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**Lychnophora pseudovillosissima** (Asteraceae: Vernonieae: Lychnophorinae), a new species restricted to Minas Gerais, Brazil

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**Abstract.** *Lychnophora pseudovillosissima*, a new species from the State of Minas Gerais, Brazil, is here described and illustrated. The new species is unique because of the combination of petiolate linear leaves with revolute margins, reticulodromous venation, and 3–5 florets per capitulum. The new species is compared to a morphologically similar species, *L. villosissima*, resembling in habit, leaves, venation, and number of florets per capitulum, but differing by the shape and size of the leaf and petiole. Both species may occur sympatrically, but are uniform in their morphology with diagnostic features that differentiate them. Accompanying the description and the illustration, we provide a photographic plate, a first assessment of the species’ conservation status, as well as comments on the geographic distribution, ecology, and identification of the new species.

**Keywords:** Campo rupestre, Compositae, Espinhaço Range, neotropical flora, taxonomy.

**INTRODUCTION**

The Neotropical *campos rupestres* are a type of open vegetation, mostly shrubby and herbaceous, found in nutrient-poor quartzite and ironstone soils and outcrops, in elevations above 900 m a.s.l., rarely lower (Silveira et al. 2016; Miola et al. 2021). This physiognomy in Brazil occurs in Central and Eastern portions, in Bolivia and in the Guyana Shield, with the core area concentrated in the uplands of the Espinhaço Range, a mountain range that extends over 1000 km along the central parts of Minas Gerais and Bahia states, in a North-South axis (Miola et al. 2021). *Campos rupestres* are well-known for having a
high diversity of plants, including several endemic species, among which some families are quite diverse and stand out as characteristics of this vegetation, such as Eriocaulaceae, Velloziaceae and Asteraceae (BFG 2015; Colli-Silva et al. 2019). Within Asteraceae, the subtribe Lychnophorinae (tribe Vernonieae) stands out for the high number of species endemic to campos rupestres, particularly of the genus Lychnophora Mart. (Loeuille et al. 2019).

Lychnophora is restricted to Brazil, with 30 species distributed almost exclusively in the campos rupestres of the Brazilian Central Plateau, especially in the Espinhaço Range, which makes the genus a distinct taxon of this physiognomy (Loeuille et al. 2019; Marques et al. 2020, 2021). Recently, the genus delimitation has been subject to several changes to recognize only monophyletic genera, including the synonymization of Lychnophoropsis Schultz-Bip. under Lychnophora, the description of Lychnophorella Loeuille, Semir & Pirani, and the re-establishment of Lychnocepalus Mart. ex DC. (Loeuille et al. 2015, 2019).

Species of Lychnophora have a distinctive morphology, with a candelabrum habit, thick indumentum covering leaves and stems, and a large synccephalium (secondary capitulum) that can protect against herbivory and enhance reproductive success (Loeuille et al. 2019). Additionally, some species are used in folk medicine (known as “arnica”) due to their diversified secondary compounds (Keles et al. 2010; Semir et al. 2011). These unique features aroused the curiosity of the 19th century naturalists that collected in Brazil, resulting in the description of the genus and several new species (e.g., Martius 1822; Gardner 1846). Nonetheless, systematic evaluations of the genus have only been carried out much later by Coile and Jones (1981) and Semir (1991), Semir et al. (2011), and with a recent synopsis (Loeuille et al. 2019). Among these studies, the work by Semir (Semir 1991; Semir et al. 2011) stand out as the most complete taxonomic assessment ever made of Lychnophora.

Based on morphological evidence, we describe and illustrate a new species of Lychnophora from the campos rupestres of Minas Gerais State, Brazil. The new species was previously recognized by João Semir (1937–2018) in his unpublished thesis (Semir 1991). In addition, we characterize the new species, discuss its morphological affinities, and provide a first assessment of the species conservation status.

**MATERIAL AND METHODS**

Morphological descriptions were based on specimens analyzed in the following herbaria: BHCB, DIAM, HUFU, K, MBM, SAMES, SPF, UEC and UFP (acronyms according to Thiers, continuously updated). In addition, the online databases Reflora Virtual Herbarium (Reflora, 2022) and SpeciesLink (2022) were consulted. A 10–60 × magnification stereomicroscope was used to examine morphological features of the specimens. Terminology follows Harris and Harris (1973) for leaf shape, and Roque et al. (2009) and Loeuille et al. (2019) for specific terms.

