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## *Stachytarpheta atkinsiae*, a new species of Verbenaceae endemic to the Chapada Diamantina, Bahia, Brazil

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### Abstract

*Stachytarpheta atkinsiae*, belonging to the Radlkoferiana group from the Chapada Diamantina, Bahia state Brazil, is here described. It is a red-flowered species, and unusual in being a large, much-branched shrub, with densely lanate indumentum. The species shows similarities with *S. froesii* and *S. radlkoferiana*, but differs from both vegetative and floral characters. We provide a full description of the species, together with illustrations, a conservation status assessment, and a distribution map.

### Resumo

Nesse trabalho está sendo descrita *Stachytarpheta atkinsiae* pertencente ao Grupo Radlkoferiana e de ocorrência na Chapada Diamantina, Bahia, Brasil. É uma espécie vistosa, com flores vermelhas, e bem distinta por ser um arbusto alto, robusto e ramificado, com ramos densamente lanados. A espécie tem semelhanças com *S. froesii* e com *S. radlkoferiana*, mas difere por caracteres vegetativos e florais. É apresentada descrição detalhada, ilustrações, fotos em campo, análise do estado de conservação, e mapa de distribuição.

**Keywords:** “campo rupestre”, endemic species, Serra do Espinhaço, taxonomy

### Introduction

The montane rocky grasslands or “Campos Rupestres” of the Espinhaço Range of eastern Brazil, extending from Minas Gerais State in the South to Bahia State in the North, are a major centre of plant diversity, which has attracted the interest of biologists, who are intrigued by the evolutionary processes that have led to its existence (Harley 1995; Giulietti *et al.* 1997; Zappi *et al.* 2017). Among the many genera which display a high level of speciation in this region, *Stachytarpheta* Vahl (1804:201) (Verbenaceae) is notable. Generic relationships of *Stachytarpheta* within the Verbenaceae have been variously interpreted, however a phylogenetic analysis (Marx *et al.* 2010) based on seven chloroplast DNA regions, places it in a clade with the New World *Bouchea* Chamisso (1832:252) and *Chascanum* E.Mey (1837: 275), from the Old World tropics. The flowers are arranged in elongate, or sometimes short, terminal spikes, and the fruit, divided into two mericarps, is enclosed (except in *Bouchea*) in a persistent calyx. *Stachytarpheta* is unique within the family in having only two stamens and two staminodes, and in some species the flowers are sunken in the inflorescence axis. It shares the spicate inflorescence and a schizocarpic fruit of two mericarps, with the neotropical genus *Bouchea*, which has six species recorded from Brazil (BFG 2015), but differs, as the species of this genus have four fertile stamens. *Stachytarpheta* also has an exserted style with a discoid stigmatic apex, and, unusually in the family, uniseriate, multicellular trichomes as well as the typical unicellular trichomes.

In her account of the genus *Stachytarpheta* in Brazil, Atkins (2005) estimated that there are a total of 133 species in the genus, all but one neotropical in origin, with a few which extend to the Old World. From Brazil, 79 species

have been recorded, of which 72 are endemic to it (Atkins 2005; BFG 2015). Of these, 20 species are restricted to the campos rupestres of Minas Gerais and 18 species similarly restricted to Bahia, while a further six are endemic to similar habitats in the Central Planalto of Goiás State. So, the greatest diversity is to be found in the geologically ancient mountain range of the Serra do Espinhaço of Bahia and Minas Gerais States, with the mountains in the Planalto of Goiás showing slightly less diversity. Many of these species with a very restricted distribution are extremely vulnerable, due to destruction of their habitat by human activities: road-building, agriculture, and extensive burning. Some species in the genus are at present known from only a single collection, and urgently require further field investigation.

