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RESEARCH ARTICLE

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Paepalanthus sphaeroides, a new species of *Eriocaulaceae* from the Atlantic Forest, Brazil

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Key words

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Abstract We describe and illustrate *Paepalanthus sphaeroides* (*Eriocaulaceae*, *Paepalanthoideae*) from the Mantiqueira Range in South-eastern Brazil and compare it with the morphologically most similar species: *Paepalanthus aequalis* and *Paepalanthus eriophaeus*. *Paepalanthus sphaeroides* has unique membranaceous sheaths tightly adpressed to the scapes, patent involucral bracts slightly surpassing the capitula, and sepals of the staminate flowers fused from the base to the middle as distinctive characteristics. Comments on morphological variation, geographical distribution, ecology, conservation status, as well as a distribution map, line drawings, and photos are provided.

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INTRODUCTION

Paepalanthus Mart. is the richest genus of the Neotropical *Eriocaulaceae*, encompassing around 400 species. It is defined by its isostemonous flowers, petals of the pistillate flower not fused at the middle, and nectariferous and stigmatic branches free at the same insertion points (Koernicke 1863, Giulietti & Hensold 1990, Stützel 1998). According to Ruhland (1903), the genus is divided into several categories, regarding floral and vegetative structures. *Paepalanthus* ser. *Paepalanthus* (= *Paepalanthus* ser. *Variabiles* Ruhland) was defined as having rosulate herbs possessing scapes on the axil of the leaves, and trimerous flowers (Ruhland 1903). As expected by its original name, this group encompasses a wide variety of plant forms as well as most of the morphological and taxonomic diversity of *Paepalanthus*, including more than 150 species occurring throughout South America, but mainly on the Brazilian savannas and 'Campos Rupestres' (Giulietti & Hensold 1990, Stützel 1998, Costa et al. 2008).

The South American *Eriocaulaceae* are found in two main centres of diversity: the Guyana Shield and the Espinhaço Range in Brazil (Giulietti & Hensold 1990, Hensold 1991, Stützel 1998). *Paepalanthus* present the same distribution pattern, except for *Paepalanthus* sect. *Diphyomene* Ruhland, which is mostly diverse in the savannas of Central Brazil (Trovó & Sano 2010) and *Paepalanthus* subgen. *Platycaulon* Körn., which is also diversified on the north of the Andes (Tissot-Squalli 1997). The majority of the species are distributed in the Espinhaço Range in Minas Gerais state (Giulietti & Hensold 1990, Giulietti et al 2005, Costa et al. 2008), in the Campos Rupestres domains, but a few species occur on the Mantiqueira Range and adjacencies, in the Atlantic Forest domain.

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The Atlantic Forest is considered a hotspot of biodiversity (Myers et al. 2000). The high altitudes of the Mantiqueira mountain range, associated with igneous outcrops and meadows, create a particular ecosystem known as the 'Campos de Altitude' (Martinelli et al. 1989), or 'Brazilian Páramos' (Safford 1999, 2007). This ecosystem presents very distinct vegetation and strongly contributes to the rich endemism of the Atlantic Forest biome. As a result of our taxonomic research on *Paepalanthus*, based on field trips and visits to the representative herbaria for *Eriocaulaceae*, we describe the following species, hoping to contribute to the floristic inventories of the Atlantic Forest.

TAXONOMIC TREATMENT

Paepalanthus sphaeroides Trovó, Echtern. & Sano, *sp. nov.* — Fig. 1, 2; Map 1

Differt a *Paepalantho aequalis* vaginae ad pedunculis fortiter constrictae; bractae involucrantes interiores patentis, exteriori superantes; sepalae flores masculinis ad media parte conatae. — Typus: *M.L.O. Trovó 319, M. Mitne, G. Müller, L.M. Borges* (holo SPF; iso B, NY, SP), Brazil, São Paulo, Piquete, "trilha para o Pico dos Marins, pouco após a Pedra do Careca", 16 Dec. 2006.

