



## Original Paper

# Updating the checklist of subtribe Hyptidinae (Lamiaceae) from Brazilian Amazonia, with three new taxa and notes on *Hyptis* sect. *Eriosphaeria*

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### Abstract

Three new taxa of subtribe Hyptidinae (Lamiaceae) from Amazonian Brazil are here described: two from Pará state *Eriope macrostachya* var. *amazonica*, and *Hyptis cachimboensis*, and *Hyptis spathulata* from Rondônia state. The diagnostic characters, which distinguish them from their closest relatives are described and discussed, their conservation status is given and a plate is provided for each of the new taxa. The Hyptidinae conspectus an earlier checklist of Lamiaceae from Amazonian Brazil is updated with various name changes since its publication, and with the addition of another two species of *Hyptis* not previously included. Also included, is a note on *Hyptis* sect. *Eriosphaeria*, to which the two new species described here, belong.

**Key words:** endemic species, *Eriope*, *Hyptis*, Serra do Cachimbo, taxonomy.

### Resumo

Três novos táxons da subtribe Hyptidinae (Lamiaceae) da Amazônia Brasileira são aqui descritos: dois do estado do Pará, *Eriope macrostachya* var. *amazonica* e *Hyptis cachimboensis*, e *Hyptis spathulata* de Rondônia. Os caracteres diagnósticos destes novos táxons são descritos e discutidos, incluindo o status de conservação, além de pranchas para todas as novas taxons. A parte do *checklist* da subtribo Hyptidinae da Amazônia do Brasil é aqui atualizado com algumas mudanças de nomes desde sua publicação, e com a adição de duas espécies não previamente incluídas. Também, foram incluídos comentários sobre *Hyptis* sect. *Eriosphaeria*, a qual as duas novas espécies aqui descritas pertencem.

**Palavras-chave:** espécies endêmicas, *Eriope*, *Hyptis*, Serra do Cachimbo, taxonomia.

## Introduction

The subtribe Hyptidinae (Ocimeae tribe, Nepetoideae subfamily) from the Lamiaceae (or Labiatae) is represented by c. 400 species distributed mostly in America, with seven species also found as introductions in the Old World Tropics (Harley & Pastore 2012), perhaps two species occurring naturally in Africa. *Hyptis* Jacq. still the most species-rich genus in Hyptidinae, even after its dismantling in which several new genera were recognized (Harley & Pastore 2012). In Brazil, this subtribe is represented by all genera, except for *Asterohyptis* Epling, endemic to Central America and Mexico. Recently, several studies have been published on Brazilian Hyptidinae,

describing new species, as well as floristic accounts (e.g., Harley *et al.* 2019a, b; Harley & Antar 2019; Soares *et al.* 2019; Soares *et al.* 2020). The Hyptidinae of the Amazonian region were recently studied by the senior author (Harley 2012), who presented a checklist including records of all species of Lamiaceae (except *Aegiphila* Jacq., *Amasonia* L.f. and *Clerodendrum* L. *Vitex* L. including *Volkameria* L., which had previously been treated under the family Verbenaceae) and a key for the Hyptidinae taxa occurring in the region. The objective of the present paper is to update the account of the Hyptidinae of Brazilian Amazonia presented by Harley (2012) and describe the new taxa of the subtribe from to this region.

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## Materials and Methods

All material cited has been seen by at least one of the authors. The morphological analyses of herbarium material studied for this paper were prepared with the aid of optical equipment in the Museu Goeldi, where the status of material could be assessed and compared with morphologically similar species. Herbarium acronyms are taken from Thiers (continuously updated). We built a specimen database containing all specimens studied and their respective geographic coordinates, which were either taken from the original herbarium labels or, when not available, estimated from the web. The distribution maps were also made with Qgis 2.18.13 (2016) and later edited in Corel® PHOTO-PAINT™ X7. The conservation status of each species was inferred with GeoCAT (Bachman *et al.* 2011). The species were classified according to the parameters of the International Union for Conservation of Nature (IUCN 2017), taking into account the number of occurrence locations, the area of occupancy (AOO), the extension of occurrence (EOO), and the quality of habitat. The categories are as follows: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), and Data Deficient (DD).

This paper is divided in three parts: 1. Updating the checklist of Hyptidinae of Brazilian Amazonia published by Harley (2012); 2. Notes on *Hyptis* sect. *Eriosphaeria*; and 3. New taxa from the Brazilian Amazonian Region.

## Results and Discussion

1. Updating the checklist of Hyptidinae of Brazilian Amazonia published by Harley (2012).

A generic updating on the Amazonian Hyptidinae.

The checklist of Brazilian Amazonian Hyptidinae (Harley 2012) was published shortly before a major generic revision of Hyptidinae (Harley & Pastore 2012) in which the genus *Hyptis* was divided into twelve smaller genera, and before a number of other generic adjustments were made, resulting from a molecular phylogenetic study (Pastore *et al.* 2011; Harley & Pastore 2012). Thus, three new genera and a new combination on *Hyptidendron* are now added to Brazilian Amazonian Lamiaceae:

**Cantinoa** Harley & J.F.B. Pastore (2012).

*Cantinoa americana* (Aubl.) Harley & J.F.B. Pastore (2012) = *Hyptis spicigera* Lam.

*Cantinoa carpinifolia* (Benth.) Harley & J.F.B. Pastore, (2012) = *Hyptis carpinifolia* Benth.

*Cantinoa mutabilis* (Rich.) Harley & J.F.B. Pastore (2012) = *Hyptis mutabilis* (Rich.) Briq.

**Hyptidendron** Harley (1988).

*Hyptidendron eximium* (Epling) Harley & J.F.B. Pastore (2012) = *Hyptis eximia* Epling (1936).

**Gymneia** (Benth.) Harley & J.F.B. Pastore (2012).

*Gymneia interrupta* (Pohl ex Benth.) Harley & J.F.B. Pastore (2012) = *Hyptis interrupta* Pohl ex Benth.

*Gymneia moniliformis* Harley (2013) = *Hyptis* sp. nov. ined (sect. *Gymneia*) Harley (2012).

**Mesosphaerum** P. Browne (1756: 257).

*Mesosphaerum pectinatum* (L.) Kuntze (1891) = *Hyptis pectinata* (L.) Poit.

*Mesosphaerum suaveolens* (L.) Kuntze (1891) = *Hyptis suaveolens* (L.) Poit.

Taxa newly cited

for the Brazilian Amazonian Region

Apart from the generic updating provided above, two species were not included in the first checklist of Hyptidinae from Brazilian Amazonian region (Harley 2012). These are:

*Hyptis* (sect. *Xylodontes*) *lutescens* Pohl ex Benth., Labiat. Gen. Spec.: 109 (1833).

**Selected Material:** BRAZIL. PARÁ: Altamira: Rio Fresco, 29 July 1962, *Thomas da Silva 736* (IAN). RONDÔNIA: Porto Velho, Aeroporto Internacional, *Mota & Coelho 02* (INPA).

