



A new species of *Leiothrix* (Eriocaulaceae) from the Espinhaço Range, Bahia, Brazil

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Abstract

A new species of *Leiothrix* (Eriocaulaceae) from Brazil is described and illustrated. *Leiothrix raymondii* is a restricted endemic living under the shelter of rocks, in large rocky outcrops, occurring in the Northern part of the Espinhaço range in Bahia state, Brazil. The species is here assessed as endangered.

Keywords: rocky field, *Leiothrix raymondii*, taxonomy

Resumo

Uma nova espécie de *Leiothrix* (Eriocaulaceae) do Brasil é descrita e ilustrada. *Leiothrix raymondii* é uma espécie endêmica restrita, que vive na sombra de grandes rochas, nas partes mais altas da porção Sul da Cadeia do Espinhaço no estado da Bahia, Brasil. A espécie é aqui considerada como em Perigo de Extinção.

Palavras chave: campos rupestres, *Leiothrix raymondii*, savana, taxonomia

Introduction

The highland region known as the Chapada Diamantina in the Northern part of the Espinhaço Range occupies a central position in the state of Bahia and is a centre of diversity for Neotropical Eriocaulaceae. Ruhland (1903) cites 31 species for the state of Bahia, Brazil, based mainly on Blanchet's collections which were made mostly around the town of Jacobina. Recent studies have shown that the species richness is much greater, including especially *Paepalanthus* Martius (1843: 28) *nom. cons.*, *Comanthera* Smith (1937: 38) *emend.* Parra & Giul. in Parra *et al.* (2010: 1136) and *Leiothrix* Ruhland (1903: 225) species. Moldenke (1980) listed 55 taxa from Bahia based on the collections of R. M. Harley and co-workers, 15 of them described as new taxa. Giuliatti (1996) refers seven species of *Leiothrix* for the state of Bahia: *L. angustifolia* (Körnigke 1863: 424) Ruhland (1903: 231), *L. distichoclada* Herzog (1924: 88), *L. flavescens* (Bongard 1831: 628) Ruhland (1903: 231), *L. hirsuta* (Wikström 1820: 745) Ruhland (1903: 229), *L. pilulifera* (Körnigke 1863: 425) Ruhland (1903: 231), *L. rufula* (Saint-Hilaire 1833: 391) Ruhland (1903: 230) and *L. schlechtendalii* (Körnigke 1863: 425) Ruhland (1903: 231). All occur in the Chapada Diamantina, except *L. pilulifera* occurring in the Atlantic coastal "restingas". Apart from these general treatments, some areas of the Chapada Diamantina have been surveyed. Giuliatti (1986) published a treatment for the *Florula of Mucugê*, including six *Leiothrix* species. Giuliatti & Parra (1995) refer the same species for the *Flora of Pico das Almas*, except *L. hirsuta*. Miranda & Giuliatti (2001) refer *Leiothrix angustifolia* and *L. flavescens* for the Serra do Pai Inácio (Municipality of Palmeiras) and Serra da Chapadinha (Municipality of Lençóis).

Leiothrix is a neotropical genus with about 49 species, occurring in Brazil, especially in the Espinhaço Range in Minas Gerais and Bahia (Giuliatti & Hensold 1990, Giuliatti *et al.* 2010). It is a monophyletic clade in the Eriocaulaceae

subf. Paepalanthoideae, based on morphological and molecular dates (Giulietti *et al.* 1995, Andrade *et al.* 2010, Giulietti *et al.* 2012). During the ongoing revision of *Leiothrix* for the Flora Neotropica, a new analysis of the specimens from Pico das Almas and Catolés was made and mixed with the *L. schlechtendalii* specimens, a new species was recognized and is described in this paper.

Taxonomic Treatment

Leiothrix raymondii Giul. & D.M. Silva *sp. nov.* Type:—BRAZIL. Bahia: Rio de Contas, Pico das Almas, ca. 1800 m, 14 December 1984, A.M. Giulietti, R.M. Harley, B. Stannard, H.M. Longhi-Wagner, G. Lewis & M.G. Arraes in CFCR* 6927 (*Coleção da flora dos campos rupestres) (Holotype SPF!, Isotypes K!, HUEFS!). Figures 1A–T, 2, 3.

