



An illustrated checklist of Bromeliaceae from Parque Estadual do Rio Preto, Minas Gerais, Brazil, with notes on phytogeography and one new species of *Cryptanthus*

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Abstract

A checklist of the 14 genera and 34 species of Bromeliaceae from the Parque Estadual do Rio Preto in São Gonçalo do Rio Preto municipality, Minas Gerais state, southeastern Brazil, is presented. The Tillandsioideae was the most diverse subfamily and was found to be concentrated in rocky field areas. Bromelioideae is also a species rich subfamily, but its taxa have shown a preference to forested areas and savannas at lower altitudes. Pitcairnioideae is highlighted by its level of endemism, but has only four species. *Cryptanthus micrus*, a new species found in this area is described and illustrated. Our cluster analysis indicated that the Rio Preto State Park has a Bromeliaceae flora more similar to that from Pico do Itambé and Grão Mogol State Parks. Taxa like *Dyckia glandulosa*, *Orthophytum itambense* and *Vriesea medusa*, which were previously considered to be endemic to Pico do Itambé, now have their area of occurrence extended to Rio Preto. These new occurrences highlight the importance to create a corridor joining these neighboring reserves to connect populations of narrowly ranged or rare species. In this work we present pictures of 19 species in their habitats within the park, and we hope that these illustrations will help in the identification and conservation of these taxa.

Key words: *Cadeia do Espinhaço*, *campo rupestre*, Bromelioideae, Diamantina Plateau

Introduction

The Espinhaço mountain range in Brazil is floristically one of the richest regions in the world (Giulietti *et al.* 1997). This mountain range extends more than 1,000 km from Minas Gerais to Bahia State and has strong ecotonal characteristics that divide different biological zones and phytogeographical domains. Detailed characterizations of the Espinhaço range vegetation and patterns of plant species distribution can be found in Giulietti *et al.* (1987, 1997), Stannard (1995), Pirani *et al.* (2003), Zappi *et al.* (2003). Similar information can be found in a recent special issue of a journal edited by Conservation International and Instituto Biotrópicos in Brazil called Megadiversidade (Azevedo & Machado 2008). Most of these works highlight the importance of *campo rupestre* vegetation (rocky fields or grasslands with rocky soil) for endemic or narrowly ranged species.

The knowledge of the Bromeliaceae flora of Minas Gerais is in a state of flux and is progressively increasing due to several inventories focusing on small areas. This knowledge has revealed new data and in

some cases new taxa, which allows the elaboration of the taxonomic treatment of this family for the Flora of Minas Gerais in the near future. Because of the current collection effort focused on areas of rocky fields along the Espinhaço range in detriment of other vegetation types (Versieux & Wendt 2007), it is not surprising that such vegetation still bring to light new records for the state or even new species. After all the Espinhaço range is the most important area of endemism for Bromeliaceae in Minas Gerais (Versieux & Wendt 2006, 2007). An updated list of all Bromeliaceae species from the Espinhaço range indicates that few species are widespread, revealing a high level of endemism, and few taxa are shared by distinct sectors of this range (Versieux *et al.* 2008).

The Parque Estadual do Rio Preto is an important reserve located along the Espinhaço range and has a mosaic of physiognomies inside its limits. This area encompasses the savanna (*cerrado*), secluded pockets of forests within the savanna (*capões*), varied kinds of forests, and rocky fields or grasslands (*campo rupestre*). These wide varieties of habitats are also associated with different substrates along an elevation gradient.

This study attempts to list all Bromeliaceae known to occur in Parque Estadual do Rio Preto (PERP), and present colored illustrations of bromeliads inside the park. One new species of *Cryptanthus* was found which is described below. We anticipate that this illustrated catalogue will aid the identification, conservation and environmental education projects within this reserve. We also discuss the phytogeographical aspects of floristic similarity of Bromeliaceae among different reserves in Minas Gerais, and compare these with the PERP.

Material and methods

Study site

The Parque Estadual do Rio Preto (PERP) is a state park situated at the Diamantina Plateau region in the municipality of São Gonçalo do Rio Preto. The Diamantina Plateau is part of the Espinhaço range, which is situated in the north central part of Minas Gerais. The PERP is located ca. 56 km northeast of the town of Diamantina. With a total area of approximately 130 km², it is delimited by the Rio Preto river basin (43°18'W to 43°21'W and 18°14'S to 18°03'S) and it has an elevation range from near 700 m to 1826 m on the Pico Dois Irmãos.

Distribution patterns of the vegetation at the study site are clearly associated to factors of elevation and edaphic gradients. Savannas, riparian forests and rocky fields are associated to the quartzite outcrops that cover the lower quotes, from ca. 700 to 1000 m elevation. Above 1000 m the rocky field vegetation is dominant, but riparian forests, evergreen montane forests, and open bogs are found as well (Fig. 1). Around Pico Dois Irmãos, above 1700 m, the rocky fields are quite distinct, resembling those found at Pico do Itambé, the highest mountain in the Diamantina Plateau.

Methods

Herbarium specimens collected at PERP were deposited in the herbarium of the Federal University of Minas Gerais (BHCB) as a result of an ongoing project to inventory the PERP's flora, carried out by BHCB. Since 1999 more than 30 expeditions to the area were made and some conspicuous families, such as Bromeliaceae, are currently sampled to satisfaction. During fieldwork all vegetation types in PERP were visited during different seasons. Fertile specimens of bromeliads were collected, photographed and identified. Duplicates were sent to the herbarium of the Instituto de Botânica (SP). Notes on the distribution and abundance (based on simple visual estimates) of the species, as well as the type of vegetation and geographical reference using GPS were taken in the field. Additionally 14 herbaria were consulted and added to the database of Bromeliaceae in Minas Gerais (Versieux, unpublished data). The species were ranked in four categories according to their apparent abundance in the PERP: common (widespread in several vegetation types), occasional (common only in one or two specific types of vegetation), rare (population limited to a particular place or environmental condition, but several individuals observed) and very rare (only few individuals