This species is distributed also in Peru, Bolivia, Paraguay, and several other parts of Brazil: North: Tocantins; Northeast: Bahia, Piauí; Southeast: Minas Gerais, São Paulo; Central-West: Goiás (and Distrito Federal), Mato Grosso, Mato Grosso do Sul.

*Hyptis* (sect. *Eriosphaeria*) *velutina* Pohl ex Benth., Labiat. Gen. Spec.: 90 (1833).

**Selected Material:** BRAZIL. PARÁ: Redenção, 10-20 April 2009, *Lobato 3634* (MG).

This species is also distributed in: Bolivia: La Paz, Santa Cruz; Brazil: North: Maranhão, Tocantins; Northeast: Bahia; Central-West: Goiás (and Distrito Federal), Mato Grosso and Mato Grosso do Sul; Southeast: Minas Gerais.

## 2. Notes on *Hyptis* sect. *Eriosphaeria* *Hyptis* Jacq. sect. *Eriosphaeria* Benth.

This section was originally characterized by Bentham (1833: pags. 69 and 88–89) in having the flowers in well-defined pedunculate capitula, clearly hemispherical (rather than globose as seen in the younger stages of several other sections, which are now treated as separate genera), with a straight calyx-tube, and with abundant long usually white trichomes, not only from the base of the flowers, but also in the upper part of the calyx-tube, giving the capitula an extremely hairy appearance. The indumentum is often accompanied by yellowish or orange glands, which seem characteristic of many members of the section. The section possesses another important character, not recorded by Bentham (1833, 1848), which is a gynoeceium in which the style is jointed above the level of the ovary, with the basal part (stylopodium) persistent.

Bentham (1848) later divided the section into four subsections: *Hyptis* sect. *Eriosphaeria* subsections *Sessilifoliae* Benth., *Velutinae* Benth., *Passerinae* Benth. and *Ditassoides* Benth., and recognized a total of 23 species in the section. However, this last subsection name is now replaced by the earlier name subsect. *Gnidiifoliae* Benth. (1833).

The above suite of characters, which is shared by many of the species, which today compose the section, held good for some time until three species from Goiás, with unusual coriaceous subglabrous leaves, dorsiventrally compressed, and sessile, few-flowered capitula, were discovered. Epling (1937: pag. 290) erected a new subsection for this extremely distinctive group: *Hyptis* subsect. *Pachyphyllae* Epling. A further species, *Hyptis imbricatiformis* Harley was subsequently described (Harley 1986b). All four are endemic to the Chapada dos Veadeiros in Goiás state, and share the presence of a stylopodium in the flowers and long silky white hairs extending from their base. Recent findings from molecular DNA studies (Pastore *et al.* 2011) confirm that this subsection is monophyletic, placing it within sect. *Eriosphaeria*. Morphological, micromorphological and molecular evidence

appear to place the “*Pachyphyllae*” group as a link between the rest of *Hyptis* sect. *Eriosphaeria* and *Hyptis* sect. *Induratae* Epling (Harley 1986a; Rudall 1986; Pastore *et al.* 2011). All three groups are best considered as representing *Hyptis* sect. *Eriosphaeria*, with its centre of diversity primarily in the mountains of Goiás, with also a strong presence in similar biomes in Minas Gerais.

Epling also created three other new subsections (Epling 1936, 1937) to accommodate four species, which did not appear to fall within those of Bentham, but a more detailed molecular study is required to elucidate their relationships. At the present time, 32 species are recognized in the section. The two subsections, *Hyptis* subsect. *Sessilifoliae* and subsect. *Velutinae*, are relevant to this paper, as each contains a new species from Amazonian Brazil. The two subsections are separated largely on the basis of leaf shape, although both typically have sessile or subsessile leaves. In *Hyptis* subsect. *Velutinae*, the leaves taper gradually towards the slender, often rounded, cuneate or acuminate base, while in *Hyptis* sect. *Sessilifoliae*, the base of the leaves is broader and cordate to truncate, sometimes almost clasping the stem. There also seems to be a difference in the indumentum of the two sections, although this is not clearly expressed in the literature. That of *Hyptis* sect. *Sessilifoliae* is composed of more delicate, softer trichomes, while those of *Hyptis* sect. *Velutinae* are more rigid and sometimes slightly silvery in appearance.

*Hyptis* sect. *Eriosphaeria* subsect. *Sessilifoliae* Benth. *in DC.* Type: *Hyptis ovata* Pohl *ex* Benth.

*Hyptis* sect. *Eriosphaeria* subsect. *Obtectae* Epling, (1937: 289), *syn. nov.* Type: *Hyptis obtecta* Benth.

As shown by the molecular analysis (Pastore *et al.* 2011), *Hyptis* sect. *Eriosphaeria* subsect. *Sessilifoliae* forms a well-supported clade, based on the five species analysed, and the morphological features support this. Eight species were recognized (Epling 1949). These eight species include a complex array of forms, and some collections appear to be intermediate between the species recognized. This is especially true with the extremely variable *Hyptis crenata* and two other widely collected species, *Hyptis dilatata* Benth. and *Hyptis goyazensis* A.St.-Hil. *ex* Benth. Although, based on empiric analyses, we suspect that this may be due to the long history

of habitat destruction, especially of forest, and the resultant expansion of more open savanna habitats, including pasture, where the species occur. Originally, forest may have acted as a barrier to gene flow, allowing a number of species to evolve in isolation. Subsequently, with the merging of populations, unrestricted gene flow may have allowed a whole range of intermediate forms to appear. Judging by present-day distribution, *Hyptis dilatata* probably evolved in the northern part of South America, particularly Amazonia, while *H. goyazensis* arose in the Western savannas south of the Amazon, in Mato Grosso and Goiás. The taxonomy of the *Hyptis crenata* complex has still not been elucidated, and the species shows a great deal of variation, which seems to be partly correlated with geography. This entire group is urgently requiring a detailed biosystematic and molecular study.

However, a number of taxa are sufficiently distinct, and merit recognition. These mostly have very narrow distributional ranges in montane areas. Examples include *Hyptis alpestris* A.St.-Hil. ex Benth., from mountains in SW Minas Gerais and neighbouring northern São Paulo, *Hyptis hamatidens* Epling & Játiva from northern Mato Grosso, and *Hyptis oblecta* Benth. from Pará, Tocantins and Goiás. This latter species, for which Epling created a new monotypic subsection (*Hyptis* subsect. *Oblectae* Epling 1936: 289), has now been analysed for its DNA (Pastore *et al.* in press), and is shown to form a clade with other members of *Hyptis* subsect. *Sessilifoliae*. This group is characterized by a mainly herbaceous habit, with sessile, often rugose and villous leaves, truncate to cordate at base and with a terminal, usually sub-corymbose inflorescence of capitula. *Hyptis oblecta* is unusual in having very small erect, conduplicate, imbricate leaves, under 1 cm long, which are closely applied to the stem. Leaf indumentum is silky, with short adpressed trichomes. However, a number of taxa have recently been discovered in which the leaves are also small, imbricate, sometimes conduplicate, as in *H. oblecta*, and with similar leaves. The new species here described, *Hyptis cachimboensis*, certainly has the habit and leaf shape and indumentum of a species belonging to *Hyptis* subsect. *Sessilifoliae*, but differs in its very small leaves, which are imbricate and erect, and often conduplicate, thus bridging the morphological gap between *Hyptis oblecta* and other members of subsect. *Sessilifoliae*.