Leiothrix raymondii differs from the sympatric *L. schlechtendalii* and the Minas Gerais species *L. fulgida* by its longer leaves and shorter scapes. Also differs from *L. schlechtendalii* by the plane leaves, pubescent on both faces, scape 3-costate, and pistillate flowers with sepals the same size as the ciliate petals *versus* conduplicate leaves, pubescent on adaxial face and glabrous on the adaxial face, scape 6-costate, and pistillate flowers with sepals 2x the size of the glabrous petals. Also differs from *L. fulgida* by the involucre bracts elliptic-lanceolate and apex acute, and staminate flowers with short pistillodes *versus* involucre bracts obovate to ovate and apex round, and staminate flowers with long pistillodes up ½ size of the filaments.

Perennial, caespitose herb 15–28 cm tall. *Rhizome* short, light-brown roots. *Leaves* rosulate, flat, (6.5–14.0) 15.0–20.0 × 0.1–0.2 cm, linear-lanceolate, membranous, delicate, multi-nerved, “in vivo” erect to bent, glaucous-green when young, changing to light brown, apex acute to acuminate, sheath slightly wider 0.2–0.3 mm, pubescent in both surface, more densely on the adaxial surface. Trichomes on the leaves, spathes and scapes of two different types always together: filamentous, multicellular, delicate, white, long (ca. 0.5 mm) in greater number; or capitate, multicellular, apical cell globose, glandular. *Spathe* 3.7–4.5 × 0.1 cm, external face pubescent, with capitate and filamentous trichomes, the last ones bigger in size and number, internal face with rare filamentous trichomes, operculum with apex oblique, 3-lacerate, teeth acuminate and involute. *Scapes* few per plant, delicate (10.5) 15.0–25.0 cm long, slightly larger than the leaves, 3-costate, ribs slightly evident, pubescent, filamentous trichomes larger and with larger basal cell than the capitate trichomes. The scape, from the base to the middle, with filamentous trichomes much more abundant than capitate trichomes, from the middle to the lower 2/3 of the upper part, the trichome types occur in equal frequency, while the apical 1/3 of the upper half of the scape bears many more capitate than filamentous trichomes. *Capitulum* elliptic-globose, 0.7–0.9 × 0.8–1.3 cm. Receptacle flat, scarcely hairy. Involucre bracts in 4 ranks, all of them elliptic-lanceolate with acute apex, the external ones ca. 1.2 × 0.5 mm and the internal ones c. 2.5 × 1 mm long, ciliate from the middle to apex, dorsal surface with few filamentous and capitate trichomes, shorter than the cilia, ventral surface glabrous. Floral bracts hyaline, ca. 2.5 mm long, same size as the flowers, oblong-spathulate, apex obtuse, ciliate along the upper 1/3, dorsal surface with rare filamentous and capitate trichomes, ventral surface glabrous. Flowers trimerous, staminate and pistillate flowers mixed on the capitulum. In one capitulum of the collection Giulietti 1360 there were 46 staminate flowers and 36 pistillate flowers. *Staminate flower* zygomorphic, ca. 2.5 mm long, with pedicel ca. 0.9 mm; sepals 3, ca. 1.6 mm long, united at base, the two posterior-lateral carinate and the anterior flat, apex obtuse, ciliate, dorsal surface with rare trichomes on apical portion, ventral surface glabrous; corolla funnel-shaped, 3-lobed, lobes triangular obtuse, erect, slight larger than the calyx; short anthophore at the base of the corolla; stamens 3, anthers basifixed, filaments flattened, free from the corolla, pistillodes 3, free, short, filiform. *Pistillate flower* zygomorphic ca. 2.5 mm long, pedicel ca. 0.6 mm; sepals 3, ca. 2 mm long, free, the two posterior-lateral carinate and the anterior concave, apex acute, ciliate, dorsal surface with rare trichomes on apical portion, ventral surface glabrous, petals free, linear-ovate, flattened, ca. 1.8 mm long, slight ciliate at apex, annulus between corolla and gynoecium pilose; gynoecium ca. 2 mm long, ovary ca. 0.4 mm long, stylar column up to nectariferous branches ca. 0.9 mm long, the nectariferous branches ca. 0.3 mm long, filiform-cylindrical, the column up to the stigmatic branches ca. 0.3 mm long, cylindrical, stigmatic branches ca. 0.3 mm long, exserted. *Fruits* loculicidal capsule, in general producing 3 seeds per fruit; seeds ca. 0.5 mm, with striate testa.