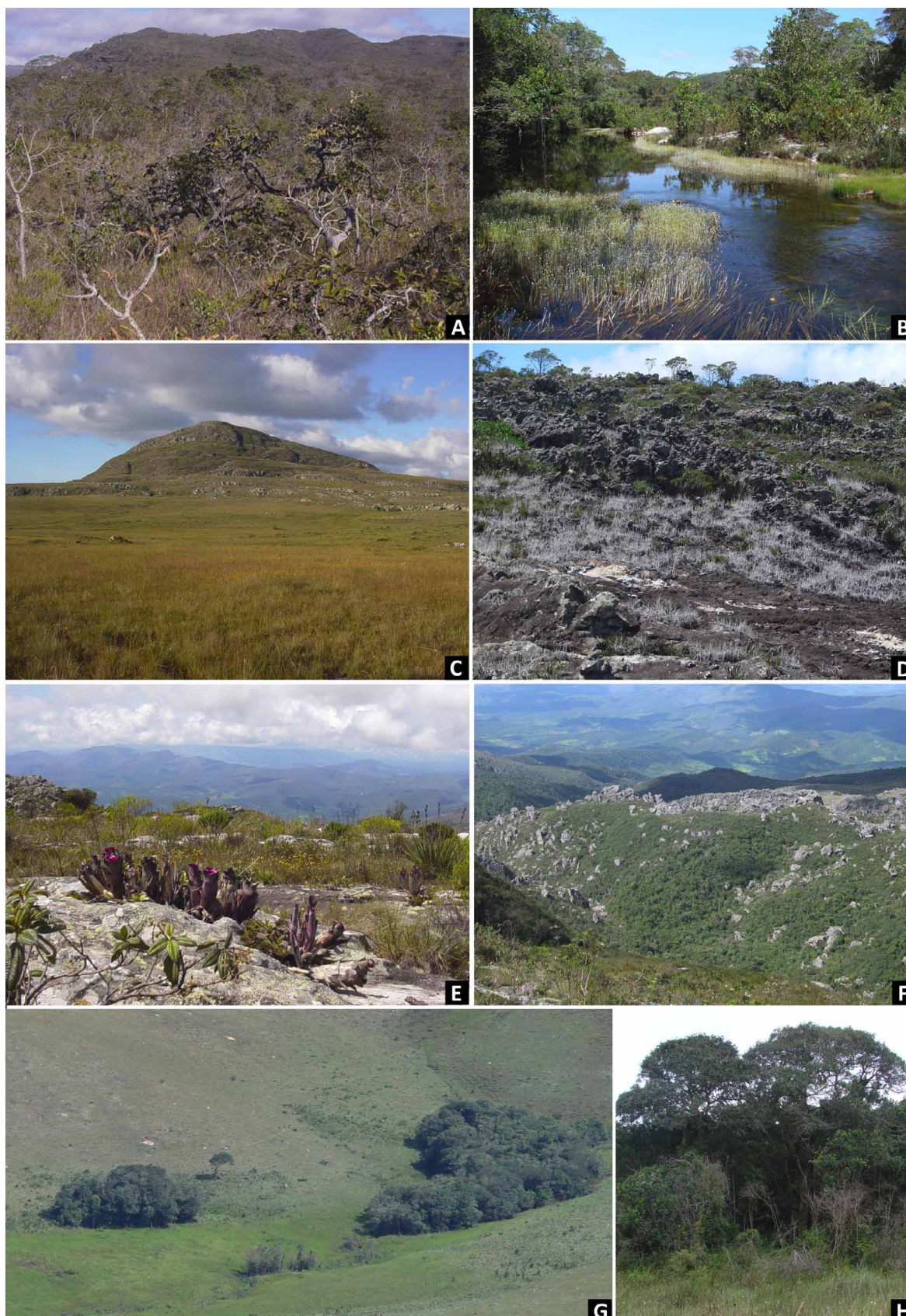


FIGURE 1. Some types of vegetation found inside the Parque Estadual do Rio Preto. A. *Cerrado sensu stricto*. B. Riparian forest, around rio Preto. C. Open grasslands with the Pico Dois Irmãos (1826 m) behind. D. Quartzite outcrops with *campo rupestre* vegetation. Note a dense population of *Tillandsia streptocarpa*. E. *Campo rupestre* on the Pico Dois Irmãos, featuring *Billbergia vittata*. F. Semideciduous forest. G. Patches of evergreen high altitude forests surrounded by open grasslands, locally called *capão*. H. Border of a *capão*. (Photos by Pedro L. Viana)

observed in a particular place or under an specific environment condition). The floristic similarities of Bromeliaceae between the PERP and other areas in Minas Gerais State were analyzed with BioDiversity Pro Version 2/1997 (The Natural History Museum & Scottish Association for Marine Science), which was used to generate a presence and absence matrix, calculate the Jaccard distance equation, and create a dendrogram using the Group Average. Data from Bromeliaceae occurrence in other areas were compiled from the following sources: Serra do Cipó (Forzza & Wanderley 1998, Santos 2008, Coffani-Nunes *et al.* in press), Serra do Caraça (Versieux *et al.*, unpublished data), Parque Estadual do Pico do Itambé (Versieux 2008), Grão Mogol (Wanderley & Forzza 2003, Leme & Paula 2008), Parque Estadual do Ibitipoca (Monteiro & Forzza 2008), Parque Estadual do Itacolomi (Coser *et al.* 2010) and Parque Estadual do Rola Moça (Guarçoni *et al.* 2010). Morphospecies or undetermined taxa cited in these references were excluded from the matrix.

Results and discussion

Species richness and phytogeography

The Parque Estadual do Rio Preto supports 14 genera and 34 species of Bromeliaceae (Tab. 1, Figs. 2–5). Tillandsioideae is the richest subfamily (3 genera/16 species) and is concentrated in open elevated areas of rocky field vegetation. It is followed by the Bromelioideae (8 genera/14 species) that has more representatives in forested areas, including the riparian forests at lower elevations and in the savannas. Pitcairnioideae (3 genera/4 species) occur either in open areas of rocky fields or rupicolous along the margins of streams and rivers at lower elevations. The most diverse genus was *Vriesea*, followed respectively by *Tillandsia*, *Billbergia*, *Aechmea* and *Orthophytum* (Fig. 6).

