



UNIVERSIDADE FEDERAL DE UBERLÂNDIA
Instituto de Biologia
Programa de Pós-Graduação em Biologia Vegetal



DISSERTAÇÃO

**Asteraceae in the Caparaó National Park, Espírito Santo, Minas Gerais, Brazil: Basal
Clades and Vernoniae Cass.**

Polla Renon Rodrigues Machado

UBERLÂNDIA – MG

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UNIVERSIDADE FEDERAL DE UBERLÂNDIA

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Asteraceae in Caparaó National Park Espírito Santo/Minas Gerais, Brazil: Basal Clades and tribe Vernoniae Cass.

Abstract

To continue the studies of flora in the Caparaó National Park, a hotspot remnant, the present dissertation aims to do a floristic inventory and a systematic treatment for important groups within Asteraceae in mountain habitats of the Atlantic Forest. The Basal Clades and Vernoniae are remarkably diverse in South America and have their diversity underestimated at high-altitude environment in the Atlantic Forest. Herbaria collections, field expedition and searches on online databases were our strategies to perform this research, resulting identification keys, descriptions, taxonomic comments, examined material, distribution and phenology data, and conservation status. In this way, 10 new records are documented here, expanding the last compiled list and contributing with the knowledge about the biogeography of species. A total of 43 species and nine genera were found from 240 specimens analyzed, with twenty-three species having a narrower distribution, being *Mutisia lutzii* and *Critoniopsis bradeana* endemic to the Caparaó. A gap regarding conservation status was observed, thirty species have not had their threat level measured. However, the present dissertation has two chapters. The first one (Chapter I) contains our study about the Basal Clades in the park, and the second one (Chapter II) about Vernoniae.

Key words: Araçuaí Orogen, Biodiversity, Brazilian Plants, Sunflower Family, Taxonomy.

Resumo

Para dar continuidade aos estudos da flora no Parque Nacional do Caparaó, um remanescente de *hotspot*, a presente dissertação tem como objetivo realizar um inventário florístico e um tratamento sistemático para grupos importantes dentro da família Asteraceae, nos habitats montanhosos da Mata Atlântica. Os Clados Basais e a tribo Vernoniae são notavelmente diversos na América do Sul e têm sua diversidade subestimada em ambientes de alta altitude na Mata Atlântica. Coleções de herbários, expedição de campo e buscas em bancos de dados online foram nossas estratégias para realizar essa pesquisa, resultando chaves de identificação, descrições, comentários taxonômicos, material examinado, dados de distribuição e fenologia, e status de conservação. Desta forma, 10 novos registros foram documentados aqui, ampliando a última lista compilada e contribuindo com o conhecimento sobre a biogeografia das espécies. Um total de 43 espécies e nove gêneros foram encontrados

a partir de 240 espécimes analisados. Deste total, vinte e seis espécies apresentam uma distribuição mais restrita, sendo *Mutisia lutzii* e *Critoniopsis bradeana* endêmicas do Caparaó. Foi observada uma lacuna em relação ao status de conservação, trinta e três espécies ainda não tiveram seu nível de ameaça mensurado. No entanto, a presente dissertação está dividida em dois capítulos. O primeiro (Capítulo I) contém nosso estudo sobre os Clados Basais no parque, e o segundo (Capítulo II) trata de Vernonieae.

Palavras-chave: Orógeno Araçuaí, Biodiversidade, Plantas Brasileiras, Família dos Girassóis, Taxonomia.

General introduction

At the moment it is estimated that 37-44% of all vascular plant species are endangered and 571 species of seed plants have become extinct (Humphreys, 2019; Lughadha *et al.*, 2020). It's important to note that these estimates are based solely on known species with documented conservation statuses. Consequently, the actual number of threatened species could be higher.

Besides, there is a great number of plant species to be discovered (~50.000 spp.) and neither all known species has evaluation about threat category (Joppa *et al.*, 2011^b; Pimm & Joppa, 2015; Lughadha *et al.*, 2016). In other words, species unknown for science or not evaluated may already have disappeared or under risk extinction (Joppa *et al.*, 2011^a).

Floristic inventories coupled with taxonomic knowledge can mitigate the Linnean shortfall (n° species existant vs. n° known species) and contribute to distribution's data (Wallacean shortfall). This data can complement threat analysis (Funk, 2006; Humphreys, 2019; Lagomarsino & Frost, 2020), enabling conservation actions to be developed. Also, studies in taxonomy are being used to understand ecological and evolutionary patterns of organisms and to subsidize others gaps in biodiversity knowledge (Lagomarsino & Frost, 2020).

An important caveat worthwhile to be mentioned, every biodiversity study needs an accurate identification to become corroborate (Funk, 2006). Therefore, works containing tools for taxa recognition such as descriptions, diagnoses, identification keys, photographs and/or illustrations can improve the accurate of identifications and optimize the time spend in production of scientific research on the biodiversity research agenda.

Thinking in species' conservation, biodiversity hotspots are places in the world, where there are highest biological diversity and endemism, threatened by reduction of their natural

areas (Myers *et al.*, 2000; Mittermeier *et al.*, 2004). It is extremely important to ensure the preservation of them to safeguard the species.

At Brazil the Atlantic Forest and Cerrado are considered as hotspots (Myers *et al.*, 2000; Mittermeier *et al.*, 2011). The Atlantic Forest is the richest domain to Brazilian flora since it has, 21.145 species being 7.646 endemic (Flora e Funga do Brasil, 2023). Human interference already suppressed almost 70% of original extent of domain (MapBiomass, 2023). Regarding the Brazilian's areas that remaining, approximately 9% of remanescent are fully protected conservation units and 21% are conservation units of sustainable use (Rezende *et al.*, 2018).