### 3. New taxa

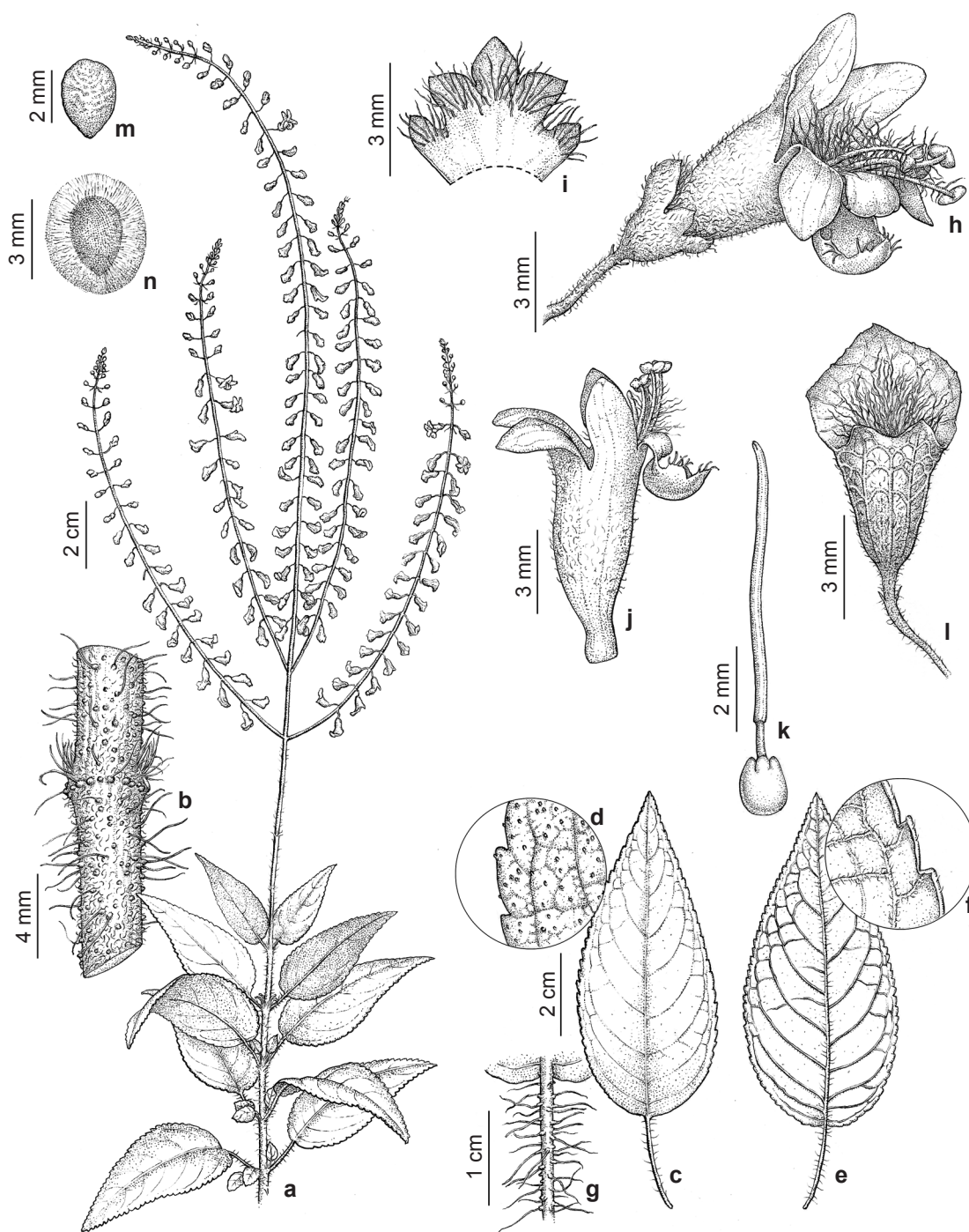
from the Brazilian Amazonian Region

*Eriope* Bonpl. ex Benth. (1833: 144).

**3.1. *Eriope macrostachya* Mart. ex Benth. var. *amazonica* Harley. var. nov.** Type: BRAZIL, PARÁ, Acará, Campina do Guarajá, 08.VI.2017, *Andrade & Nascimento 3578* (holotype MG (MG227653), isotype MG). Fig. 1

*The new variety described in this paper is very similar to the more widespread E. macrostachya var. macrostachya, but differs in its subglabrous leaves, often with the base unequal, and rounded to weakly cordate, the unusual setose trichomes with a thickened, dark, ± conical base, persistent, especially on the stems and petioles, and with flowers that are slightly larger than in the typical variety.*

Shrub to 4 m tall with older stems woody, pale brown < 1.4 cm diam., branched from the base, leafless below; upper stems more or less terete, often densely covered by long, rigid, ± setose and patent uniseriate trichomes, broad-based and 4–5 mm long, these mixed with very small, slender, few-celled uniseriate trichomes, patent at base and strongly curled above (often almost hooked, but not rigid). Many setose trichomes possess a stout, often conical, very rigid and dark-coloured base, persisting as a rigid projection, after the upper more slender, hyaline part has been eroded. Cauline leaves aromatic, with petiole (0.7–)1.2–2.5(–3.7) cm long, indumentum as on stems, but sparser and with few small curved trichomes, and broad-based setose trichomes frequent and often eroded, leaving dark, rigid projections; lamina (3.9–)6.7–8.2 × (1.9–)3–3.9 cm long, lanceolate to broadly ovate-lanceolate, usually at least twice as long as broad, (the leaves on short, non-flowering, side-branches smaller with lamina c. 1.8 × 0.8 cm, and sometimes narrowly ovate), membranous to cartaceous, discolorous, adaxial surface bright green when fresh, glabrous or nearly so, rugulose, with occasional usually very short, thick, conical trichomes, or very few short, setose trichomes, and numerous small, sessile, sunken glands, abaxial surface pale green, glabrous except along midrib and veins, midrib with some setose, patent and thick-based, uniseriate trichomes, veins with few, smaller, more slender trichomes, and very numerous small, sunken glands; base rounded to weakly cordate, often unequal, apex acute, margin somewhat irregularly and shallowly serrate, with teeth thickened along margin and especially at apex; older leaves often turning vinaceous.



**Figure 1** – a-n. *Eriope macrostachya* var. *amazonica* – a. habit; b. upper portion of stem; c. cauline leaf, adaxial surface; d. detail of cauline leaf, adaxial surface; e. cauline leaf, abaxial surface; f. detail of cauline leaf, abaxial surface; g. petiole with trichomes; h. flower side view; i. calyx at anthesis displayed to show internal surface; j. corolla, side view; k. gynoecium showing stylopodium; l. fruiting calyx with paired bacteoles on pedicel; m. nutlet; n. nutlet when wet showing mucilage. (Andrade & Nascimento 3578 MG). All figures drawn by João Silveira, Instituto de Tecnologia de Vale, Belém, Brazil.