TABLE 1. List of Bromeliaceae from Parque Estadual do Rio Preto, MG, Brazil. Taxa are organized by subfamily and followed by the collector and one voucher (herbarium in parentheses). The distribution within the park is listed as follows: habitat (CER—*cerrado sensu stricto*, CR—*campo rupestre*, including open grasslands and quartzite outcrops, MSF—montane semideciduous forest, EMF—evergreen montane forest (*capão* or *mata nebulosa*), RFO—riparian forest), elevation, life form (Epi—Epiphyte, Rup—Rupicolous, Ter—Terricolous) and abundance within the park (c = common, o = occasional, r = rare, vr = very rare). * Endemic to Minas Gerais, † Endemic to the Diamantina Plateau.

SUBFAMILY	Distribution
Taxon and voucher	
BROMELIOIDEAE	
<i>Aechmea bromeliifolia</i> Baker ex Benth. & Hook. f. var. <i>albobracteata</i> Philcox J.A. Lombardi 4857 (BHCB).	MSF, RFO; 800–1000 m; Epi, Ter. (o)
<i>Aechmea nudicaulis</i> Griseb. var. <i>aureorosea</i> (Antoine) L.B.Sm. J.A. Lombardi 4133 (BHCB).	CR, EMF; 1000–1800 m; Epi, Rup. (o)
<i>Aechmea phanerophlebia</i> Baker J.A. Lombardi 3830 (BHCB).	MSF, RFO, CR; 800–1500 m; Epi, Rup. (c)
<i>Ananas ananassoides</i> (Baker) L.B.Sm. J.A. Lombardi 3571 (BHCB).	CER; 800–1300 m; Ter. (o)
<i>Billbergia amoena</i> (G.Lodd.) Lindl. var. <i>amoena</i> J.A. Lombardi 4135 (BHCB).	CAP, RFO, MSF, CR; 750–1500 m; Rup. (c)
<i>Billbergia iridifolia</i> (Nees & Mart.) Lindl. var. <i>iridifolia</i> Only photographed	EMF; ~1500 m; Rup. (r)
<i>Billbergia vittata</i> Brongn. M.G.L. Wanderley 2594 (BHCB, SP).	CR, EMF; 1400–1800 m; Rup. (o)
<i>Billbergia zebrina</i> (Herb.) Lindl. J.A. Lombardi 4548 (BHCB).	CER, MSF, RFO; 700–1400 m; Epi, Rup. (c)

<i>Bromelia balansae</i> Mez <i>J.A. Lombardi 3451</i> (BHCB).	CER; 700–1300 m; Ter. (o)
<i>Canistrum flavipetalum</i> Wand. <i>P.L. Viana 1734</i> (BHCB, SP).	EMF; 1500–1600 m; Epi, Ter. (r)
† <i>Cryptanthus micrus</i> Louzada, Wand. & Versieux <i>Mota et al. 1474</i> (BHCB, SP).	CR; 1000–1400 m; Rup. (r)
<i>Neoregelia bahiana</i> (Ule) L.B.Sm. <i>M.G.L. Wanderley 2596</i> (BHCB, SP).	CR; > 1000 m; Rup. (o)
† <i>Orthophytum itambense</i> Versieux & Leme <i>N.F.O. Mota 1507</i> (BHCB).	RFO; 800–900 m; Rup. (r)
† <i>Orthophytum schultzeianum</i> Leme & M.Machado <i>P.L. Viana 3706</i> (BHCB).	CR; 900–1600 m; Rup. (o)
PITCAIRNIOIDEAE	
† <i>Dyckia glandulosa</i> L.B.Sm. & Reitz <i>M.G.L. Wanderley 2623</i> (BHCB, SP).	CR; 1400–1800 m, Rup. (o)
† <i>Encholirium magalhaesii</i> L.B.Sm. <i>J.A. Lombardi 3568, 3569, 3908</i> (BHCB).	CR; 1100–1500 m; Rup. (o)
* <i>Pitcairnia bradei</i> Markgr. <i>J.A. Lombardi 4136</i> (BHCB).	RFO; 800–900 m; Rup. (r)
* <i>Pitcairnia curvidens</i> L.B.Sm. & Read <i>P.L. Viana 1295</i> (BHCB).	CR; > 1700 m; Rup. (vr)
TILLANDSIOIDEAE	
† <i>Alcantarea duarteana</i> (L.B.Sm.) J.R.Grant <i>R.C. Mota 3137</i> (BHCB)	CR; ~1400 m; Rup. (vr)
† <i>Vriesea diamantinensis</i> Leme <i>N.F.O. Mota 1504</i> (BHCB).	CR; 1300–1600 m; Rup. (o)
† <i>Vriesea densiflora</i> Mez <i>P.L. Viana 1519</i> (BHCB).	CR; > 1750 m; Rup. (vr)
<i>Vriesea friburgensis</i> Mez var. <i>friburgensis</i> <i>P.L. Viana 1257</i> (BHCB).	EMF, RFO; 1200–1600 m; Epi. (o)
† <i>Vriesea medusa</i> Versieux <i>N.F.O. Mota 1265</i> (BHCB)	CR; 1500–1800m; Rup. (r)
* <i>Vriesea aff. jonghei</i> (Libon ex K.Koch) E.Morren <i>Only photographed</i>	CR; 1500–1700 m; Rup. (o)
† <i>Vriesea nanuzae</i> Leme <i>Only photographed</i>	CR; ~1500 m; Rup. (r)
<i>Vriesea oligantha</i> (Baker) Mez <i>N.F.O. Mota 831</i> (BHCB)	CR; 1400–1600 m; Epi, Rup. (o)
<i>Vriesea procera</i> Wittm. var. <i>tenuis</i> L.B.Sm. <i>R.B. Louzada 67</i> (BHCB).	EMF, RFO; 1400–1600 m; Epi. (r)
<i>Vriesea schwackeana</i> Mez <i>P.L. Viana 1772</i> (BHCB).	EMF; ~1700 m; Epi. (vr)
<i>Tillandsia gardneri</i> Lindl. <i>R.B. Louzada 64</i> (BHCB)	MSF, RFO, EMF, CR; 800–1600 m; Epi, Rup. (c)
<i>Tillandsia recurvata</i> (L.) L. <i>R.B. Louzada 65</i> (BHCB).	MSF, RFO, EMF, CR; 700–1800 m; Epi, Rup. (c)
<i>Tillandsia streptocarpa</i> Baker <i>M.G.L. Wanderley 2582</i> (BHCB, SP)	CR; 1100–1600 m, Rup. (o)
<i>Tillandsia stricta</i> Sol. <i>P.L. Viana 1204</i> (BHCB)	MSF, RFO, EMF; 700–1500 m; Epi, Rup. (c)
<i>Tillandsia tenuifolia</i> L. var. <i>tenuifolia</i> <i>N.F.O. Mota 827</i> (BHCB)	EMF, RFO; 1400–1600 m; Epi. (r)
<i>Tillandsia usneoides</i> (L.) L. <i>N.F.O. Mota 747</i> (BHCB)	EMF, RFO; 1200–1800 m; Epi. (o)