Distribution and habitat:—So far only known in the southern part of the Chapada Diamantina in Bahia in high altitudes above to 1300 m, usually 1700–1800 m in the “Campo Rupestre” vegetation, and in the shade of large quartzitic boulders (Fig. 2). This is the only species of *Leiothrix* living in this habitat, which in the Espinhaço Range area in Minas Gerais is a preferential habitat for small plants of *Paepalanthus*, previous included in the genus *Blastocaulon*

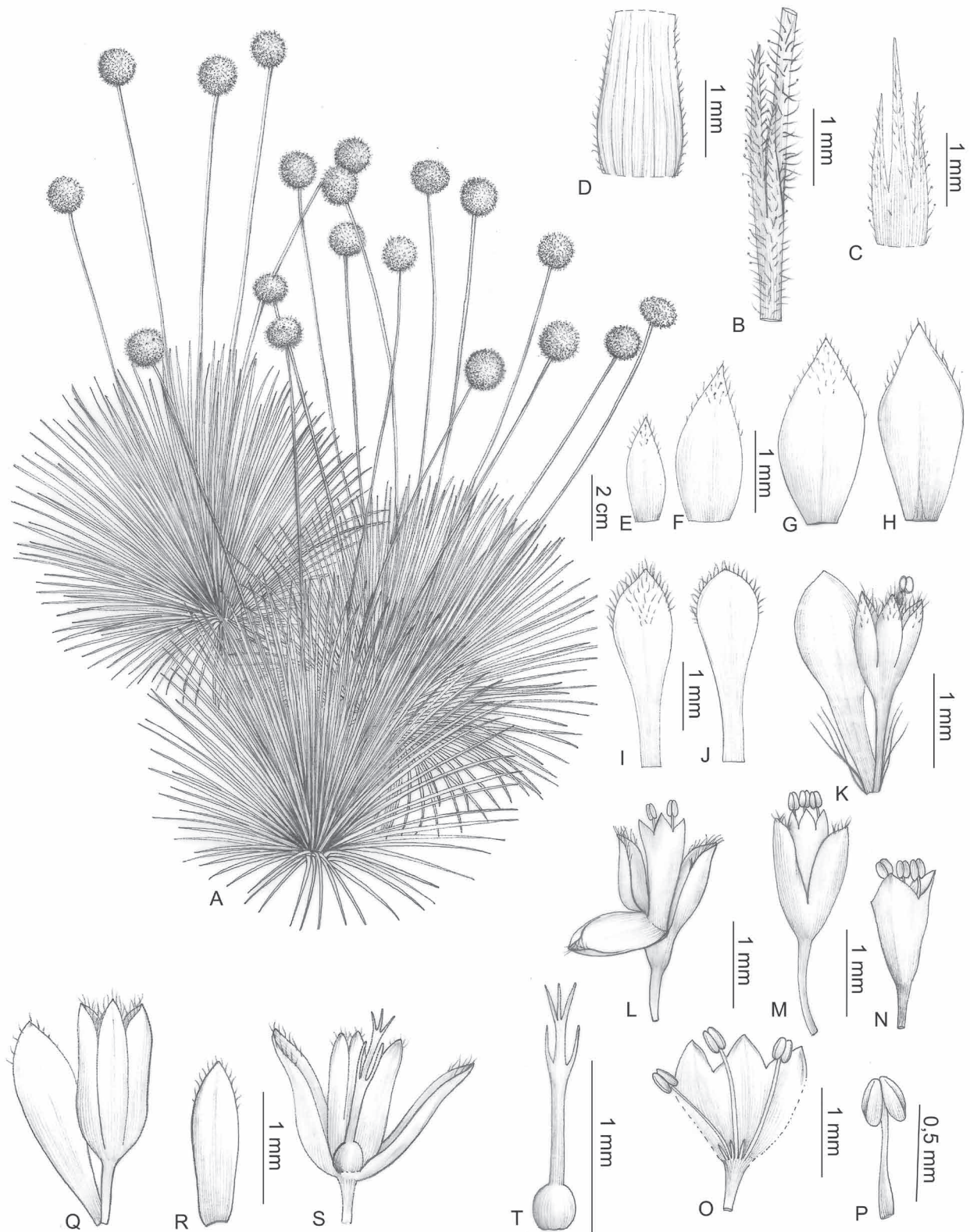


FIGURE 1. *Leiothrix raymondii* (based on *Giulietti & Scatena 1360*). A. Habit; B. Spathe; C. Detail of spathe apex; D. Detail of leaf base; E–F. External and median involucral bracts, dorsal surface; G–H. Internal involucral bracts, dorsal and ventral surfaces; I–J. Floral bract, dorsal and ventral surfaces; K–P. Staminate flower, K. Complete flower and floral bract, L–M. Complete flower, N. Infundibuliform corolla, O. Open corolla showing stamens and pistillodes, P. Stamen with basifixed anthers; Q–T. Pistillate flower, Q. Complete flower and floral bract, R. Sepal, S. Flower with one sepal removed; T. Gynoecium. Illustrated by Carla Lima.



FIGURE 2. Photo of the species in its natural habitat in Pico das Almas, Rio de Contas, Bahia, Brazil (Photo Raymond M. Harley).

(Ruhland 1903: 223) Andrade *et al.* (2011). The species was collected between the Pico das Almas, in Rio de Contas Municipality to Serra da Tromba in Catolés, Abaíra Municipality (Fig. 3). Ule 7299 is referred to Serra do Sincorá without a precise locality.

Etymology:—The specific epithet is named in honour of Dr Raymond Mervyn Harley, Honorary Research Fellow at the Royal Botanic Gardens, Kew and Visiting Professor of the Post Graduate programme in Botany, at the State University of Feira de Santana, for his great contribution to our knowledge of the Flora of Bahia and Brazilian Lamiaceae.