A first assessment of the species’ conservation status was made based on the IUCN criterion B, following the IUCN categories and criteria (2012) and guidelines (2022). This analysis was made in the Geospatial Conservation Assessment (GeoCAT) tool (Bachman et al. 2011) using the IUCN default values for Extent of Occurrence (EOO) and Area of Occupancy (AOO). A geographic distribution map was produced in QGIS version 2.18.15 (QGIS Development Team 2018). For all non-georeferenced herbarium specimens, geographic coordinates were approximated using the locality described on the specimen label.

**TAXONOMIC TREATMENT**

**Lychnophora pseudovillosissima** Semir ex Antar, M.Monge & Loeuille, **sp. nov.**

Type: Brazil. Minas Gerais: Diamantina, km 184 da MG220 na direção de Conselheiro Mata, 18°17'30"S, 43°44'15"W, elev. 1300 m, 7 February 2009, J.R. Pirani et al. 5834 (holotype SPF [barcode SPF 203228], isotypes CTES, HUFU, NY, UEC, UFP).

**Diagnosis**

Species Lychnophorae villosissimae habitu, foliis breviter petiolatis, venation reticulodroma et floribus 3–5 similis, sed petiolo 1–2.4 mm longi (non usque 6 mm), basi expansa (non angustata), foliis lineariobus (non angustissime lanceolatis vel angustissime ellipticis), plumereque glaucis, in sicco brunneolis ad cinerascencia (non nunquam glaucis, in sicco viridulis ad cinerascentia), lamina apice acuto (non apice acuto vel obtusato), basi atenuata vel truncata (non atenuata vel rotundata), longitudinalis foliorum maiore pro ratione ad latitudinem 1: (8.7–)14–57 (non 1:5–12.2(–17)) differt.

**Description**

Treelet, candelabrum form, 1–3 m tall. Stems highly branched at apex, densely lanate, glabrescent, whitish, greyish, or ochraceous, surface tesselate, mamillated; leaf-scars circular, punctiform. Leaves alternate, simple,
Lychnophora pseudovillosissima, a new species restricted to Minas Gerais, Brazil

Phenology

Flowering and fruiting between November and August.

Preliminary assessment of conservation status

Lychnophora pseudovillosissima has an Extent of Occurrence (EOO) of 7,705 km² and an Area of Occupancy (AOO) of 80 km² (Figure 3). Most of the known populations are located along the road that connects the cities of Diamantina to Conselheiro Mata. This is an area very rich in plant species, many of which are endemic and little known (e.g., Antar et al. 2019; Cavallari et al. 2006; Konno et al. 2006; Semir et al. 2011). According to the national action plan for conservation of biodiversity in southern Espinhaço, this is an area of conservation priority, yet still unprotected as it does not currently possess any conservation units (Pougy et al. 2015). Current threats to the plant diversity in the area are agriculture, cattle raising, and quartzite mining (Pougy et al. 2015). The southern populations from the Quadrilátero Ferrífero, where the first known collection record of the new species came from (specimen Roth 1660, from Belo Horizonte), are located in or near areas subject to significant habitat destruction from increasing urbanization and iron mining. Additional collection efforts in these areas are necessary to evaluate better the conservation status of the southern populations. Lychnophora pseudovillosissima has populations protected only in the Parque Estadual do Biribiri, in Diamantina, and in the Parque Nacional das Sempre Vivas, in Buenópolis. Despite having the threshold for being accessed as Vulnerable due to its limited EOO or Endangered due to its AOO, the species occurs in more than 10 locations and does not seem to present extreme fluctuations, what preclude the assessment in categories of higher risk of extinction. Therefore, according with these data, Lychnophora pseudovillosissima should be assessed as Near Threatened (NT).

Comments and affinities

Lychnophora pseudovillosissima disjunction (Quadrilátero Ferrífero and Diamantina plateau–Figure 4) is noteworthy as the range break is considerable in its extension and there are several cases of endemic species...
Figure 1. *Lychnophora pseudovillosissima* Semir ex Antar, M.Monge & Loeuille: (A) Treelet habit. (B) Flowering branch with syncephalia at apices. (C) Stem indumentum detail. (D) Leaf, adaxial (l) and abaxial (r) surfaces. (E) Outer to inner phyllaries, the outer ones smaller, the inner ones larger. (F) Floret. (G) Detail of style arms. (H) Stamen. (I) Style. (J) Cypsela with pappus, some elements of the pappus have been removed for clearer view. Illustration by Klei Souza based on J.R. Pirani et al. 5834 (SPF).
Lychnophora pseudovillosissima, a new species restricted to Minas Gerais, Brazil