FIGURE 2. A. *Aechmea nudicaulis* var. *aureorosea*. B. *Aechmea phanerophlebia*. C.-D. *Alcantarea duarteana*. C. Individual in the habitat. D. Blooming under cultivation. E. *Billbergia amoena* var. *amoena*. F. *Billbergia iridifolia* var. *iridifolia*. G.-H. *Billbergia zebrina*. G. Inflorescence. H. View of the inflorescence from below. I.-J. *Billbergia vittata*. I. Habit. J. Detail of the flowers. K. *Canistrum flavipetalum*. L.-M. *Cryptanthus micrus*. L. Blooming individual. M. Habit. N.-P. *Encholirium magalhaesii*. N. Habit. O. Inflorescence visited by hummingbirds. P. Detail of the inflorescence at the postanthesis. (Photos: A., B., G., H., I., J., L., N., O., P. by Pedro L. Viana; E., F., M. by Nara F. O. Mota; C. by Rubens Mota, D. Leonardo Versieux).



FIGURE 3. A. *Neoregelia bahiana*. B. *Orthophytum itambense*. C. *Orthophytum diamantinense* D.-E. *Pitcairnia bradei*. D. Habit. E. Inflorescence. F. *Pitcairnia curvidens*. G. *Tillandsia gardneri*. H.-I. *Tillandsia streptocarpa*. H. Habit. I. Detail of the flower. J. *Tillandsia stricta*. K. *Vriesea densiflora*. (Photos: A, D, E, F, G, H, I, J, K by Pedro L. Viana; B., C. by Nara F. O. Mota)



FIGURE 4. A.–B. *Vriesea medusa*. C.–D. *Vriesea nanuzae*. E.–F. *Vriesea* aff. *jonghei*. G. *Vriesea friburgensis*. H. *Vriesea diamantinensis*. I.–J. *Vriesea gutatta*. (Photos: A, B, E, F by Nara F. O. Mota, C, D, G, H by Pedro L. Viana, I, J by Felipe S. F. Leite)