Atkins (2005) divided the Brazilian species of *Stachytarpheta* into 12 informal groups, based on a cladistic analysis of morphological characters. One of the groups, which is well-supported in her analysis, is Group 5 Radlkoferiana, which contained eight species and one variety, all restricted to the northern part of the Serra do Espinhaço in Bahia, known as the Chapada Diamantina. They are: *Stachytarpheta almasensis* Mansfeld (1924:155), *S. arenaria* S. Atkins (2005:223), *S. bromleyana* S. Atkins (2005: 221), *S. froesii* Moldenke (1949:173), *S. ganevii* S. Atkins (2005:223), *S. lychnitis* Mart. ex Schauer (1847:571), *S. piranii* S. Atkins (2005: 225), *S. radlkoferiana* Mansfeld (1924:156) var. *radlkoferiana* and *S. radlkoferiana* var. *lanata* S. Atkins (2005:219). The new species described in this paper belongs here. This group is characterized (Atkins 2005), as shrubs or subshrubs with a woody rootstock, with short, compact inflorescences with up to 12 flowering nodes; bracts herbaceous, calyx 2-lobed, not embedded in the rhachis, corolla bright red with stamens attached below mid-tube; fruit not beaked at apex, with surface reticulate and without a stylopodium.

During studies of the Radlkoferiana Group for the Flora of Bahia, we discovered this new species, whose description is the objective of the present paper.

## Material & Methods

Extensive fieldwork in the Chapada Diamantina, principally for the Flora of Bahia Project, has been carried out in the last 45 years, by researchers both in Brazil, working from the herbaria SPF, CEPEC, HUEFS and ALCB, as well as researchers from RBG, Kew, in England. In relation to *Stachytarpheta* of the Radlkoferiana Group, all eight species and the one variety listed by Atkins (2005), have been collected by these researchers, while five of the taxa were first collected by them. Here we add a ninth species, now described in this paper, which was first discovered and collected by two of the authors of this paper.

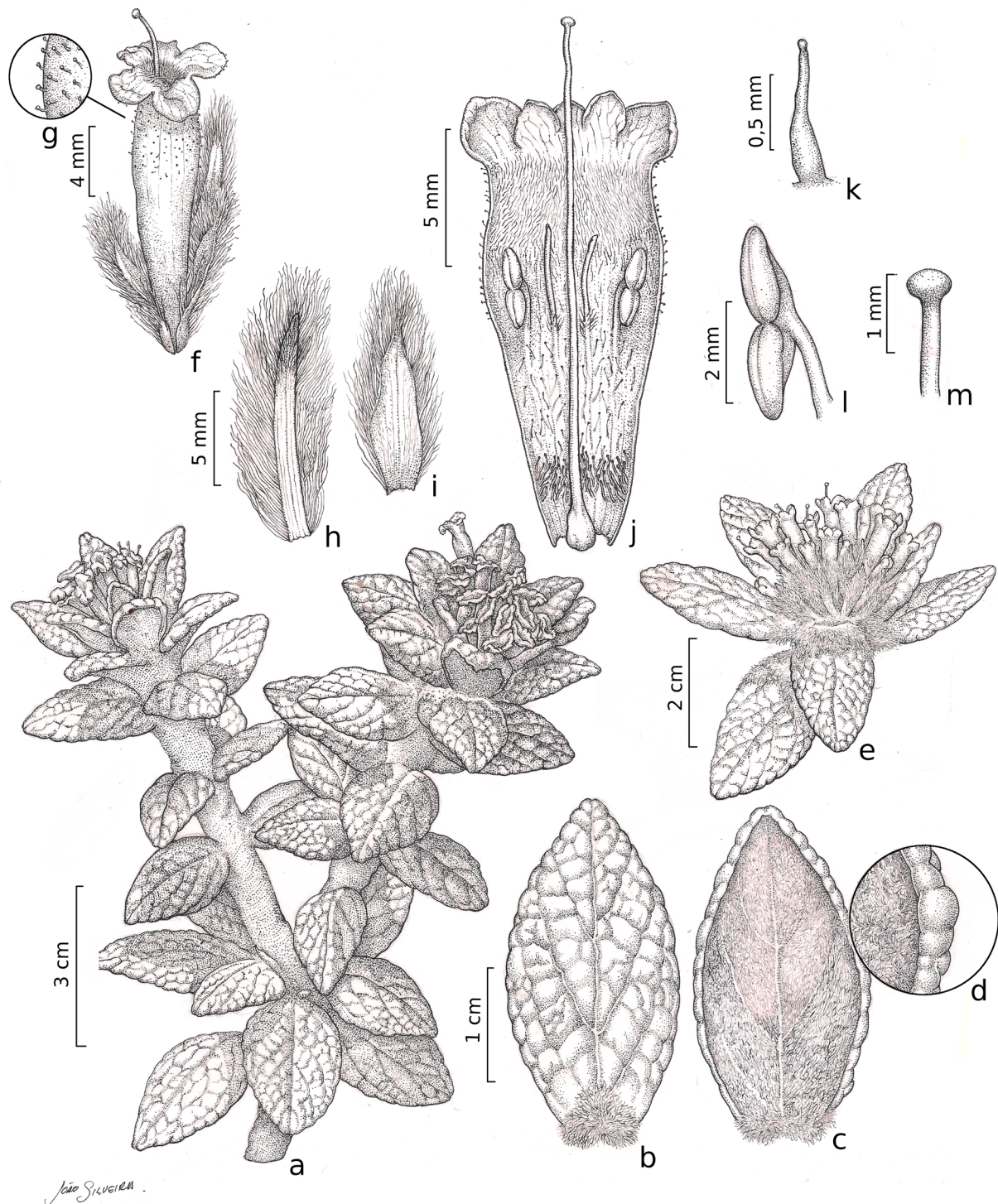
To infer conservation status we used the criteria B (IUCN 2012), the GeoCAT tool for Extent of Occurrence (EOO) and Area of Occupancy (AOO) analysis (Bachman *et al.* 2011). The distribution map was produced in QGIS (QGIS Development Team 2018).