Inflorescence c. 20–30 cm long, a terminal, branched thyrse (with one or very rarely two orders of branching) of uniflorous cymes, the axis slender with many short and slender, curved trichomes and some short, erect, gland-tipped trichomes. Flowers from the axils of rapidly deciduous bracts, 2–2.5 mm long, narrowly linear-lanceolate, pedicel slender, c. 2.5 mm long, slightly hairy, with two minute bracteoles shortly below the calyx†, calyx 5-lobed, green at anthesis and tinged vinaceous on upper surface, zygomorphic, 3–3.5/2.5 mm long††, tube turbinate, 3 posterior lobes broadly deltate, 2 anterior lobes narrowly deltate; calyx in fruit, with pedicel c. 4 mm long, deflexed, calyx 8/6 mm, strongly zygomorphic, posterior lip broadly fan-shaped, spreading, lower lip with lobes directed forward, throat with conspicuous tuft of white trichomes; corolla two-lipped with tube 6–7 mm long, externally pale lilac, white within, lobes spreading, dark lilac, with base of posterior lip internally with longitudinal, purple striations; stamens with filaments white, those of posterior (outer) stamens with long, whitish hairs, anterior stamens sparsely hairy, anthers yellow; style glabrous, lilac. Nutlets c. 2.6 × 1.8 mm, obovate, slightly flattened with rounded apex, glabrous, dark brown and strongly mucilaginous when wetted.

**Additional specimens examined (Paratypes):** BRAZIL. PARÁ: Acará, Campina do Guarajá, 3.II.2011, *Rocha 1473* (MG). Campina do Guarajá, cerca de 6 a 8 km de distância da Alça Viária, (PA-166), 01°30'32.5"S, 48°22'37.4"W, 7.VII.2017, *Andrade et al. 3582* (MG). Campina do Guarajá, 28.III.2018, *Harley et al. 58222* (MG).

*Eriope macrostachya* var. *amazonica* is at present only known from the type locality, but should be looked for in other similar campinas in Pará, and perhaps elsewhere in Amazonia (Fig. 2). The collection *Miranda 606* from Pará state, Tukurui, Campina de Santa Rosa deposited in INPA, recently determined as *Eriope macrostachya* Mart. ex Benth., which was described as “more glabrous than typical”, and should be re-examined. It is the only other known collection of this species from Amazonia, and could well prove to be a further record of this new variety. The area where this variety occurs is composed of deep

sand, varying in colour from almost white to a pale brownish orange, and has been subject in the past to the wholesale removal of sand for building. This has left a much-disturbed vegetation with occasional clumps of secondary woodland, and hollows as a result of the sand removal. In the rainy season these form temporary pools, although no aquatic species were observed. The open areas are dominated with a cover of *Chamaecrista ramosa* (Vog.) Irwin & Barneby var. *ramosa*, suggesting a much disturbed habitat. *Eriope* was so far found in only two main areas, although much of the site was not visited. In all, less than 50 plants were observed, although this probably represents a small part of the total population. It seems to occur on slightly raised areas and well away from standing water, and often nearby taller vegetation. Very young, dwarf plants, only about 20 cm tall, were observed growing below the *Chamaecrista*.

The varietal name was given in reference to the region where this variety is distributed.

The variety was flowering and fruiting during February to July, but further observations needed.

Conservation status. Species assessment: EOO: 0 km<sup>2</sup> AOO: 4 km<sup>2</sup> IUCN Assessment: Critically Endangered (CR). Its conservation status has been classified as Critically Endangered (CR) according to criteria B: B1 and B2 a, b(iii).

*Eriope macrostachya* var. *amazonica* is mainly threatened by the destruction of the habitat, due to sand removal. This did not seem to be happening during our visit, but we noticed enormous mounds of excavated sand near where we entered the area. When this supply is exhausted, excavation will probably restart, unless steps are taken to preserve the area and control access.

All the material was collected from the same area. This species falls into the criterion b-III of IUCN (2017), as the area of occurrence is less than 10 km from the city of Belém (capital of the state of Pará), thus one can anticipate a steady decline in the quality of the habitat due to urban expansion. Even if the site eventually becomes a conservation area, it is still likely to be affected by increased visits by local people for leisure activities.

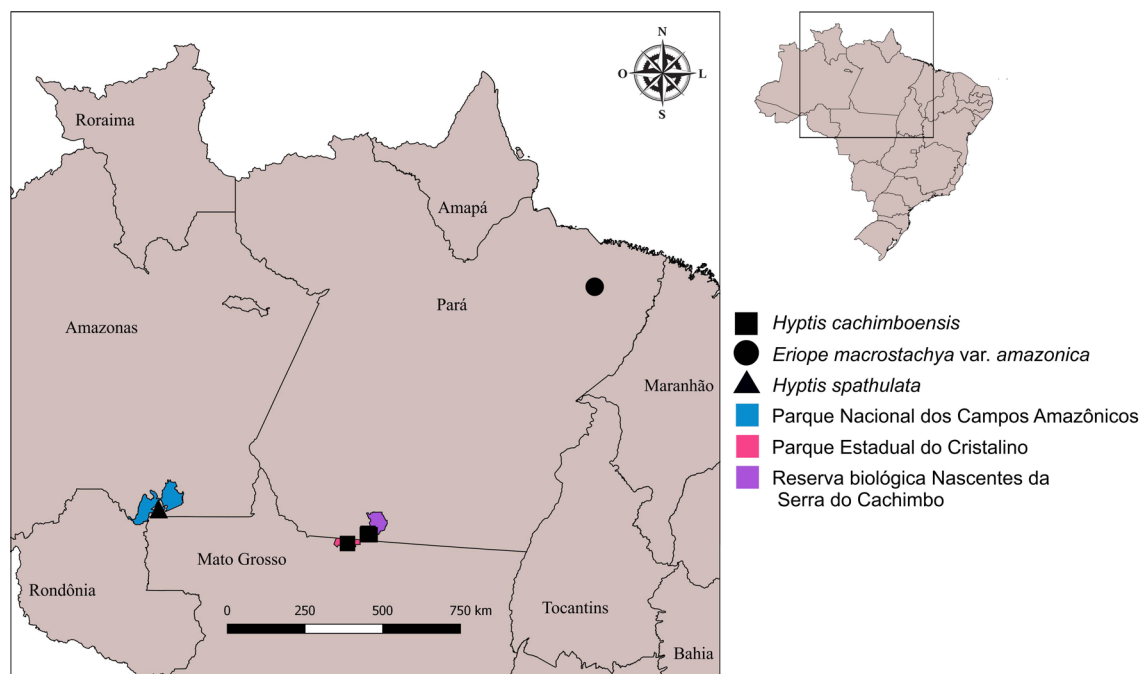
Apart from the typical variety of *Eriope macrostachya*, three other varieties are known (Harley 1976): *E. macrostachya* var. *hypoleuca* Benth, *E. macrostachya* var. *platyantha* (Epling & Mathias) Harley and *E. macrostachya* var. *grandiflora* (Epling) Harley. The first of these, *E. macrostachya* var. *hypoleuca*, grows principally on *canga* (iron-rich) soils in Minas Gerais and has

† These technically mark the point where the peduncle - below - joins the true pedicel - above, but in this description, for convenience, the whole structure is referred to as the pedicel.