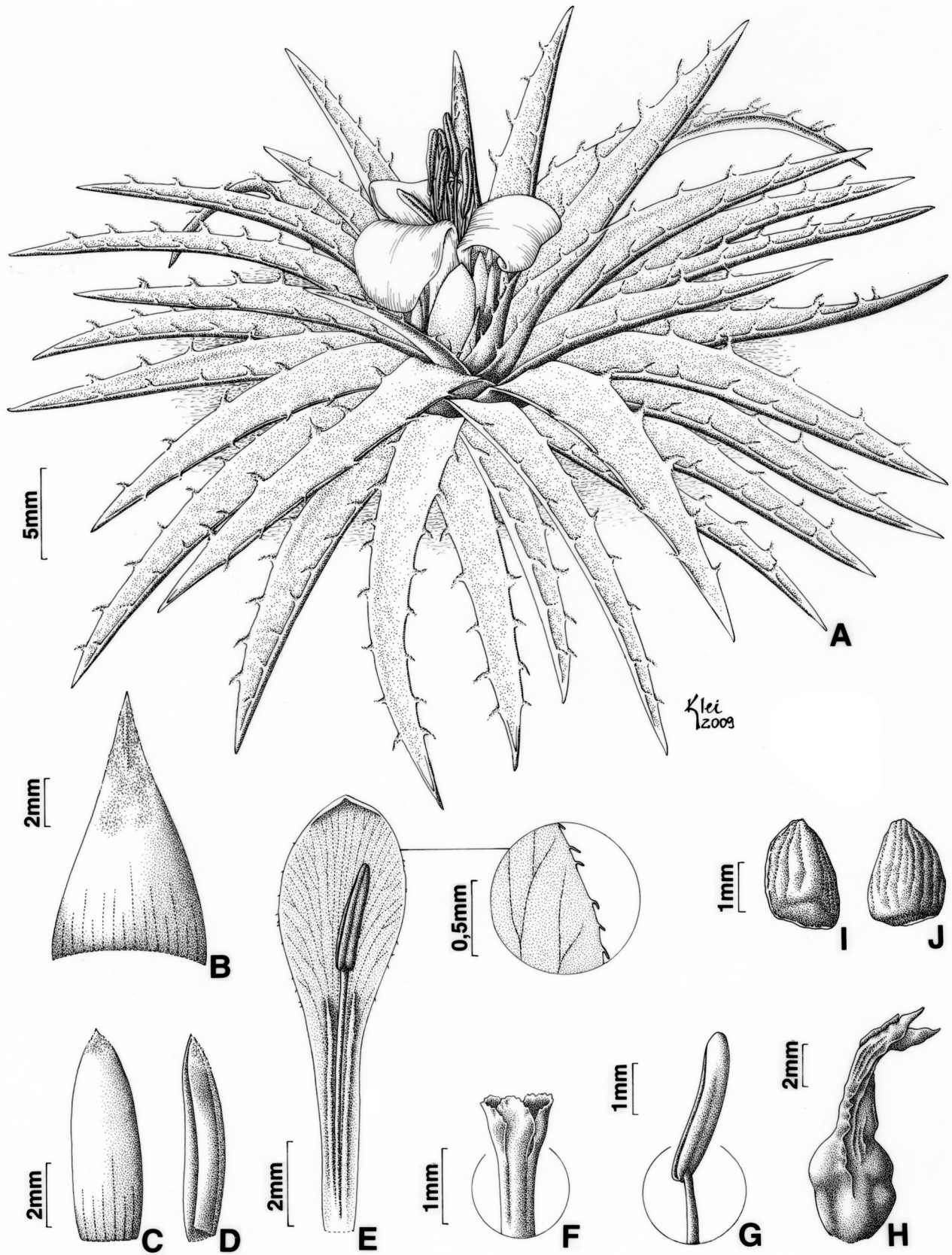


FIGURE 5. *Cryptanthus micrus* Louzada, Wand. & Versieux. A. Habit. B. Primary bract. C. Abaxial view of the sepal. D. Lateral view of the sepal. E. Petal showing the opposite stamen and two lateral calli. F. Stigma detail. G. Anther detail. H. Baccate fruit. I. Ventral view of the seed. J. Dorsal view of the seed.

Distribution of species within genera

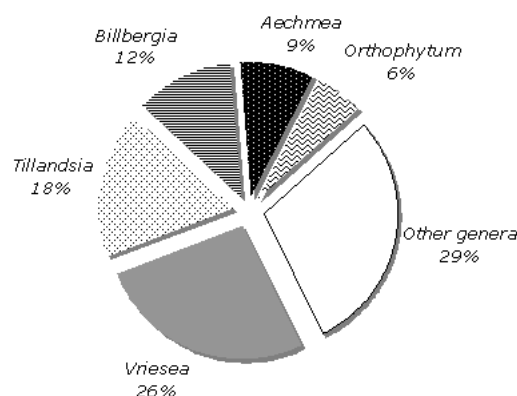


FIGURE 6. Distributions of the species within each genus that occur inside the Parque Estadual do Rio Preto, Minas Gerais.

Life forms

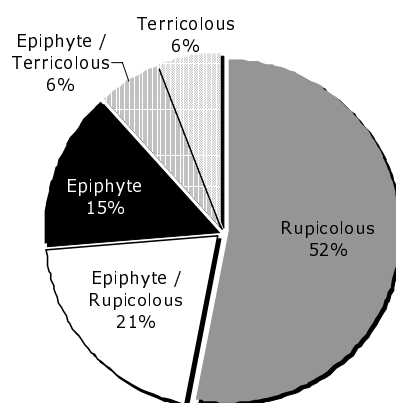


FIGURE 7. Distribution of the species within each life form categories inside the Parque Estadual do Rio Preto, Minas Gerais.

Regarding the life forms observed, the species found in PERP can be rupicolous, epiphytic or terricolous. The rupicolous life form is dominant among the species and is followed by the facultative epiphytic life form, growing either epiphytically or on rocks (Fig. 7). Versieux & Wendt (2007) found similar results for the entire state of Minas Gerais. According to these authors, the open habitats characteristic of rocky fields and savannas are probably more conducive to the establishment of rupicolous taxa due to the high degree of outcropping. Considering the bromeliads found in different surveys conducted in Minas Gerais, we observe that in general the similarity among distinct areas is low, below 50% (Figs. 8–9). This pattern was also observed by Versieux & Wendt (2007) for all bromeliads in Minas Gerais state, and apparently it arose due to the high number of endemic and narrowly distributed species. The composition of Bromeliaceae in PERP shows a greater similarity with that in Parque Estadual do Pico do Itambé, a reserve located nearby (43 km south). Three species that were considered to be restricted to the boundaries of Parque Estadual do Pico do Itambé, namely *Dyckia glandulosa* L.B.Sm. & Reitz in Smith (1967: 484), *Orthophytum itambense* Versieux & Leme (2007: 130) and *Vriesea medusa* Versieux (2008: 713), were also found in PERP, which extends their range and assures better possibilities to conserve these species, since they are no longer thought to be confined to a single reserve. Variations in collection effort may explain the difference in species richness observed between PERP and the neighboring Pico do Itambé. While PERP has been thoroughly explored for more than

a decade, Pico do Itambé only has a preliminary checklist (Versieux 2008), but it would be possible to present higher numbers of species and genera soon, because it is currently going through a more detailed, intensive floristic inventory (Versieux, in preparation).

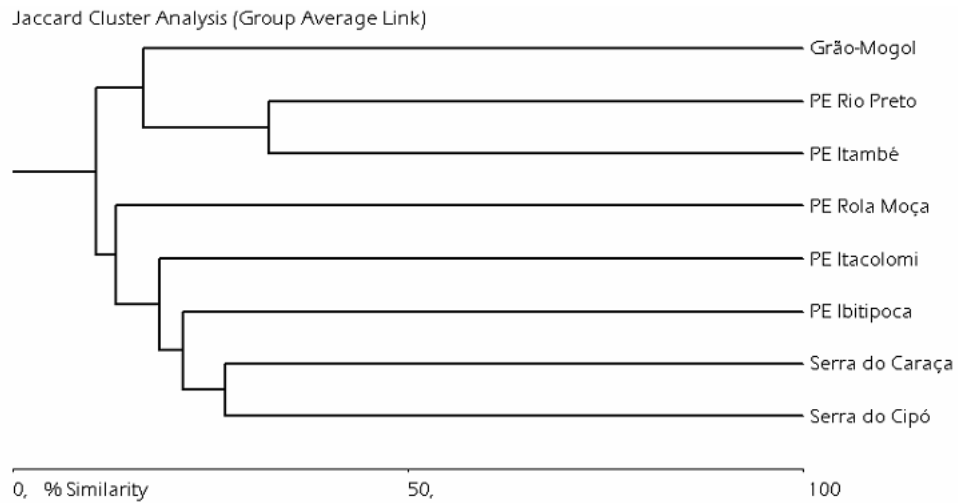


FIGURE 8. Dendrogram showing the similarity between the inventoried areas for the Bromeliaceae family at the Minas Gerais State (see text for references of data).