## Taxonomic Treatment

*Stachytarpheta atkinsiae* Harley & Giul. *sp. nov.* Figures 1 a–m; 2A–C; MAP1.

Type:—BRAZIL. Bahia: Mucugê, Serra do Gobira, ca. 8,4 km ao sul de Mucugê em linha reta, na última subida próxima ao cume, 13° 04'26"S, 41°22'44"W, 1555 m. Campo rupestre entre pedras, 19 January 2005, R.M. Harley, A.M. Giuliatti & E. Ribeiro 55488 (holotype HUEFS; Isotypes K, MG, SPF).

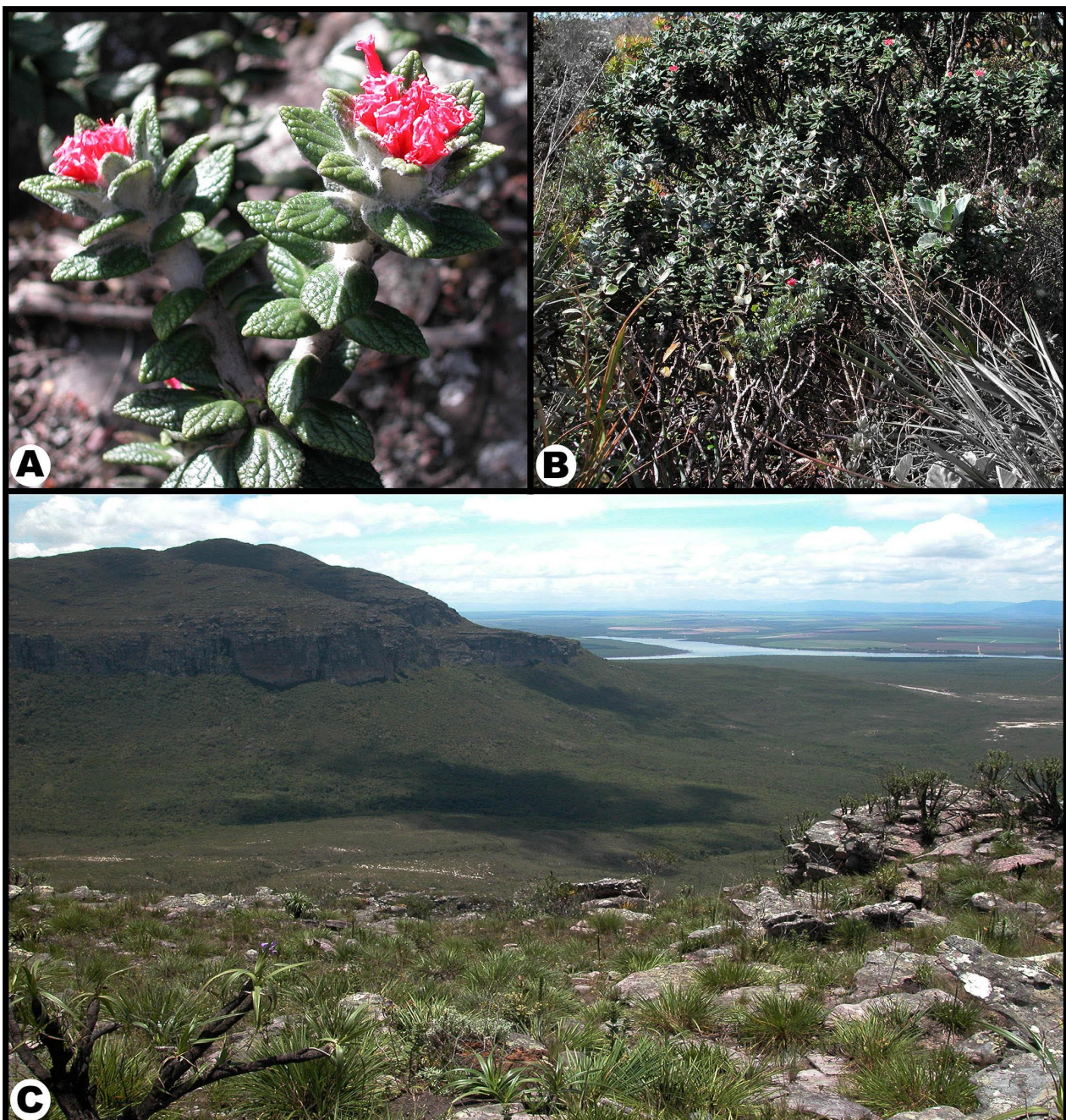
*Stachytarpheta atkinsiae* is morphologically similar to *S. froesii* Moldenke, *S. radlkoferiana* Mansfeld var. *radlkoferiana* and *S. radlkoferiana* var. *lanata* S. Atkins. All taxa are red-flowered and those species are the only ones to share with *S. atkinsiae* the discoloured leaves, ± glabrous on adaxial surface and white-lanate on abaxial surface and with a revolute margin. *S. atkinsiae* has leaves sessile or with petiole up to 2 mm long, lamina 2.0–3.7 × 1.0–2.3 cm, elliptic, apex obtuse; bracts linear, 10–12.5 mm long; base of flowers obscured by lanate indumentum. *S. froesii* differs from the new species as follows: it has leaves with petiole 5–8 mm long, lamina 1.5–2.8 × 1.4–2.5 cm, broadly