†† The first calyx measurement is taken along the posterior side, and the second along the anterior side of the calyx. The two measurements are separated by “/”.

very hairy, discoloured leaves. *E. macrostachya* var. *platyantha* has a more elongate petiole and is only known from few collections in Tachira Province, Venezuela, north of Amazonia. *E. macrostachya* var. *grandiflora* (Epling) Harley, in which the flowers have a corolla tube up to 10 mm long, was originally collected by Pohl, from the Serra de Chumbo in Minas Gerais. It was originally known only from the type, until more recent collections were made, one from Minas Gerais, and the others all from the Chapada Diamantina, Bahia, where it is the only variety recorded. Although the corolla colour of the type is unknown, all other collections of this taxon are recorded as having dark pinkish-wine coloured corollas, as opposed to the lilac to violet flowers found in the other varieties of this species, including var. *amazonica*. This represents a most interesting new record for the genus *Eriope* in Amazonia. The genus, which contains over thirty species, is centred in the cerrados and campos rupestres of the Brazilian planalto and the Serra do Espinhaço extending northwards from Minas Gerais into the Chapada Diamantina of Bahia, and with occasional records in other states in NE Brazil. Many species of *Eriope* have highly restricted distributions, especially those occurring in montane regions (Harley 1988). In Amazonia, the genus was previously only known by *Eriope*

*crassipes* Benth., which is recorded from a number of *campinas* in Amazonia, and extends into the llanos of Colombia. The occurrence of *Eriope macrostachya* var. *platyantha*, in the mountains of Tachira state, Venezuela, provides further evidence of the former occurrence of populations of *Eriope* in the Amazonian region, from where a further extension into Venezuela becomes more possible. At present, only the two above-mentioned species extend beyond the boundaries of Brazil: *Eriope crassipes* Benth. is a typical and widespread component of *cerrado* vegetation, with the widest distribution of any member of the genus, extending from Central Brazil southwards as far as Paraná, into the Northeast to Bahia, Pernambuco, Piauí and Maranhão, westwards through Mato Grosso and Mato Grosso do Sul into Eastern Paraguay and Bolivia, and northwards into Pará, French Guiana, Venezuela and the llanos of Colombia. *Eriope macrostachya* Mart. ex Benth., a species associated with forest margins and gallery forest, was previously known to occur from Paraná state in the South of Brazil, northwards through São Paulo state, Rio de Janeiro, Espírito Santo to Minas Gerais, Bahia and Ceará, and in Tachira Province, Venezuela. Its distribution now extends to Pará state, and *Eriope macrostachya* var. *amazonica* is the only taxon of *Eriope* endemic to Amazonia.



**Figure 2** – Map. Distribution of the new taxon in Brazilian Amazonian.

**3.2. *Hyptis spathulata*** Harley *sp. nov.* Type: BRAZIL. RONDÔNIA: Igarapé Preto, RADAM Ponto 61-Q. XB-SC-20. 4.VII.1975, *Ribeiro 1086* (Holotype IAN (IAN149776); isotypes MG, RB). Fig. 3

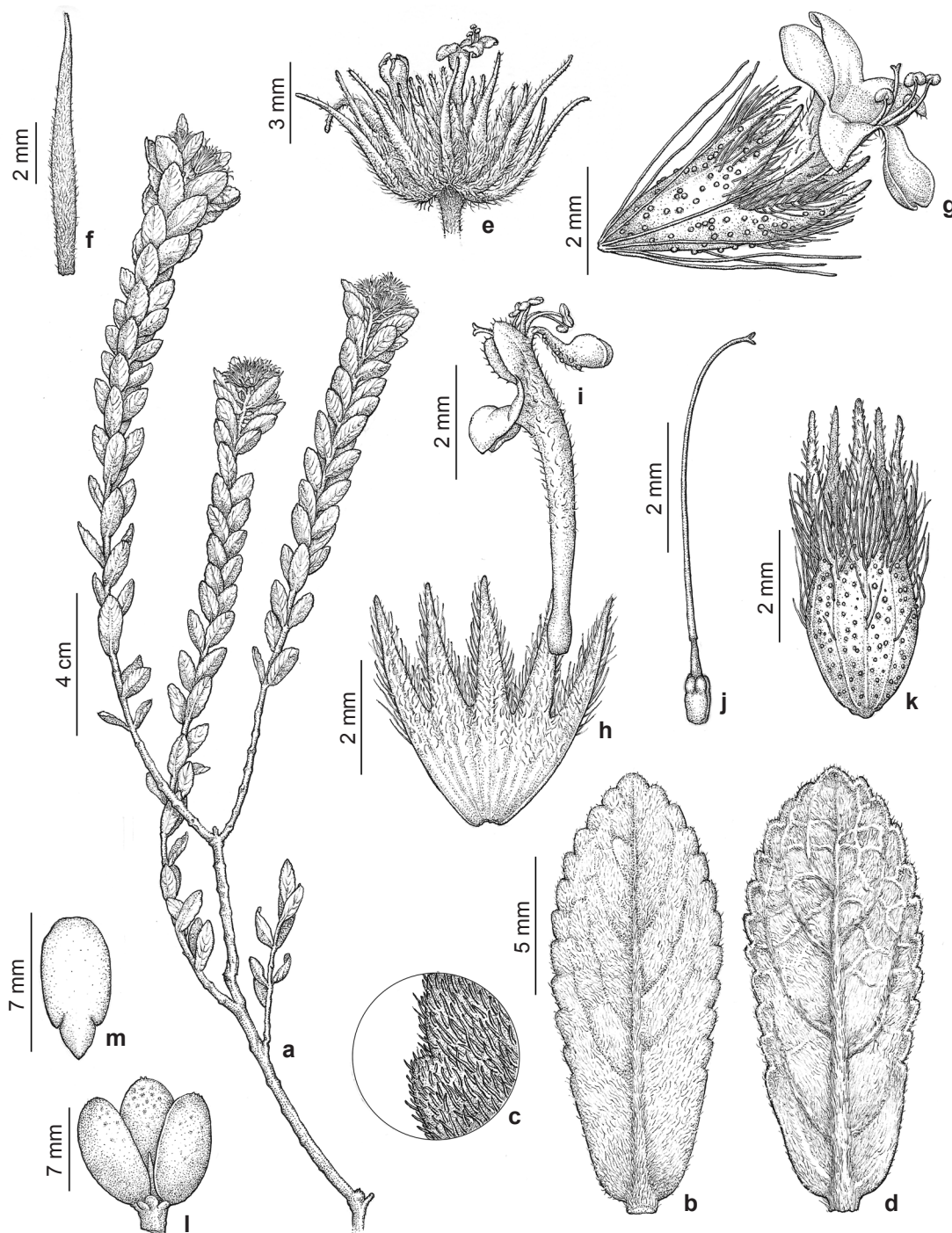
*Hyptis spathulata* differs greatly from all other members of subsection by its more shrubby habit, apparently reaching a height of 3 m, far in excess of heights recorded for other species. In other respects, it appears closest morphologically to *Hyptis saxatilis* A.St.-Hil. ex Benth. One of the taller members of the subsection, this species is so far only recorded up to a height of 1.5 m, and possesses elliptic or obovate, non-imbricate leaves  $3-6 \times 0.8-1.5$  cm, while the much smaller, often  $\pm$  spathulate and imbricate leaves of *Hyptis spathulata* are  $1.1-1.6 \times 0.36-0.5$  cm. The differences in size of calyx and corolla between the two species are slight, although the measurements for *Hyptis spathulata* appear marginally greater. However, a wider sample is required to be significant.