Etymology. The epithet *sphaeroides* refers to the general habit of the flowering individuals, resembling a sphere.

Perennial herbs. *Stem* short, 2–5 cm long. *Leaves* arranged in rosette, flats, linear to lanceolate, chartaceous, (5–)12–21.5 by (0.3–)0.5–1 cm long, green with cream base, glabrous on both surfaces, margin ciliate to glabrescent, apex acute. *Sheaths* tightly adpressed to scapes, membranaceous, 2–3.5 cm long, glabrous, apex truncate. *Scapes* free, 10–50 per plant, arranged in groups of 3–5 on a single plane on the axil of consecutive leaves, (5–)12–23 cm long, multicostate, glabrous. *Capitula* 0.6–1.2 cm diam, white. *Involucral bracts* in 3–5 series, oblong, c. 6 mm long, paleaceous, pilose to glabrescent on abaxial surface, ciliate toward the acute to mucronate apex. *Flowers* 3-merous, c. 57 per capitula: 5× more staminates than pistillates. *Floral bracts* obovate, c. 3 mm long, pilose on abaxial surface, ciliate toward the acute apex. *Staminate flowers* c. 4 mm long; pedicel c. 1 mm long, with long trichomes; sepals fused from the base to the middle, obovate, c. 3 mm long, pilose on abaxial surface, ciliate toward

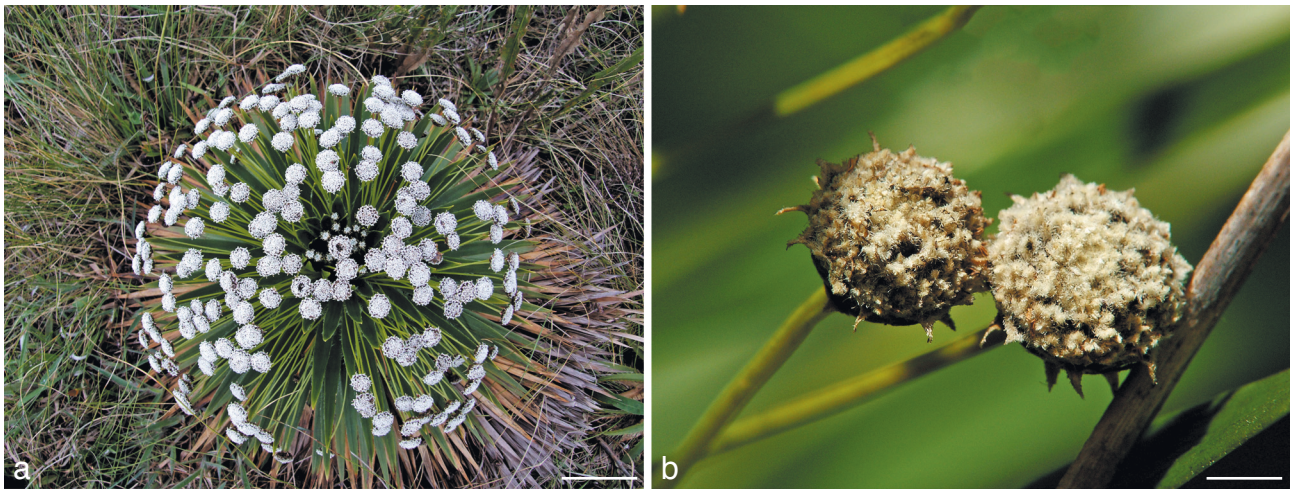
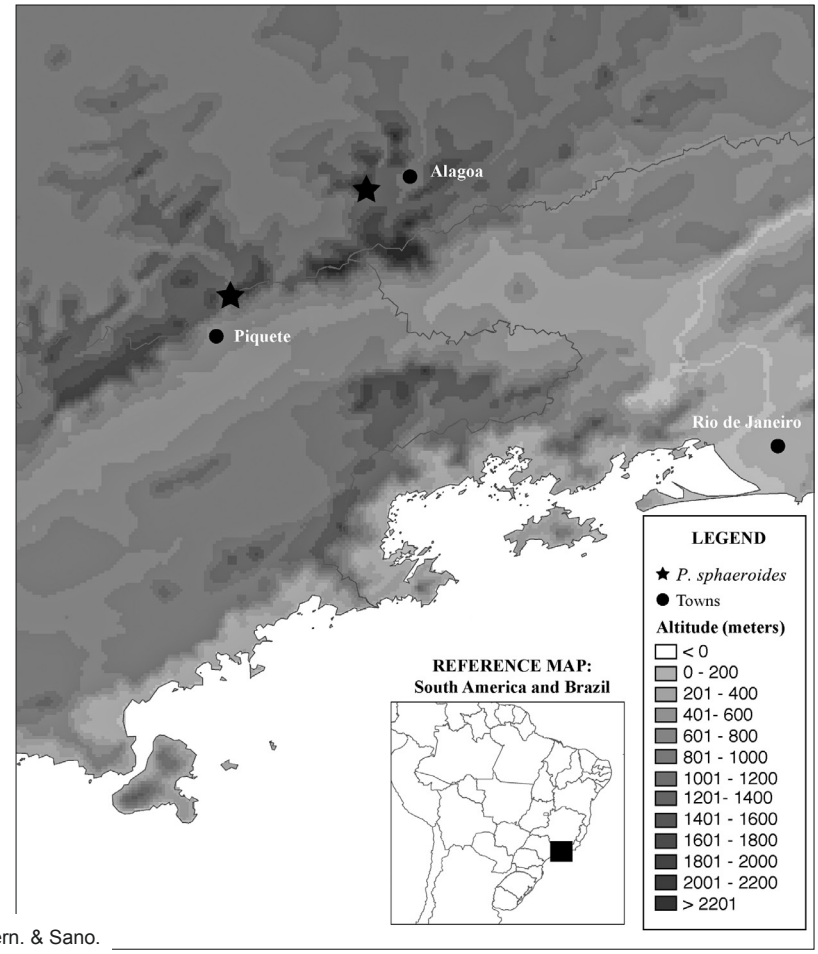