obovate, apex rotund to truncate, base of flowers not obscured by lanate indumentum and especially because the bracts which are linear as in *S. atkinsiae*, measure only c. 4 mm long. *S. radlkoferiana* var. *radlkoferiana* and var. *lanata* differ from the new species as both possess obovate and not linear bracts, as well as having much smaller, sessile leaves. *S. radlkoferiana* var. *radlkoferiana* has imbricate leaves on the young shoots, 0.7–1.5 × 0.4–0.8 cm., linear-elliptic to long-triangular or narrowly oblong, while *S. radlkoferiana* var. *lanata* has ovate leaves, which measure 1.0–1.4 × 0.5–0.7 cm.



**FIGURE 1.** *Stachytarpheta atkinsiae*. **a.** Habit. **b.** Leaf, adaxial surface. **c.** Leaf, abaxial surface. **d.** Leaf, detail of revolute margin. **e.** Inflorescence. **f.** Flower, including calyx, corolla, bract. **g.** Corolla tube detail with gland-tipped trichomes. **h.** Bract, adaxial surface. **i.** Calyx lobe, internal surface. **j.** Dissected corolla. **k.** Detail of the trichome of corolla. **l.** Anther. **m.** Style apex with capitate stigma. All from *Harley et al. 55488* (type). Drawn by João Silveira.

