plants, preventing a correct identification. The flowers of the morphotypes within the *P. chiquitensis* may also be useful for the taxon delimitation but must be analyzed with especial attention. Those are quite similar and the usually taxonomically significant pilosity of the floral parts is quite variable, particularly when considering phenology. An analysis of the flowers at the population level would be an appropriate approach.

In the course of studying the dried and living specimens of *Paepalanthus* sect. *Diphyomene* with the aim of splitting *P. chiquitensis* (sensu Trovó and Sano 2010) into more reliable entities according to morphology and geographical distribution, some morphological variants remain dubious. Those are somehow disconnected from the main morphological complexity of the group but still should be treated as *P. chiquitensis* until a proper morphometrical and molecular analysis can clarify the species boundaries. Somes of these specimens were previously commented here (those included in the map, Figure 3) or in previous works, as the collections from the municipality of Minuaçu (Goiás), which are closely related to *P. burle-marxii* Trovó (Trovó et al. 2024). Other materials previously identified as *P. chiquitensis* are indeed more difficult to relate to the *P. chiquitensis* species complex as recognized here and are commented below (those not included in the map).

The morphological variation of the populations restricted to the *Serra do Cabral* (Minas Gerais state), usually identified as *Paepalanthus chiquitensis*, does not fit the range of variation of *P. chiquitensis* (morphotype IV) and *P. erectifolius*, the most common taxa occurring in the vicinities. The isolated distribution of such populations and the shape of main inflorescence axis bracts point to a yet undescribed species. Finally, there is a set of intriguing specimens from the slopes of the mountains in Jalapão (Tocantins state), and adjacencies in the states of Maranhão and Piauí. Those share similarities with *P. koernickei* but are usually more gracile plants. It is unfortunately scarcely represented in herbaria, and additional specimens are required to precisely decide if it is a new species or a morphological variation.

Selected exsiccate list: Morphotype I, Bigio 228 (RON), Cardenas 4513 (US), Herzog 114 (L), Pires 16333 (NY), Pott 2232 (SPF), Simon 2137 (CEN), Souza 16620 (ESA), Torke 675 (NY), Wood 16481 (K); Morphotype II, Castroviejo 12021 (HUFES), Córdoba 1624 (COL), Maguire 31754 (NY), Maguire 35423 (NY), Mandriñan 1105 (K), Schultes 18385 (US), Steyermark 113826 (MO), Zarucchi 2020 (US); Morphotype III, Aguiar 1342 (SPSF), Barbosa s.n. (HUFU), Barreto 2411 (ESA), Dusén 16966 (US), Echternacht 2469 (HUFU), Eiten 2724 (NY), Farinaccio 501 (SPF), Fonseca 1905 (IBGE), Irwin 13425 (NY), Irwin 14532 (NY), Kirkbride 5282 (US), Mendes 578 (HUFU), Myiagi 381 (ESA), Pilon 310 (UEC), Souza 506 (ESA), Trovó 382 (SPF); Morphotype IV, Andrino 33 (SPF), Giulietti CFCR 4700 (SPF), Lima 98 (SPF), Maguire 49187 (NY), Trovó 350 (SPF), Trovó 427 (SPF); Paepalanthus koernickei, Alkimin 8 (UB), Anderson 9996 (NY), Anderson 10461 (NY), Delprete 10119 (NY), Delprete 10228 (NY), Hatschbach 34631 (MBM), Irwin 5313 (NY), Irwin 17860 (NY), Simon 3051 (CEN); Dubious specimens, Aragão 172 (IAN), Capistrano 38 (RON), Lombardi 10068 (HRCB), Pereira-Silva 14297 (CEN), Piva 52 (RB), Ratter 459 (K), Souza 15351 (SPF), Trovó 289 (SPF), and Watanabe 364 (SPF).

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Conflicts of Interest

The author declares no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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