Branched, erect shrub to 3 m tall, much branched above, with stems terete, bare below, 2–3.5 mm diam., at least in upper stems, with epidermis densely hairy, with coarse, acute, rigid, silvery, antrorse trichomes strongly appressed to stem. Lower parts of plant not seen. Leaves subsessile, with petiole usually less than 1 mm, crowded along the upper, ultimate branches, densely imbricate, ascending. Lamina of leaf slightly coriaceous, discolorous,  $11-16 \times 3.6-5$  mm, often weakly spathulate, widest just below obtuse and often rotund apex and tapering gradually towards narrowly rounded base, and often slightly concave above towards apex, margin rather indistinctly serrate-crenate below apex and entire in lower half; adaxial surface probably dark green when fresh, covered with strongly appressed, silvery, rigid trichomes and numerous orange-red sessile glands, abaxial surface grey to white, with similar but denser indumentum, especially along prominent, thickened midrib and with sessile glands, lateral nerves usually obscured except sometimes those near base on underside of lamina. Inflorescence small,  $\pm$  hemispherical capitula, clustered at stem apex, on short, hairy peduncles, c. 5 mm long, arising from the axils of foliaceous bracts, similar to the leaves, but smaller, and with the stem leaves extending upwards to the base of the inflorescence. Capitula c. (4–)7–9 mm in diam., with narrow, linear bracteoles, the outer  $< 6.5 \times 0.5$  mm, with subulate apices often overtopping

the flowers,  $\pm$  discolorous and with indumentum similar to the leaves, but with adaxial surface subglabrous, and with margins strongly ciliate, especially towards base. Inner bracteoles often narrower. Flowers very shortly pedicellate, and with long, silky hairs extending upwards from the base and often overtopping them. Calyx at anthesis c. 4.5–5 mm long, tube 2–2.5 mm long, cylindrical, membranous, densely covered on external surface by orange-red sessile glands, and distally covered with antrorse, rigid, long hairs,  $\pm$  glabrous towards base, internal surface with numerous shorter hairs except towards base, calyx lobes 2–2.5 mm long, subequal, narrowly deltate-lanceolate, densely long-ciliate and, especially on external surface, very densely hairy with long slender  $\pm$  appressed hairs and sessile glands; calyx in fruit scarcely accrescent, c.  $5.5 \times 1$  mm, tube 3–3.5 mm, broadly cylindrical, thin-walled, lobes 2–2.5 mm long, indumentum as previously described; corolla c. 7 mm long, colour not recorded, tube c. 5 mm long, very slender, c. 0.2–0.3 mm diam., straight for most of its length, slightly up-curved just below throat, externally thinly pilose distally, especially on lower part, and with sessile glands above, glabrous near base, lobes glabrous, with numerous orange-red sessile glands on external surface, anterior lobe concave, not compressed; stamens glabrous, gynoecium with stylopodium overtopping ovary at first, style glabrous with short stigmatic lobes. Nutlets  $1.5-2 \times 0.9-1$  mm, oblong-ellipsoid, very pale brown with dimpled surface, glabrous, not mucilaginous when wet.

*Hyptis spathulata* is, up to the present, only known from a single collection, made in a *campo cerrado* area in the state of Amazonia, in the West and bordering on the state of Rondônia (Fig. 2). It was probably collected within the Parque Nacional dos Campos Amazônicos, although label data is not precise. Apart from the recent record of *Hyptis velutina* from the Eastern Amazon (see above), it is the only other member of the subsection to occur in Amazonia. The remaining seven species of *Hyptis* subsect. *Velutinae* all occur further South (Epling 1949). Of these, four: *H. origanoides* Pohl ex Benth., *H. hilarii* Benth., *H. saxatilis* A.St.-Hil. ex Benth. and *H. angustifolia* Pohl ex Benth. are known only from Central Brazil in Goiás state or the Distrito Federal. One species: *H. adamantium* A.St.-Hil. ex Benth. is known only from the Diamantina district of the neighbouring state of Minas Gerais. The remaining species: *Hyptis deminuta* Epling, described from Bahia and Minas





**Figure 3** – a-m. *Hyptis spathulata* – a. habit; b. cauline leaf, adaxial surface; c. detail of cauline leaf, adaxial surface; d. cauline leaf, abaxial surface; e. capitulum at anthesis; f. bracteole, abaxial surface; g. flower, side view; h. calyx at anthesis displayed to show internal surface; i. corolla, side view; j. gynoecium at anthesis with stylopodium at base of style; k. fruiting calyx, side view; l. portion of fruit with nutlets; m. nutlet. (Ribeiro 1086 MG). All figures drawn by João Silveira, Instituto de Tecnologia de Vale, Belém, Brazil.

Gerais states, is perhaps only a depauperate form of the more widespread *Hyptis velutina* Pohl ex Benth. This last species is the most widespread; frequent throughout Central Brazil, it extends north-east into Bahia, north, into Pará and Tocantins states, and westward into Mato Grosso, Mato Grosso do Sul and Eastern Bolivia. From the field data provided, it is assumed that the new species is characteristic of humid soils, in open areas such as *cerrado*, probably similar to the habitats occupied by *H. velutina*.

The name was given in reference to the spatulate leaves shape.

The limited information available indicates that the species can be found in flower and fruit in July.

*Hyptis saxatilis* is a frequent component of the *cerrado* vegetation in Goiás state and in the Distrito Federal, to which it is restricted. The only other member of subsection *Velutinae* recorded from Amazonian Brazil is *Hyptis velutina* Pohl ex Benth. This is a fairly low perennial herb, frequent in *cerrado* in the Centre-West region of Brazil (states of Goiás, Mato Grosso and Mato Grosso do Sul), extending into Bolivia, with a few records in the Northeast region, and a few records from Tocantins state and a single record from Pará. In appearance it is very different from *H. spathulata*., both in habit and leaf shape.

Conservation status. Species assessment: EOO: 4 km<sup>2</sup> AOO: 4 km<sup>2</sup> IUCN Assessment: Critically Endangered (CR). Its conservation status has been classified as Critically Endangered (CR) according to criteria B: B1 and B2 a, b(iii). The only known specimen of this species was collected within or near the area that was later to become part of the Parque Nacional dos Campos Amazônicos. However, *Hyptis spathulata* falls within the criterion b-III da IUCN (2017), as the region suffers frequently from illegal mining and disputes regarding land-ownership, which threaten to seriously damage the habitat.