Conservation status:—This species is so far only known from a small area on the top of the hills in Pico das Almas and Catolés. The total area of occupancy is less than 500 km² and the extent of occurrence is less than 722 km². Therefore, the species is here considered as Endangered (IUCN 2014).

Additional specimens examined (paratypes):—BRAZIL. Bahia: Rio de Contas, Pico das Almas, 30 October 1988, Harley *et al.* 25795 (SPF!, K!); 27 March 1998, Giuliatti & Scatena 1360 (HUEFS!, K!); 13°31'S 41°56'W, 1380–1500 m, Juchum *et al.* 99, 19 January 2000 (HUEFS !, 2 exs.); between the “Campo do Queiroz” to the top of the hill, 13° 31'S 41°59'W, 17 April 2001, Harley *et al.* 54275 (HUEFS!, K!); 13°31'34”S 41°57'52”W, “campo rupestre”, 1794 m, Giuliatti *et al.* 2102, 22 May 2002 (HUEFS!); 13° 31'S 41°57'W, 1523 m, Andrade *et al.* 449, 4 August 2003 (HUEFS!, K!); 13°31'31”S 41°56'57”W, 1807 m, Araújo 95, 10 April 2004; 13°31'31”S 41°57'47”W, 1807 m, Araújo 89, 10 June 2004; 13°31'28”S 41°57'43”W, 1745 m, Araújo & Cruz 119, 16 December 2004 (HUEFS!); 13°31'14”S 41°56'10”W, 1460 m, Harley *et al.* 55653, 20 August 2007 (HUEFS!, K!). Rio de Contas, on the way from Boa Vista to Mutuca Corisco, near to Bicota, 1325m, 13°50'S 42°21'W, “campo rupestre”, Ganev 2196, 2 September 1993. Rio de Contas, Kaiambola, Serra da Mesa, 13°23'S 41°52'W, “campo rupestre”, Giuliatti *et al.* 2406, 19 April 2003 (HUEFS!). Bahia: Abaíra, Catolés, Pico do Barbado, 1800–2000 m, Giuliatti *et al.* 1432, 15 August 1998 (HUEFS!). Serra da Tromba, nascente do Rio de Contas, 13° 16'S 41° 47'W, 18 December 1992, 1500 m, Ganev 1690 (HUEFS!, K!, SPF!). Bahia: In Felsenschluchten Serra Sincorá, 1300 m, November 1906, Ule 7299 (HBG!, K!).