Lychnophora pseudovillosissima, a new species restricted to Minas Gerais, Brazil from both localities (e.g., Carmo et al. 2018; Cota et al. 2020). There are very few examples of plants presenting the same disjunctive pattern, e.g., *Chamaecrista itabiritoana* (H.S. Irwin & Barneby) H.S. Irwin & Barneby (Cota et al. 2020). This disjunction is basically due to the absence of records of these species in the *campos rupestres* of Serra do Cipó, a well-studied area (Zappi et al. 2013; Pirani et al. 2015). Nevertheless, several species of Lychnophorinae frequently recorded in the Quadrilátero Ferrífero and Diamantina plateau are known from very few recent collections in the Serra do Cipó, e.g., *Chromopappus bifrons* (DC. ex Pers.) Pers., *Heterocoma albida* (DC. ex Pers.) DC. and *Piptolepis ericoides* Sch.Bip. (Loeuille et al. 2019). The evolutionary history of several plant lineages from Serra do Cipó is strongly marked by environmental filters (e.g., edaphic factors, elevation and microenvironmental aspects) (Mattos et al. 2021), this may explain the difficulty for these cited species (incl. *L. pseudovillosissima*) to establish permanent population in the Serra do Cipó.

Although both localities (Quadrilátero Ferrífero and Diamantina plateau) share a similar *campo rupestre* physiognomy, the ones from Quadrilátero Ferrífero are usually composed of ferruginous soils, which par-

Figure 2. *Lychnophora pseudovillosissima* Semir ex Antar, M. Monge & Loeuille: (A) Treelet habit. (B) Treelet habit. (C) Branches bearing immature inflorescences (capitulescences). (D) Dense population growing in campo rupestre. A–D. Photos by B. Loeuille.
tially explain its unique flora (Carmo et al. 2018). For _Lychnophora pseudovillosissima_, we found just some differences between gatherings from both localities. The specimens from Diamantina Plateau usually dry greyish and have a higher blade length/wide ratio and the specimens from Quadrilátero Ferrífero dry brownish and have a slightly smaller blade length/wide ratio. Despite of that, gatherings from both localities are clearly representatives of the same taxon, having solid differences from other species. Future phylogeographic studies with the species are desired in order to better understand its genetic diversity as well as further expeditions to uncover other localities for the species and better understand its distribution.

The new species is distinguished from other _Lychnophora_ species by petiolate leaves (Figure 3), with the petiole obscured by lanose trichomes, long linear lamina usually drying glaucous, leaves with acute apex, frequently with a short blunt mucron, ca. 0.5 mm long, reticulodromous venation, and 3–5 florets per capitulum.

As stated in the diagnosis, the morphologically closest species is _Lychnophora villosissima_. The new species shares with it a similar habit, leaves shortly petiolate, reticulodromous venation and 3–5 florets per capitulum, but differs in the combination of mature leaves linear (vs. mature leaves narrow lanceolate or very narrow elliptic in _L. villosissima_), usually glaucous, with leaves drying greyish or brownish (vs. leaves drying brownish or greenish), apex acute (vs. apex acute or obtuse), base attenuate or truncate (vs. attenuate or rounded), blade length/wide ratio 1:(8.7–)14–57 (vs. 1:5–12,2(–17)), and petiole 1–2.4 mm long with expanded base (vs. petiole up to 6 mm long with narrowed base). Furthermore, individuals of _L. pseudovillosissima_ seem to possess less robust stems (Figure 2) when compared to _L. villosissima_; it should be noted, however, that due to variation in collection procedures, sometimes only the apical part of the stems was sampled, and no measurements were taken.

In addition, _Lychnophora pseudovillosissima_ is morphologically similar to _L. ericoides_ Mart. and _L. pinaster_ Mart. which also possess linear leaves but it differs from both species by having shortly petiolate leaves (vs. sessile in _L. ericoides_ and _L. pinaster_), reticulodromous venation (vs. broquidodromous), and lanose or villose trichomes fully covering the midrib abaxially (vs. midrib glabrous or tomentose partially covering the midrib). The main morphological differences among _L. pseudovillosissima_ and related species are summarized in Table 1.