Erect shrub 1–1.7 m tall, taller plants with trunk near base up to c. 10 cm diam., much branched in the upper parts; upper branches woody, thick, 5–8 mm diam., the younger ones terete to weakly quadrangular in cross section, lanate, the older ones rounded in cross section and less hairy, leaf-scars conspicuous. Leaves, crowded at apex of stem, 2–3 per node, sessile or the petiole up to 2 mm long, lanate, lamina coriaceous, discolorous, much longer than internodes, patent, elliptic, 2.0–3.7 × 1.5–2.3 cm, base cuneate to truncate, apex obtuse or slightly rotund, rarely acute, margin narrowly revolute (c. 0.4 mm), adaxial surface shiny, reticulate and strongly bullate with venation deeply impressed,

entire but margin appearing shallowly crenate along edge, due to bullae, younger leaves white-villous at base, but soon glabrescent, with few, short trichomes on veins, abaxial surface densely white-lanate, venation only visible in older leaves, primary and secondary veins prominent. Inflorescence 1.5–2.0 cm long, 2.0–2.5 cm wide, a terminal, congested spike, almost overtopped by surrounding leaves, densely lanate, obscuring bracts, calyx and part of the corolla; bract linear, 10–12.5 mm long, overtopping calyx, adaxial surface tomentose in apical  $\frac{1}{4}$ , glabrous towards base, abaxial surface densely lanate, becoming rigid and reflexed after anthesis. Flowers sessile; calyx straight, light green, 9–10 mm long, densely lanate on outer surface, glabrescent within, 2-lobed, lobes equal, 4–5 mm long; corolla 20–22 mm long, bright pink, lobes 2.0–2.5 mm long, patent, papillose, tube 18–20 mm long, narrowly funnel-shaped, straight, base of the tube white (for c. 5mm), external surface with minute gland-tipped trichomes mostly near the mouth, internal surface pubescent on upper  $\frac{1}{3}$  to near the throat, with white hairs, a few scattered glandular trichomes and with a dense ring of bottle-shaped, gland-tipped hairs, just above the ovary; stamens 2, included, with point of attachment above middle of corolla-tube, filaments c. 2 mm long, pubescent to glabrescent, anthers 3.0–3.5 mm long, cream, staminodes 2, c. 3.7 mm long. Ovary c. 2 mm long, glabrous, ellipsoid, style 18–20 mm long, long-exserted, stigma capitate, white. Fruit castaneous to black, 2.0–3.0  $\times$  1.5–2.0 mm, oblong, commissure hardly discernible, abscission-point in the apex of the fruit leaving a short stump, surface wrinkled, reticulate with prominent attachment scar.