**3.3. *Hyptis cachimboensis*** Harley, *sp. nov.* Type: BRAZIL. PARÁ: Novo Progresso: Serra do Cachimbo, próximo a Base Aeronáutica, campos de provas Brigadeiro Veloso. *Bonadeu da Silva et al.* 747, 22.VIII.2013 (holotype MG (MG216849); isotype NY). Fig. 4

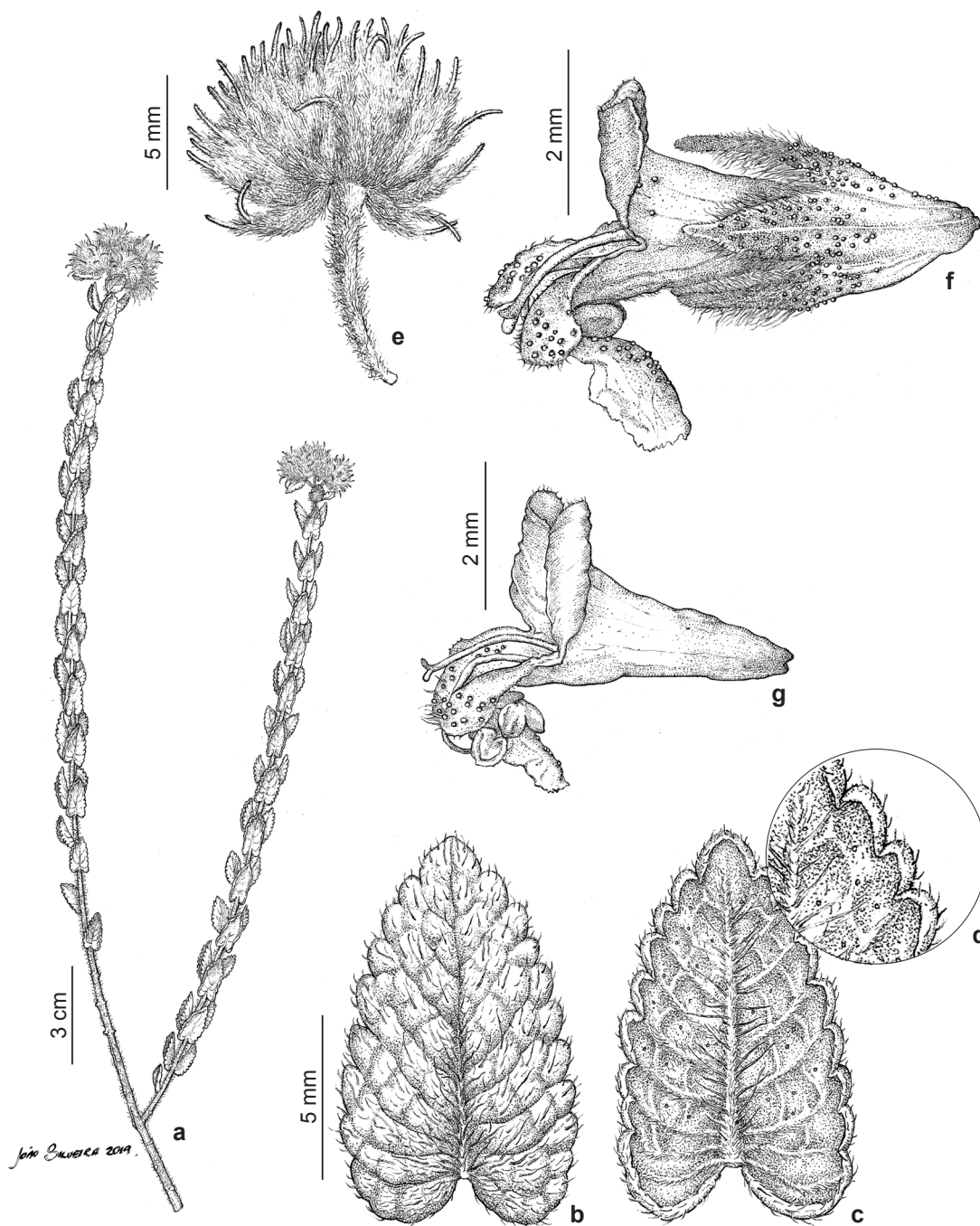
*In Epling's key (1949) to Hyptis subsect. Sessilifoliae, the new species would key out to Hyptis turnerifolia Mart. ex Benth. This is a species from Southern Brazil, occurring in the*

*states of Minas Gerais and Goiás, which differs from the new species in a number of characters. Hyptis cachimboensis has shorter internodes than in H. turnerifolia, and the sessile, strongly cordate upper leaves, 8–12 mm long, are more or less erect, distinctly imbricate and often slightly conduplicate, where as those of Hyptis turnerifolia are spreading, 12–20 mm long, with a base that is weakly cordate to truncate, and they are never conduplicate. The indumentum on the stems and leaves of H. turnerifolia is usually much more adpressed than that in H. cachimboensis, where it is laxer. The capitula form a short terminal corymb in the new species and are only 10–14 mm diameter, and in H. turnerifolia are up to 18 mm diameter. In the latter species, the calyx tube at anthesis is 2.5 mm long, and the lobes more or less subulate, as opposed to the calyx tube 1.5 mm long, with narrowly deltate lobes in H. cachimboensis. Also the corolla is smaller in the new species, with the tube only 3.5 mm long, as opposed to 4.5 mm long in H. turnerifolia. In general appearance, the new species is more likely to be confused with Hyptis crenata or H. goyazensis A.St.-Hil. ex Benth., although both of these tend to be larger plants, with spreading non-imbricate leaves, some of which often extend to 20 mm long and 6–14 mm wide. Both these species have more ovate to rounded, spreading leaves, up to 10–25 mm long, and often have slightly longer, bright blue flowers, as opposed to the white to pale lilac flowers recorded for H. cachimboensis.*

Slender, erect, aromatic perennial herb or subshrub 35–70 cm tall, upper stems slightly branched, ± quadrangular, slender, c. 2.5 mm diam., villous with long, straight, patent uniseriate trichomes, mixed with very short patent hairs, stems often bare below due to leaf-fall. Leaves sessile, erect and imbricate, sometimes slightly conduplicate and partially obscuring abaxial surfaces, upper and middle cauline leaves with lamina membranous, 8–12 × 6–9 mm, lowest < 15 × 9 mm, ± oblong with strongly cordate to almost sagittate base, apex ± acute to obtuse, margin strongly revolute or recurved, crenate, adaxial surface green, bullate between sunken midrib and primary veins, with long, whitish uniseriate trichomes, weakly antrorsely adpressed and with numerous very minute, patent trichomes, often with a small apical gland, abaxial surface pale green, with long, delicate, whitish trichomes mostly restricted to midrib and primary veins, and with a continuous indumentum of minute, often

gland-tipped trichomes, and with sparse, orange sessile glands. Inflorescence an often congested terminal corymbose thyrses of shortly pedunculate capitula, arising from the axils of reduced, leaf-

like bracts. Peduncles often < 1 cm, or sometimes the lowest to 2(–3) cm, densely hairy with long and short trichomes. Capitula c. 1–1.4 cm diam., hemispherical, very hairy with long whitish hairs,