Semir (1991) in his unpublished thesis recognized 68 species in _Lychnophora_ (with a different circumscription), 27 of which were proposed as new to science. Some of Semir’s proposed new species have already been published (Semir et al. 2014; Loeuille et al. 2019; Gomes and Loeuille 2021), but other clearly recognizable taxa
remained unpublished. Here, we described and illustrated another new species previously recognized in João Semir’s (1937–2018) thesis (Semir 1991), then named *L. pseudovillosissima* and also treated in Semir et al. (2011) as *Lycnhophora* sp. 5. Although *L. pseudovillosissima* has never been formally described before, the name is present in the IPNI (IPNI 2022) and in The Plant List (The Plant List 2013), which makes the formal publication of the species name urgent. This is especially important in view of the recent and diverse threats of campo rupestre areas, including open pit mining, wood extraction, agriculture, altered fire regimes, and invasive species (Silveira et al. 2016).

We understand that the value of the campo rupestre vegetation can be better understood from the description and recognition of its floristic diversity. This recognition can subsidize conservationist actions by the regional and national governments and lead to advances in specific legislation for the protection of the vegetation of Brazilian campos rupestres.

**BRAZIL:** Minas Gerais: Belo Horizonte, Serra do Curral, BR3, a 15 km de Belo Horizonte, 1300 m, 16 July 1956, L. Roth 1660 (HUFU, MBM, RB). Buenópolis, Parque nacional das Sempre Vivas, ao lado da Serra do Landi, 1306 m, 01 May 2007, 17°54′27.7″S, 43°45′24.2″W, T.E. Almeida et al. 974 (BHCB). Brumadinho, Serra da Calçada (Serra da Moeda), Retiro das Pedras, caminho para o Forte de Brumadinho, depois da descida da escada de pedras, à direita e terrenos na divisa da EXPLO perto da mina de cristal, 20°08′S, 44°13′W, February 1989, L.A. Martens 93 (SPF, UEC); ibid, nas proximidades da mina de cristal, 20°08′S, 44°13′W, February 1990, L.A. Martens 372 (K, SPF, UEC); arredores do condomínio Retiro das Pedras, 14 September 1999, J.R. Stehmann & M. Gonçalves 2543 (BHCBR); Serra da Moeda, Retiro das Pedras, campo de quartzito, 20°05′35″S, 43°59′01″W, 20 August 2001, P.L. Viana 162 (BHCBR); Serra da Moeda, 20°06′28″S, 43°59′02″W, 17 February 2012, C.V. Vidal & J. Paula-Souza 915 (BHCBR). Con-

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**Figure 4.** Geographic distribution of *Lychnophora pseudovillosissima* Semir ex Antar, M.Monge & Loeuille (white circles). In the smaller map, the green shaded area represents the Atlantic Forest domain and the orange shaded area represents the Cerrado phytogeographic domain.
Table 1. Diagnostic morphological characters of *Lychnophora pseudovillosissima* and related species.

<table>
<thead>
<tr>
<th>Character</th>
<th><em>L. pseudovillosissima</em></th>
<th><em>L. villosissima</em></th>
<th><em>L. ericoides</em></th>
<th><em>L. pinaster</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf petiole</td>
<td>shortly petiolate</td>
<td>shortly petiolate</td>
<td>sessile</td>
<td>sessile</td>
</tr>
<tr>
<td>Leaf arrangement</td>
<td>dense</td>
<td>dense</td>
<td>dense</td>
<td>lax, rarely dense</td>
</tr>
<tr>
<td>Blade shape</td>
<td>linear</td>
<td>narrow lanceolate or very narrow elliptic</td>
<td>linear</td>
<td>linear</td>
</tr>
<tr>
<td>Blade length</td>
<td>up to 15 cm</td>
<td>rarely exceeding 10 cm</td>
<td>up to 15 cm</td>
<td>rarely exceeding 6 cm</td>
</tr>
<tr>
<td>Veneration</td>
<td>reticulodromous</td>
<td>reticulodromous</td>
<td>broquidodromous</td>
<td>broquidodromous</td>
</tr>
<tr>
<td>Leaf color (when dry)</td>
<td>greyish or brownish, rarely greenish</td>
<td>brownish or greenish</td>
<td>greyish</td>
<td>brownish or greenish</td>
</tr>
<tr>
<td>Blade apex</td>
<td>acute</td>
<td>acute to obtuse</td>
<td>acute</td>
<td>obtuse to rounded</td>
</tr>
<tr>
<td>Mucron</td>
<td>short blunt, ca. 0.5 mm long, rarely absent</td>
<td>inconspicuous, less than 0.2 mm, commonly absent</td>
<td>short blunt, ca. 0.5 mm long, rarely absent</td>
<td>inconspicuous, less than 0.2 mm, commonly absent</td>
</tr>
<tr>
<td>Blade base</td>
<td>attenuate or truncate</td>
<td>attenuate or rounded</td>
<td>rounded, rarely truncate</td>
<td>rounded to auriculate, rarely attenuate</td>
</tr>
<tr>
<td>Indumentum midrib abaxially</td>
<td>lanose or villose</td>
<td>lanose or villose</td>
<td>glabrous or tomentose</td>
<td>glabrous or tomentose</td>
</tr>
</tbody>
</table>