Notes:—*Leiothrix raymondii* is similar to *L. schlechtendalii* from Chapada Diamantina in Bahia and also to *L. fulgida* Ruhland (1903: 233) from the Diamantina Plateau in Minas Gerais, due to the spathe with apex 3-dentate, leaves and spathe with filamentous and capitate trichomes together, zygomorphic staminate and pistillate flowers, and a pilose annulus between corolla and gynoeceium. But *L. raymondii* have longer leaves (6.5–14)–15–20 cm *versus* short leaves (1.7–) 4–6 (–11) cm in both species; the scapes are shorter, (10.5) 15–25 cm *versus* long, (6.5–15) 15–40 cm in both species and have few scapes per plant *versus* many per plant in both species. *Leiothrix raymondii* also differs from *L. schlechtendalii* and from *L. fulgida* by the characters mentioned in the diagnosis.

In the mountains of Pico das Almas and Catolés, *Leiothrix raymondii* occur sympatrically with *L. angustifolia*, *L. schlechtendalii*, *L. distichoclada* and *L. flavescens*, but all these species except *L. raymondii* occur at much lower

altitude (to 1500 m) over open sandy humid soils. Also those species have a wider distribution from Rio de Contas and Catolés up to the Sincorá Mountain in Mucugê, Andaraí, and Lençóis. *Leiothrix angustifolia* and *L. schlechtendalii* grow up to Morro do Chapéu and Jacobina, from where the type materials of these species were collected: *L. angustifolia*—between Jacobina and Vila Nova, *Blanchet 3820* (holotype Herb. Martius BR!; isotypes B!, BM!, BR!, F!, G![3exs.], M!, P![2exs.]) and *L. schlechtendalii*—Near Jacobina, *Blanchet 3818* (holotype B!, isotypes BM!, BR!, G[3 exs.], NY!, P![2 exs.]).

Giulietti & Parra (1995) in the Flora of the Pico das Almas, refer the specimens CFCR 6927 and Harley 25795, as *L. schlechtendalii* but a new analysis confirmed both as *L. raymondii*. According the light cream color of the capitulum *L. raymondii* is similar to some species of *Syngonanthus* as the capitulum in *Leiothrix* is usually light to dark brown.