**Figure 4** – a-g. *Hyptis cachimboensis* – a. habit; b. cauline leaf, adaxial surface; c. cauline leaf, abaxial surface; d. detail of leaf, abaxial surface; e. capitulum at anthesis; f. flower, side view; g. corolla, side view. (Bonadeu da Silva et al. 747). All figures drawn by João Silveira, Instituto de Tecnologia de Vale, Belém, Brazil.

bracteoles forming a lax involucre, the outer 6–7 × 1–1.5 mm, linear-lanceolate, densely hairy with long, whitish, uniseriate trichomes, antrorsely adpressed and with a recurved, thickened, subulate apex often purple-tinged. Few flowers per capitulum. Flowers sessile, with dense, slender, elongate white hairs from base and often overtopping them. Calyx ± actinomorphic, 5-lobed, at anthesis 3.5 mm long, tube straight, narrowly infundibuliform, widening towards throat, 1.5 mm long, very thinly membranous veins not prominent, external surface densely hairy especially near throat, glabrous toward base, densely covered with conspicuous, orange stipitate glands especially above, internal surface glabrous, except at base of lobes, lobes subequal, 2 mm long, narrowly deltate below, and densely bearded on both surfaces, with long, slender, antrorse trichomes, which extend into sinus, with upper third of calyx-lobe subulate, thickened, subglabrous or with very short rigid trichomes; calyx in fruit 5–5.5 mm long, with tube 2.5–3 mm long, lobes 2–2.5 mm long, subequal, erect, not spreading apart, subulate and blunt-tipped, densely hairy. Corolla lilac to white, c. 5 mm long, tube straight, 3.5 mm long, c. 2 mm diam. near throat, mostly glabrous on outer surface, except for a row of short hairs along anterior side, including lobe, interior surface glabrous, except along vascular traces of posterior stamen pair. Lobes externally with numerous orange stipitate glands. Stamens glabrous; gynoecium with stylopodium overtopping ovary, style glabrous with small swollen bilobed stigmatic apex, remnants of stylopodium in fruit shortly conical, much shorter than nutlets. Nutlets 1.3–1.4 × 0.7 mm, oblong and slightly flattened towards base, dark brown, glabrous, weakly striatulate, abscission scar biconcave with a white powdery substance filling the cavities.

**Additional specimens examined:** BRAZIL. PARÁ: Serra do Cachimbo (divisa das bacias do Xingu e Teles Pires, 400 m, IX.1952, *Soares* (K ex RB). Novo Progresso (mun.): Cachimbo airport, 11.XI.1977, *Prance et al.* 25237 (MG); Serra do Cachimbo, VI.1955, *Alvarenga* (K ex RB); 20.IX.1955, *Pereira 1865* (K ex RB); on the Cachimbo hills, at or near Cachimbo airfield, 424 m, *Hemming 11* (K); Serra do Cachimbo, próximo à base Aeronáutica Campos de Provas Brigadeiro Veloso, 22.VIII.2013, *Bonadeu da Silva et al.* 747 (MG, holotype, ex RB; isotype NY); Serra do Cachimbo, arredores da Base Aérea do Cachimbo, próximo do lago azul, 26.IV.1983, *Naélia Silva et al.* 124 (INPA, K, MG, RB). Itaituba (mun.): Serra do Cachimbo, arredores da Base Aérea do Cachimbo, próximo ao estacionamento, km 6 da estrada que vai para o aeroporto, km 794, 25.IV.1983, *Naélia Silva et al.* 89 (INPA, K, NY); Serra do Cachimbo,

área da Aeronáutica, 09°17'36"S, 54°56'41"W, 485 m, 23.VIII.2003, *Lima da Silva et al.* 4105 (MG); Serra do Cachimbo, 425 m, 12.XII.1956, *Pires 6087* (IAN, NY). Serra do Cachimbo, nos arredores do acampamento, 10.VIII.1973, *Thomas-Silva 3700* (IAN); Serra do Cachimbo, 09°20'S, 54°53'W, 16-22.V.1955, *Bokermann 227* (IAN). MATO GROSSO: Novo Mundo, Parque Estadual Cristalino, região SE do Parque, 379 m, 26.I.2008, *Sasakiet al.* 1948 (K).

*Hyptis cachimboensis* is at present known from two areas. The majority of records (in fact all, but one) occur in the Serra do Cachimbo in southern Pará state. The single record from Mato Grosso state, in Parque Estadual Cristalino, Novo Mundo, is a few hundred km to the South of Cachimbo (Fig. 4). The intervening terrain, with only one small, unpaved road, the BR-163 which connects them, crosses what must be some of the least botanically known regions in Brazil. Information on habitat is somewhat sparse, but in both localities the plants occur in open grassland, between about 380 to 485 m altitude.

Conservation status. Species assessment: EOO: 236.6 km<sup>2</sup> AOO: 16 km<sup>2</sup> IUCN Assessment: Its conservation status has been classified as Endangered (EN) according to criteria B: (B1) and B2 a, b(iii). This species occurs within the boundaries of the Parque Estadual do Cristalino and almost certainly within the Reserva Biológica Nascentes da Serra do Cachimbo. However, it is considered here to be endangered due to the rapid expansion of agriculture in the North of Mato Grosso state, which implies a decline in as yet undisturbed areas, where this species is likely to occur.

*Hyptis cachimboensis* was apparently first collected by L. de C. Soares in September 1952, in the Serra do Cachimbo, followed by a few other collections in the same decade, and then in the succeeding years almost up to the present. Previously specimens have often been assigned to the widespread *Hyptis crenata* Pohl ex Benth., to which it is obviously related. *Hyptis cachimboensis* is an erect herb, with narrowly deltate, not aristate, calyx lobes and the capitula with bracteoles 6–7 mm long, not rigid. The small leaves are imbricate, erect, and often conduplicate, thus bridging the morphological gap between *Hyptis obtecta* and other members of subsect. *Sessilifoliae*. The description of the flowers at anthesis has been taken from Silva *et al.* 89: Pará state: Itaituba (mun.): Serra do Cachimbo, 25 Apr. 1983 (NY). The new species here described, *Hyptis cachimboensis*, certainly has the habit and leaf

shape and indumentum of a species belonging to *Hyptis* subsect. *Sessilifoliae*, but differs from other members of the section by the conspicuous smaller leaves in *H. cachimboensis*.

### Conclusion

It is hoped that this presented paper, by adding several taxa not previously recorded for this state, will provide further stimulus for a future Flora of Pará, the feasibility of which is now under discussion. This important and very large area of Brazil is one of those which, due in part to lack of resources of both specialist person-power and infrastructure and due to the high logistical costs required for exploration, is still very under-collected and poorly supplied with detailed floristic studies; but see Viana & Giulietti-Harley (2016, 2017, 2018a, b) for the Flora of the *canga* vegetation of the Serra dos Carajás.

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