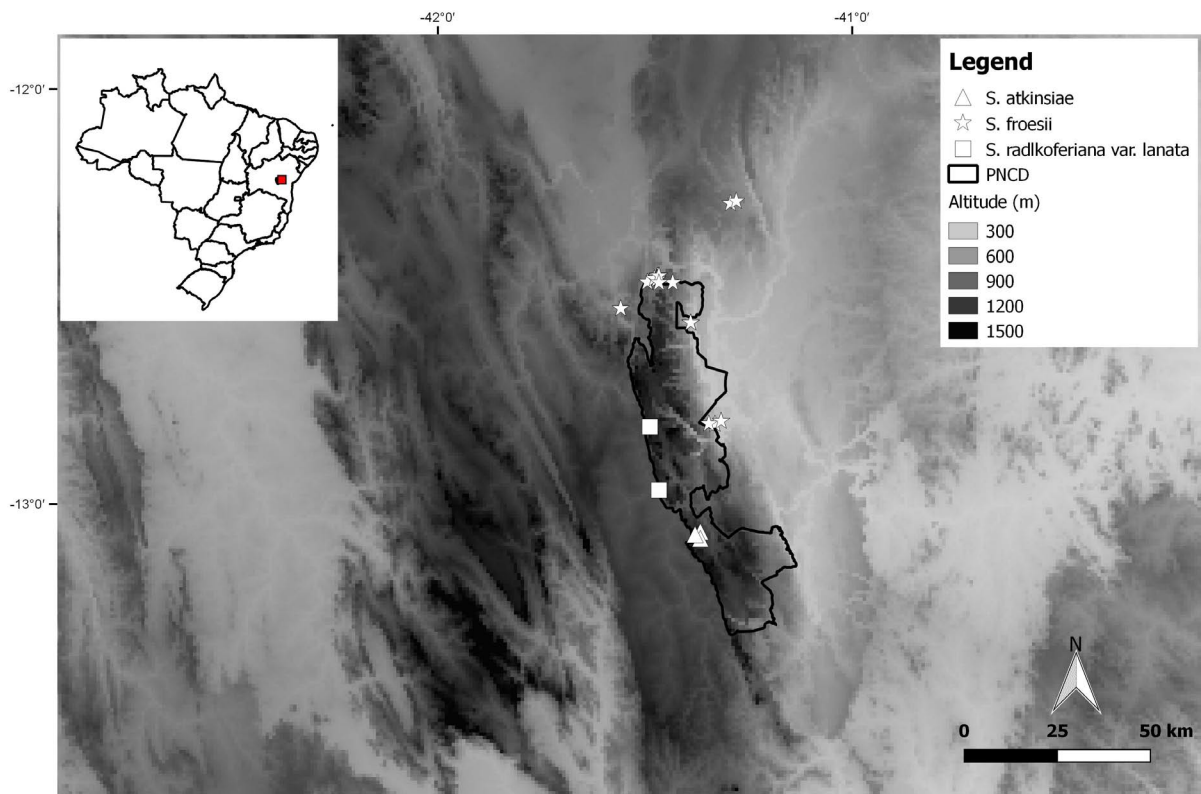
**FIGURE 2.** *Stachytarpheta atkinsiae*. **A.** Branch with flowers. **B.** Habit. **C.** Habitat. Photos by Raymond M. Harley.

**Additional specimens examined (paratypes):**—BRAZIL. Bahia: Mucugê, Serra do Gobira, 13°04'24" S, 41°22'26" W, 1471–1568m, 21 January 2005, *J.G. Nascimento et al.* 290 (HUEFS); Serra do Gobira, 13°05' S, 41°22' W, campo rupestre, 16 September 2006, *AA. Conceição et al.* 1869 (HUEFS); Serra do Gobira, 13°04' S, 41°22' W, campo rupestre, 1400 m, 30 January 2009, *AA. Conceição* 3170 (HUEFS).

**Distribution and ecology:**—*S. atkinsiae* is known only from the Serra do Gobira, in the municipality of Mucugê, in Bahia (Map 1). The species occurs only in *campo rupestre* vegetation in sandy rocky dry soils. It is recorded from high elevation areas (1400 to 1570 m) in *campo rupestre* vegetation, in sandy rocky dry soils. Flowers and fruits were registered in September and January (most collections in this month).

**Etymology:**—The specific epithet honors Sandy Atkins who worked at the Royal Botanic Gardens, Kew. Sandy Atkins is the author of the revision of *Stachytarpheta* in Brazil (Atkins 2005), a superb work that is currently the most up-to-date and important contribution to our knowledge of the genus.

**Conservation status:**—*Stachytarpheta atkinsiae* is known from just one mountain, Serra do Gobira, in the municipality of Mucugê. It has an Extent of Occurrence (EOO) of 1.295 km<sup>2</sup>, and an Area of Occupancy (AOO) of just 12 km<sup>2</sup>. The Serra do Gobira is included in the Nacional Park of Chapada Diamantina. However, in recent years, the Park has suffered from frequent illegal fires which have destroyed some of the flora and fauna of the region. The currently conservation status of this species is assessed as Endangered (EN), according to criteria B1ab(iii)+2ab(iii) (IUCN 2012).



**MAP 1.** Geographic distribution of *Stachytarpheta atkinsiae*, *S. radlkoferiana* var. *lanata* and *S. froesii*. Black lines: National Park of the Chapada Diamantina.

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