Fig. 1 *Paepalanthus sphaeroides* Trovó, Echtern. & Sano. a. Habit; b. capitula. — Scale bars: a = 4 cm; b = 0.5 cm (*Trovó et al. 319*).

the acute apex; corolla tubular, membranaceous, hyaline; stamens c. 2 mm long, anthers castaneous; pistillodes 3, papillose. *Pistillate flowers* c. 5 mm long, pedicel c. 1 mm long, with long trichomes; sepals fused at base, obovate, c. 4 mm long, castaneous, pilose on abaxial surface, ciliate toward the obtuse apex; petals membranaceous, obovate, c. 4 mm long, hyaline pilose on abaxial surface, ciliate toward the acute apex; gynoecium c. 4 mm long, stigmatic branches bifid at the apex, 2× longer than the nectariferous branches; staminodes 3, scale-like. *Fruit* a loculicidal capsule.

Distribution — *Paepalanthus sphaeroides* occurs on the Mantiqueira Range. There are collections from the municipalities of Piquete (SP) and Alagoa (MG) on the border of São Paulo and Minas Gerais states. These localities are around 80 km from each other, and probably the species also occurs between both regions, which is a poorly sampled area. Populations were found growing on altitudes between 1900–2350 m by the tracksides to Pico dos Marins (Piquete) and to Pico do Garrafão (Alagoa).

Habitat & Ecology — The species occurs in Campos de Altitude, growing over oligotrophic sandy to argillaceous soils (Benites et al. 2003). Populations of about 20–50 perennial individuals were found in full anthesis between November and December. Fully developed fruits were found in December and July. The seeming gap in the fructification period is probably due to lack of fieldwork, and the flowering and fructification period may be correlated with the beginning of the rainy season. The seeds are usually ejected jointly with the fruits by the reflexing



Map 1 Distribution of *Paepalanthus sphaeroides* Trovó, Echtern. & Sano.