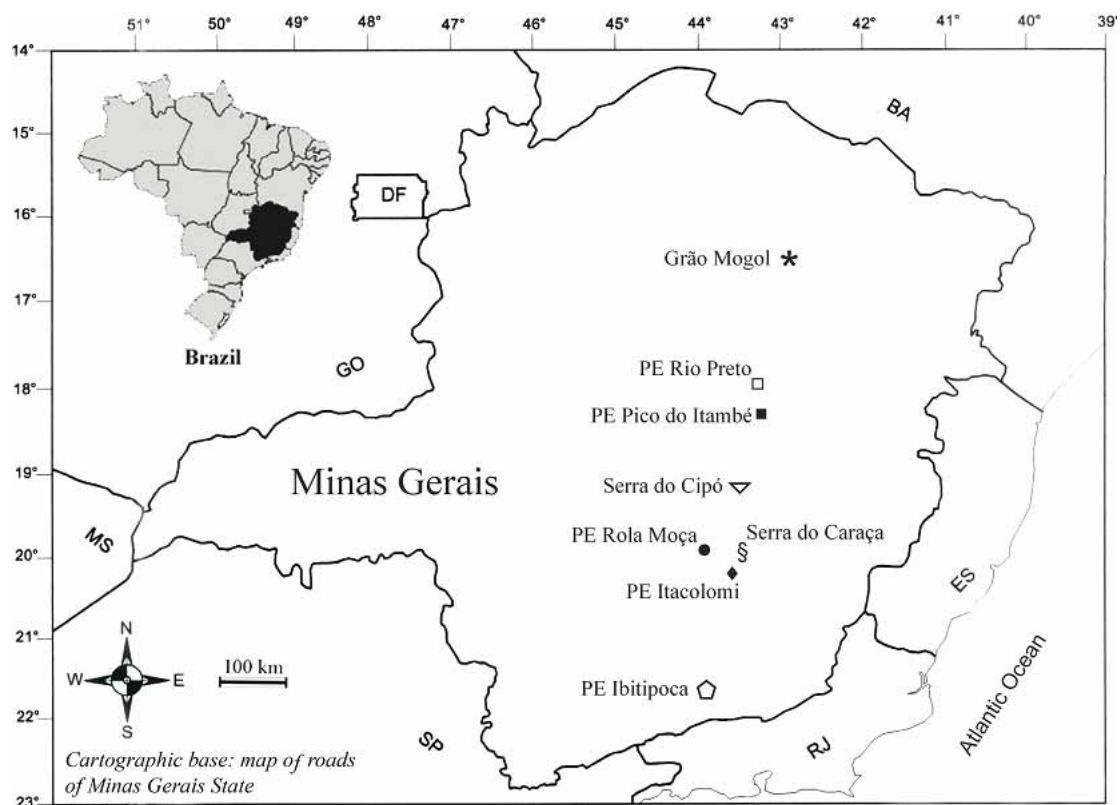


FIGURE 9. Map of the state of Minas Gerais, indicating the locations that were used in the Bromeliaceae phytogeographical analysis.

The PERP is a very important area for preservation of several species of Bromeliaceae. The total number of Bromeliaceae genera and species found in PERP is among the highest for Minas Gerais state, where it occupies the second position in ranking (Fig. 10), only behind Serra do Cipó, a region that is by far the most species rich area in Minas Gerais housing 18 genera and 54 species of Bromeliaceae (Fig. 10). Serra do Cipó

covers a much larger area than PERP, has almost 50 years of intensive botanical study, and supports the largest numbers of Bromeliaceae voucher collections (Versieux & Wendt 2007, Versieux *et al.* 2008), all contributing to this difference in species numbers. Our cluster analysis indicates that the Bromeliaceae flora of PERP and Pico do Itambé are more similar to the flora found along the northern Espinhaço range; there is particular similarity with the Grão Mogol area. All the other reserves inventoried from southern Espinhaço together with the Ibitipoca reserve (Mantiqueira mountain range) are ‘bromeliastically’ more distant (Fig. 8). This partitioning of the Espinhaço range when studying the Bromeliaceae flora was already reported by Versieux & Wendt (2007) but in that analysis the Diamantina Plateau regions appear more similar to the southern Espinhaço Range. Their results are not directly comparable with our findings, because they used a much broader scale for their data (i.e., 1° x 1° grid cells). Some differences are expected due to taxonomic changes that affected the geographical distribution of some taxa.