gonhas do Norte, estrada para Costa Sena, ca. 15 km de Congonhas do Norte, 18°42'33.8"S, 43°41'04.8"W, 1010 m, 21 January 2007, B. Loeuille et al. 81 (K, SPF).

Diamantina, 15 km S. de Diamantina, rodovia para Conselheiro Mata, 17 May 1977, P.E. Gibbs et al. 5264 (UEC); 18°18'S, 43°59'W, J.E.M. Brazão 239 (RB); estrada Guinda-Conselheiro Mata, km 178, 4 June 1985, H.F. Leitão-Filho 17340 (UEC); ibid, H.F. Leitão-Filho 17350 (UEC); estrada Diamantina-Conselheiro Mata, km 185 próximo à grande inselberg, 23 February 1986, J. Semir et al. CFCR 9492 (UEC); 20-26 km WSW de Diamantina, camino a Conselheiro Mata, MG-220, 18°17'S, 43°53'11.9"W, 20 June 2001, J.N. Nakajima et al. 01/108 (UEC); ibid., J.N. Nakajima & R. Romero 3098 (HUFU); estrada Diamantina-Conselheiro Mata, km 164, 18°18'36.5"S, 43°53'11.9"W, 20 June 2001, J. Semir et al. 01/112 (UEC); estrada pra Conselheiro Mata, km 176.5, ao lado direito da estrada, 18°17'S, 43°47'W, 14 November 2002, F. Feres et al. 74 (UEC); estrada para Conselheiro Mata, 8 July 2004, M.E. Mansanares et al. 412 (UEC); estrada para Conselheiro Mata, km 172, 8 July 2004, Mansanares et al. 414 (UEC); estrada Diamantina-Conselheiro-Mata, km 184, 2.5 km da estrada Diamantina-Gouveia (BR 259), 18°17'30"S, 43°44'10"W, 22 January 2007, B. Loeuille et al. 87 (K, MBM, MO, SPF, UFP, US); ibid., 1280 m, B. Loeuille et al. 89 (K, SPF); Parque Estadual do Biribiri, estrada para Pinheiro, mirante da Guinda, 10 August 2010, B. Loeuille et al. 532 (SPF); ibid, 18°10'20.5"S, 43°38'2.1"W, 10 August 2010, I.M. Franco et al. 584 (DIAM, HUFU); Conselheiro Mata, Estrada Diamantina-Conselheiro Mata, ca. 5 km da BR, 22 January 2012, D. Gonçalves et al. 381 (UEC); Parque Estadual do Biribiri, Alto do Guinda, 18°10'9.5"S, 43°35'54.6"W, 15 March 2012, D. Marques et al. 444 (BHCB, DIAM, HUFU); Serra do Pasmar, 18°17'53"S, 43°45'16"W, 24 February 2010, I.M. Franco et al. 48 (DIAM, HUFU). Gouveia, morro da torre de televisão, alto do morro, entrada a oeste da rodovia Gouveia-Diamantina (BR 259), a 3.3 km norte de Gouveia, 18°25'24"S, 43°43'24"W, 22 January 2007, B. Loeuille et al. 85 (SPF, UFP). Nova Lima, campo rupestre perto da BR040 próximo ao BH Shopping e Copasa, 22 February 1990, A.M.G. Anjos 125 (BHCB, UEC).

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REFERENCES


Reflora-Plantas do Brasil: Resgate histórico e herbário virtual para o conhecimento e conservação da flora brasileira. Available at: http://reflora.jbrj.gov.br/ [accessed 2022 June 3].