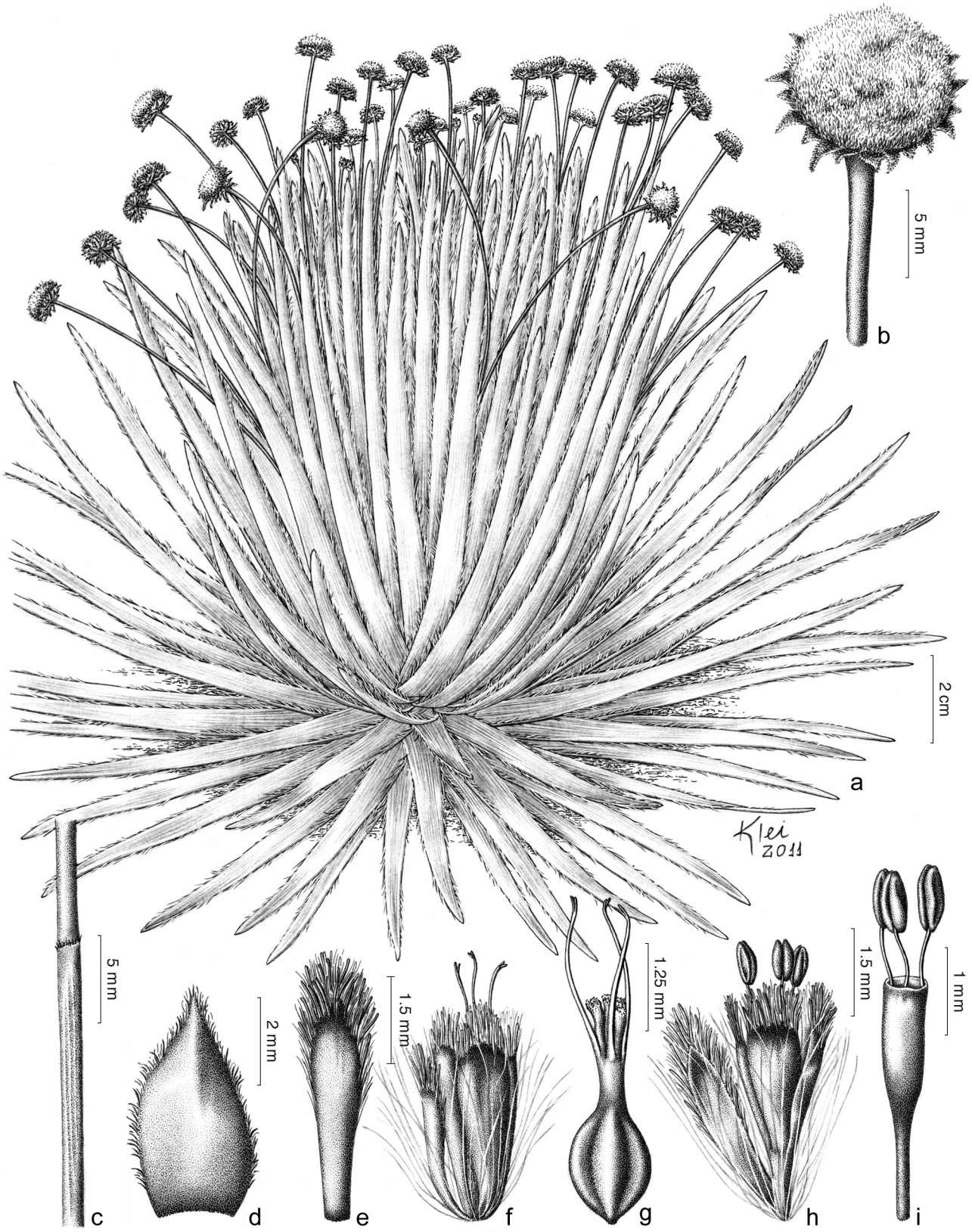


Fig. 2 *Paepalanthus sphaeroides* Trovó, Echter. & Sano. a. Habit; b. capitula detail; c. sheath detail; d. involucral bract abaxial surface; e. floral bract abaxial surface; f. pistillate flower; g. gynoecium; h. staminate flower with sepals opened; i. staminate flower with sepals removed (*Trovó et al. 319,* SPF).