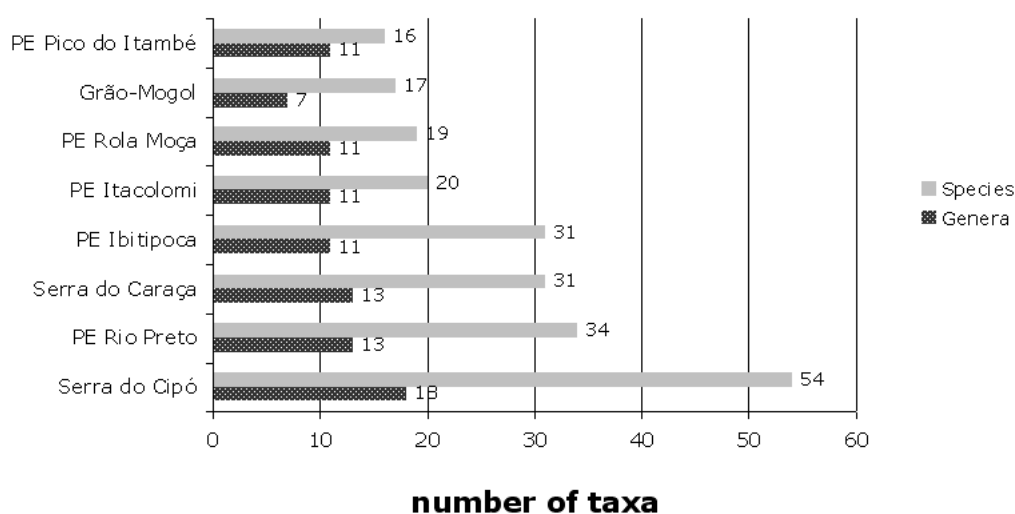


FIGURE 10. Bromeliaceae taxa richness across the locations employed in the phytogeographical analysis.

TABLE 2. Similarity values between the inventoried areas for the Bromeliaceae family in the Minas Gerais State (values presented as percentage, see text for references for source of data), greater values are shown in bold.

	Serra do Cipó	Serra do Caraça	PE Itambé	PE Ibitipoca	Grão-Mogol	PE Itacolomi	PE Rio Preto	PE Rola Moça
Serra do Cipó	*	26.8657	14.5161	23.5294	12.9032	17.4603	26.4706	15.873
Serra do Caraça	*	*	14.2857	19.6078	14.6341	24.3902	21.1538	16.2791
PE Itambé	*	*	*	4.4444	3.125	12.1212	32.4324	2.8571
PE Ibitipoca	*	*	*	*	15	16.2791	16.9811	6.5217
Grão-Mogol	*	*	*	*	*	5.8824	29.7297	12.9032
PE Itacolomi	*	*	*	*	*	*	10.6383	14.7059
PE Rio Preto	*	*	*	*	*	*	*	10.8696
PE Rola Moça	*	*	*	*	*	*	*	*

Conservation

The Parque Estadual do Rio Preto fulfills an important role in the conservation of several distinct genera and species of Bromeliaceae from Minas Gerais. The establishment of a corridor connecting the PERP and its neighbor Pico do Itambé State Park should be seriously considered, because it will create a better chance of survival for populations of rare species as well as for their pollinators. Some species found in the area are of

great conservation importance due to their low number of records from Minas Gerais or endemism. The following examples of this is *Canistrum flavipetalum* Wanderley (2008: 537) that has a disjunct occurrence: it is found in the *capões* (forest islands) of the PERP and ca. 600 km north in Bahia State, in the Abaíra municipality (Wanderley 2008). *Aechmea bromeliifolia* var. *albobracteata* Philcox (1974: 92) and *Vriesea procera* var. *tenuis* Smith (1943: 121) are only known from a few populations in the state of Minas Gerais (Versieux & Wendt 2006). Other species are endemic to the Diamantina Plateau region (Tab. 1), e.g. *Alcantarea duarteana* Smith (1968: 80) J. R. Grant (1995: 13) and *Vriesea densiflora* Mez (1894: 567), and are protected inside the PERP. During our fieldwork we additionally collected a tiny species of *Cryptanthus*, which after detailed study we believe is unknown to science. We describe this species here as new and we think it may be restricted to the boundaries of the PERP.

Taxonomic discussion

In this checklist we treated *Pepinia bradei* (Markgraf 1940: 215) Varadarajan & Gilmartin (1988: 297) as belonging to the genus *Pitcairnia*, following previous authors (Smith & Downs 1974, Wanderley & Forzza 2003). The segregation of *Pepinia* from *Pitcairnia* is still controversial and lacks support in cladistic analyses. Other taxa that occur within the PERP may present problems at the species level identification and thus can be considered part of species complexes that need further systematic revision. It is important to highlight the occurrence of *Vriesea jonghei* Morren (1878: 257) in this area, which forms a species complex (cf. Versieux & Wendt 2006), and thus we are uncertain about the correct application of the name. This species was originally described from material collected in the Diamantina Plateau (Libon 1857), but later the species circumscription was broadened to encompass plants from the coastal Atlantic rainforest. In our view the true identity of *V. jonghei* corresponds to plants that were previously identified as *V. minor* (Smith 1968: 79) Leme (1996: 245) or *V. aff. minor* that occur on the Espinhaço range only rupicolous in rocky field vegetation. Several populations of this taxon may be found along the Espinhaço range, presenting small variations in plant size, flower size and corolla color. This group is currently under revision (R.C. Moura, personal communication).

Another problem concerns *Orthophytum diamantinense* Leme (2008: 257) that is clearly related to the *O. schulzianum* Leme & Machado (2005: 175). The identity of *O. diamantinense* remains unclear and it is considered as part of the “subcomplex mello-barretoii” (Leme 2004) with at least two morphologically similar species. In the protologue *O. diamantinense* was compared with *O. mello-barretoii* Smith (1952: 2) and *O. graomogolense* Leme & Paula (2008: 107), differing from both mainly by the size of vegetative and reproductive characters, by the venation and the presence of trichomes on the leaf blades, and by the shape of the sepals. However, *O. schulzianum* Leme & Machado (2005: 175) that was not cited in the protologue of *O. diamantinense*, appears to be morphologically very similar to *O. diamantinense* and the segregation of these taxa needs further evaluation.

There are still issues in the distinction between *Billbergia zebrina* Herbert (1826: 2686) Lindley (1827: 1068) from *B. porteana* Beer (1856: 115) as already mentioned in the literature by Wanderley & Forzza (2003). In Figures 2G and 2H it is possible to observe a combination of characteristics that contradict the combination of characters that Morren (1876) and Smith & Downs (1979) used to separate both taxa. Individuals found in PERP possess pink bracts, strongly recoiled petals (characteristics attributed to *B. zebrina*), together with the purplish blue stamens, style, and a cylindrical ovary (attributes of *B. porteana*).