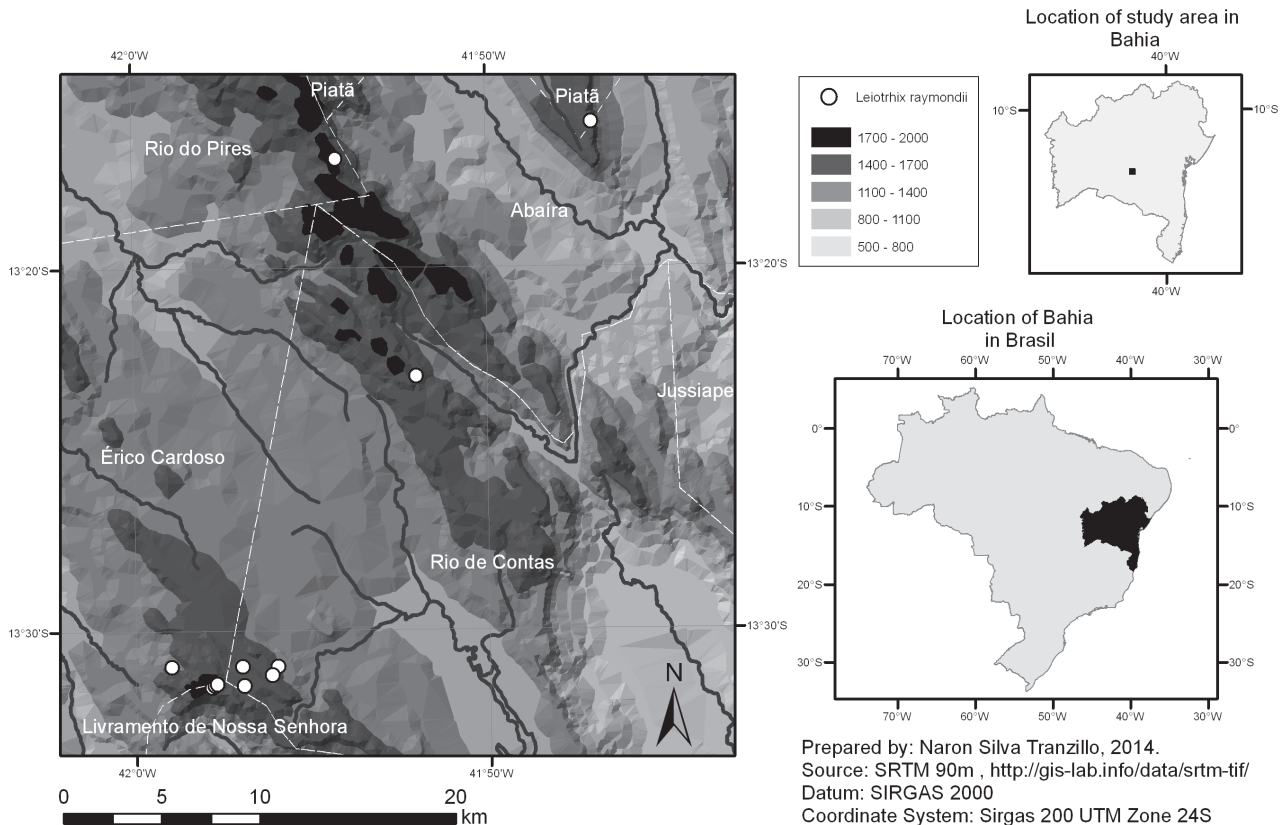


FIGURE 3. Map of distribution of *Leiothrix raymondii*.

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REFERENCES

- Andrade, M.J.G., Giulietti, A.M., Rapini, A., Queiroz, L.P., Conceição, A.S., Almeida, P.R.M. & van den Berg, C. (2010) Comprehensive phylogenetic analysis of Eriocaulaceae: Evidence from nuclear (ITS) and plastid (*psbA-trnH* and *trnL-F*) DNA sequences. *Taxon* 59: 379–388.