calyx, as previously described for other species of *Paepalanthus* (Stützel 1984, Hensold 1988).

Additional specimens examined. *M.F. Santos 04, A.B. Junqueira, D. Sassaki, L.G. Temponi, L.M. Bezerra* (NY, SPF), Brazil, São Paulo, Piquete, July 2004; *L. Echternacht 1564, P.L. Vianna, N.F.O. Motta* (BHCB, SPF), Brazil, Minas Gerais, Alagoa, Parque Estadual do Pico do Papagaio, W44°46'10", S22°12'15", 2397 m alt., 10 Nov. 2007; *L. Echternacht 1568, P.L. Vianna, N.F.O. Motta* (BHCB, SPF), Brazil, Minas Gerais, Alagoa, Parque Estadual do Pico do Papagaio, W44°44'58", 22°12'46", 2002 m alt., 10 Nov. 2007.

Conservation status — The species is known from two populations occurring on the tracksides to mountain peaks, one of them occurring within a conservation unit (Papagaio State Park in Minas Gerais). Further populations may be found in the nearby vicinity, as this is a relatively large and unexplored area. Through the available data, the species is considered endangered according to IUCN (2001) by the following criteria: B1, B2a i, and B2a iv.

Notes — *Paepalanthus sphaeroides* is placed in *Paepalanthus* ser. *Paepalanthus*, as it possesses leaves in rosette, axillary escapes, and trimerous flowers. From the remaining species of this category, *P. sphaeroides* is distinguished by its membranaceous sheaths tightly adpressed to the scapes, patent involucral bracts slightly surpassing the capitula, and sepals of the staminate flowers fused from the base to the middle. The scapes are not solitary, but grouped on a single plane on the axil of subsequent leaves. This inflorescence arrangement was previously reported for *Paepalanthus eriophaeus* Ruhland and *Paepalanthus polygonus* Körn. (Stützel 1984). The former species shares further morphological similarities with *P. sphaeroides*. Both are placed within *Paepalanthus* ser. *Paepalanthus*, have linear to lanceolate ciliated leaves with approximately the same size of the scapes, and membranaceous sheaths with truncated apex. However, in addition to the features cited above, *P. sphaeroides* is also distinguished from *P. eriophaeus* by its leaves with acute apex (vs mucronate), larger size of the leaves (12–21.5 vs 7–11 cm), tightly adpressed sheaths (vs lax), and paleaceous involucral bract (vs light brown). Both species are allopatric distributed, as *P. eriophaeus* is restricted to the Diamantina Plateau in the vicinity of Diamantina (MG).

Throughout the Mantiqueira Range and adjacencies, a complex of possible related species comprising *P. aequalis* (Vell.) J.F.Macbr., *P. cachambuensis* Silveira, *P. henriquei* Ruhland, *P. mendoncianus* Ruhland, and *P. michaelli* Silveira share morphological similarities with *P. sphaeroides*. These species have linear to lanceolate leaves of approximately the same size of the scapes. From this bulk of species, *P. sphaeroides* is morphologically most related to *P. aequalis,* showing about the same size and being both sympatric, as they occur in meadows of the Mantiqueira Range. Nevertheless, *P. sphaeroides* is easily recognized by the grouped scapes (vs solitary), paleaceous bracts (vs dark-brown), and wider capitula (0.6–1.2 vs 0.3–0.5 cm). Despite the possibility of a sympatric distribution, populations of both species were not found at the same localities.

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