Systematic treatment

***Cryptanthus micrus* Louzada, Wand. & Versieux, sp. nov. (Figs. 2L, 5)**

Species nova ad Cryptanthus leopoldohorstii et C. warasii similis sed habito minoribus et foliis brevioribus et angustioribus.

Type: BRAZIL. Minas Gerais: São Gonçalo do Rio Preto, Parque Estadual do Rio Preto, 1200 m elev., 19 July 2009, *N. F. O. Mota et al.* 1474. (holotype BHCB, isotype SP).

Plant short caulescent, forming an open rosette, 3–8 cm in diameter, ca. 5 cm high when flowering; leaves 1.5–5 cm long, ca. 30. Sheaths 0.45–0.95 × 0.5–1 cm, chartaceous, deltoid, whitish, margin entire, glabrous on both surfaces. Blades 1.1–4.1 × 0.15–0.3 cm, linear, homomorphic, arching, nearly flat or channeled, coriaceous when dry, somewhat succulent when fresh, green, densely lepidote, on both sides, scales whitish, margin laxly dentate, apex mucronate, prickles 0.5–1 mm long, whitish, antrorse and/or retrorse. Inflorescence sessile, simple or with few two-flowered fascicles. Primary bracts erect, abaxial surface densely lepidote, margins serrulate, apex acute or attenuately acute. Floral bracts ca. 9.5 × 4.5 mm, triangular, erect, ecarinate, membranaceous, white, densely lepidote, margins entire, apex pungent. Flowers ca. 9 mm long excluding the petals, sessile. Sepals ca. 6.5 mm long, 5.5 mm wide, narrowly-ovate, asymmetric, chartaceous, whitish, the adaxial ones distinct from the abaxial ones, ecarinate, free, woolly lepidote, less lepidote inside, margins entire, apex apiculate. Petals ca. 1.1 cm long, lobe ca. 0.3 cm wide, linear spatulate, not fleshy, white, free, margins ciliate or glabrous, apex of the lobes spreading to recurving, obtuse. Petals calli ca. 6 mm long. Stamens exceeding the pistil; filaments free, ca. 4 mm long, white; anthers basifixed, elliptic, ca. 2.5 mm long. Stigma simple-erect, stigmatic area only along the apical margins of the lobes. Epigynous tube absent. Ovary ca. 2.3 mm long, ovoid to near globose. Ovule obtuse, caudate. Fruit globose. Seed trigonous.

Additional specimen examined: BRAZIL. Minas Gerais: São Gonçalo do Rio Preto, Parque Estadual do Rio Preto, 863 m elev., 25 January 2010, *N.F.O. Mota & T.B. Jorge* 1505 (BHCB, SP).

Distribution and Habitat:—This tiny bromeliad was observed growing on quartzite rocks, vertically attached on small cavities, and in rocky fields at 860–1400 m, so far this area is restricted to the PERP.

Etymology:—The epithet refers to the small size of the plant, derived from the Greek μικρός, ‘micros’ meaning small.

Cryptanthus micrus is distinct due to its smaller size and tiny habit when compared to all other species in the genus. It is morphologically similar to xerophytic species belonging to subgenus *Hoplocryptanthus* Mez (1891: 202), which is characterized by the presence of leaves that are not constricted above the leaf sheath and by the presence of well developed prickles (Mez 1891). According to Ramírez-Morillo (1996), additional characters of this subgenus would include the leaf blades covered in trichomes, fragrant bisexual flowers and broad petals. Species belonging to this subgenus occur more commonly in rocky field vegetation at higher elevations (above 800 m) in exposed places on well-drained substrates (Ramírez-Morillo 1996). Two endemic species of the Diamantina Plateau, that belong to subgenus *Hoplocryptanthus*, namely *C. leopoldohorstii* Rauh (1988: 68) and *C. warasii* Pereira (1978: 252) seem to be the morphological closest relatives of *C. micrus*. While reviewing the genus, Ramírez-Morillo (1996) noticed the proximity of these two species together with *C. caracensis* Leme & Gross (1992: 12) and proposed to create a new section to include these, based on the presence of stiff succulent leaves with serrate or dentate margins that are densely covered with white or argent trichomes. However the new taxon can be distinguished from *C. caracensis*, *C. leopoldohorstii*, *C. warasii*, and from *C. schwackeanus* Mez (1891: 203) that occurs further south, by its shorter and narrower leaf blades and free sepals (vs. connate in different degrees). The indumentum that covers the leaves of *C. micrus* is sparser when compared to the dense layer of trichomes that covers both surfaces of *C. warasii*. *Cryptanthus micrus* has prickles that are laterally compressed and covered by white trichomes and its leaf margins are dentate. *Cryptanthus caracensis*, *C. leopoldohorstii* and *C. schwackeanus* all have serrate margins with shorter prickles. The leaves of *C. micrus* are somewhat succulent, the prickles are well separated and in cross section the blade is almost planar, while in *C. caracensis* and *C. schwackeanus* the prickles are more densely arranged and the blades are clearly canaliculated.

Conservation:—In Minas Gerais the genus *Cryptanthus* is threatened due to its species’ narrow ranges and endemism (Versieux & Wendt 2007). *Cryptanthus micrus* is a rare species that has only two known populations in the PERP, all with small numbers of individuals. Based on the IUCN criteria (IUCN 2001) *C. micrus* has the conservation status of Critically Endangered CR B1ab(ii,iii) due its restricted occurrence, the

small population sizes and decline in the quality of the habitat, taking into consideration that one population is located right along the border of the park. We suggest that studies in the biology of this species should be carried out in order to understand its reproductive strategies to assure its conservation. The lithophytic life form enables the species to escape from fires, which are quite frequent in these grassland habitats. To avoid other risks, particularly those of with commercial collectors and bromeliad hunters, we suggest that these populations should be well monitored by the PERP authorities.

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