- Andrade, M.J.G., Giuliatti, A.M., Harley, R.M. & van den Berg, C. (2011) *Blastocaulon* (Eriocaulaceae), a synonym of *Paepalanthus*: Morphological and molecular evidence. *Taxon* 60: 178–184.
- Bongard, A.G.H. (1831) Essai monographique sur les espèces d'Eriocaulon du Brésil. *Mémoires de l'Académie Imperiale des Sciences de St.-Petersbourg. Sixième Série. Sciences Mathématiques, Physiques et Naturelles* 1: 601–655.
- Giuliatti, A.M. (1986) Eriocaulaceae. In: Harley, R.M. & Simmons, N.A. (Ed.) *Florula of Mucugê, Chapada Diamantina, Bahia, Brazil*. Royal Botanic Gardens, Kew, pp. 61–70.
- Giuliatti, A.M. (1996) *Leiothrix* da Bahia, Brasil. *Sitientibus* 15: 61–82.
- Giuliatti, A.M. & Hensold, N. (1990) Padrões de distribuição geográfica dos gêneros de Eriocaulaceae. *Acta Botanica Brasilica* 4: 133–158.
<http://dx.doi.org/10.1590/S0102-33061990000100010>
- Giuliatti, A.M. & Parra, L.R. (1995) Eriocaulaceae. In: Stannard, B.L. (Ed.) *Flora of the Pico das Almas, Chapada Diamantina, Bahia, Brazil*. Royal Botanic Gardens, Kew, pp. 684–704.
- Giuliatti, A.M., Amaral, M.C. & Bittrich, V. (1995) Phylogenetic analysis of inter and infrageneric relationship of *Leiothrix* Ruhland (Eriocaulaceae). *Kew Bulletin* 52: 55–71.
<http://dx.doi.org/10.2307/4114608>
- Giuliatti, A.M., Sano, P.T., Costa, F.N., Parra, L.R., Echternacht, L., Tissot-Squalli, M.L., Trovó, M., Watanabe, M.T.C., Freitas, M.P. & Hensold, N. (2010) Eriocaulaceae. In: *Catálogo de Plantas e Fungos do Brasil*. Vol. 2. Jardim Botânico do Rio de Janeiro, Rio de Janeiro, pp. 938–958.
- Giuliatti, A.M., Andrade, M.J.G., Scatena, V.L., Trovó, M., Coan, A.I., Sano, P.T., Santos, F.A.R., Borges, R.L.B. & van den Berg, C. (2012) Molecular phylogeny, morphology and their implications for the taxonomy of Eriocaulaceae. *Rodriguesia* 63: 1–19.
<http://dx.doi.org/10.1590/S2175-78602012000100001>
- Herzog, Th. (1924) Neue südamerikanische Eriocaulonaceae. *Fedde Repertorium Species Novarum* 20: 82–88.
<http://dx.doi.org/10.1002/fedr.19240200603>
- IUCN (2014) Standards and Petitions Subcommittee. Guidelines for Using the IUCN Red List Categories and Criteria, version 10.1. Prepared by the Standards and Petitions Subcommittee. Available from: <http://www.iucnredlist.org/> (accessed 7 July 2014)
- Körnigke, F. (1863) Eriocaulaceae. In: Martius, C.F.P. von (Ed.) *Flora Brasiliensis*. Volume 3 (1/2). R. Oldenbourg, Munich and Leipzig, pp. 274–507.
- Martius, K.F.P. (1834) Les Eriocaulées considérées comme une famille distincte. *Annales des Sciences Naturelles; Botanique, sér. 2* 2: 25–43.
- Miranda, E.B. & Giuliatti, A.M. (2001) Eriocaulaceae no Morro do Pai Inácio (Palmeiras) e Serra da Chapadinha (Lençóis), Chapada Diamantina, Bahia, Brasil. *Sitientibus Série Ciências Biológicas* 1: 15–32.
- Moldenke, H.W. (1980) Eriocaulaceae. In: Harley, R.M. & Mayo, S. (Eds.) *Towards a checklist of the Flora da Bahia*. Royal Botanic Gardens, Kew, 250 pp.
- Parra, L.R., Giuliatti, A.M., Andrade, M.J.G. & van den Berg, C. (2010) Reestablishment and new circumscription of *Comanthera* (Eriocaulaceae). *Taxon* 59 (4): 1135–1146.
- Ruhland, W. (1903) Eriocaulaceae. In: Engler, A. (Ed.) *Das Pflanzenreich* IV. 30 (Heft 13). Wilhelm Engelmann, Leipzig, 294 pp.
- Saint-Hilaire, A. (1833) *Voyage dans le District des Diamants et sur le littoral du Brésil*. 2 vol. Librairie Gide, Paris, 456 pp.
- Smith, L. (1937) A new genus of Eriocaulaceae. *Contributions from the Gray Herbarium of Harvard University* 117: 36.
- Wikström, J.E. (1820) Trenne nya Arter af Örtsläktet *Eriocaulon*. *Kongl Vetenskaps Akademiens Handlingar* 1: 74–81.