One of these conservation unit is the Caparaó National Park, a fully national protected unit and it has been highlighted due its floristic richness and endemism (Araújo *et al.*, 2018; Moreira *et al.*, 2020), mainly for Angiosperm, where Asteraceae exhibit a notable diversity (Moreira *et al.*, 2020; Lopes *et al.*, 2021). Despite of Asteraceae to be the second family richest in the park, only the tribe Eupatorieae was inventoried and has systematic treatment published (Lopes *et al.*, 2021).

Asteraceae containing flowers grouped in capitulum, five connate anthers, a bifurcated style, inferior ovary, 1-locule, 1-ovule, and fruit type cypsela usually with pappus (Funk *et al.*, 2009; Roque *et al.*, 2017). It can be shrubs, subshrubs, herbs, tree or vines (Jeffrey, 2007; Roque *et al.*, 2017), easily found in open environments, mountains and disturbed areas. The family encloses the major diversity of vascular plants on world around 32.000 species and 1.600-1.700 genus (Funk *et al.*, 2009; Cheek *et al.*, 2020), corresponding 10-12% of flowering plants (Mandel *et al.*, 2017).

To continue the studies of flora in the Caparaó National Park, the present dissertation aims to do a floristic inventory and a systematic treatment for two important groups in Asteraceae, basal tribes and Vernonieae. The basal clades are early-diverging tribes originated mostly in South America, and Vernonieae is among the ten most diverse Asteraceae tribes being widely distributed around the world (Mandel *et al.*, 2019; Susanna *et al.*, 2020; Keeley *et al.*, 2021). Both are well represented in Brazil, particularly, in mountain habitats of Atlantic Forest (Barroso 1957; Borges *et al.*, 2010; Meireles *et al.*, 2014).

This study proposes to answer: (i) how many and what are the species of studied groups occurring in the park? (ii) how many species are endemic and endangered? (iii) what phytophysiognomies the species occurs? (iv) what is the reproductive period of the species? (v) what morphology characters may be used to recognize each taxon?

The dissertation was divided in two chapters. The first chapter is about the basal clades and the second to Vernoniae tribe.

Chapter I

Basal Clades (Asteraceae) of the Caparaó National Park Espírito Santo, Minas Gerais, Atlantic Forest, Brazil

Abstract

Asteraceae is highly diverse in the Atlantic Forest, especially in mountain environments. The Caparaó National Park is an important Atlantic Forest remaining, which has been highlighted for its diversity and endemism. To continue the studies in the park, we selected the early-diverging tribes for their great representativity in Brazil and for having unique features within Asteraceae. Nevertheless, a floristic inventory associated with systematic treatment was made here. The research was done through herbaria collections and field expedition. Identification keys, descriptions, taxonomic comments, examined material, distribution data, phenology and conservation status are present for all found species, as well as also identification keys and taxonomic comments for tribes and genera. We found 15 species, six genera and four tribes being Mutisieae and Nassauvieae the most diverse. Six species have restricted distribution, to Brazil (3 spp.), Atlantic Forest (2) and Caparaó mountain (*Mutisia lutzii*). Three new records for the park were found (*Chaptalia integerrima*, *Moquiniastrum polymorphum* and *Mutisia coccinea*). In total 98 specimens were analyzed, which 54 (55%) had their identification corrected. Regarding conservation status and distribution data, 16 species (80%) have not had the threat level measured and seven species had dubious records. An effort to evaluate the conservation status and distribution data of species must be made in order to cover the gaps and accelerate our knowledge about biodiversity. Undoubtedly, floristic inventories and systematic treatments can bring great contributions to science, understanding better the biodiversity and providing informations about flora for the conservation of priority areas.

Key words: Brazilian Southeastern, Compositae, Flora, Hotspot, Mantiqueira Setentrional.

Resumo

Asteraceae é altamente diversa na Mata Atlântica, especialmente em ambientes montanhosos. O Parque Nacional do Caparaó é um importante remanescente da Mata Atlântica, que tem sido destacado devido sua diversidade e endemismo. Para dar continuidade aos estudos no parque, selecionamos as tribos basais pela grande representatividade no Brasil e por apresentarem características únicas dentro de Asteraceae. No entanto, foi realizado um inventário florístico associado a um tratamento sistemático. A pesquisa foi conduzida por meio de coleções de herbários e expedição de campo. Chaves de identificação, descrições, comentários taxonômicos, material examinado, dados de distribuição, fenologia e estado de conservação estão presentes para todas as espécies encontradas, bem como chaves de identificação e comentários taxonômicos para tribos e gêneros. Encontramos 15 espécies, seis gêneros e quatro tribos, sendo Mutisieae e Nassauvieae as mais diversas. Seis espécies possuem distribuição restrita, para o Brasil (3 spp.), Mata Atlântica (2) e Caparaó (*Mutisia lutzii*). Três novos registros para o parque foram encontrados (*Chaptalia integerrima*, *Moquiniastrum polymorphum* e *Mutisia coccinea*). No total, 98 espécimes foram analisados, dos quais 54 (55%) tiveram sua identificação corrigida. Em relação ao estado de conservação e aos dados de distribuição, 16 espécies (80%) não tiveram seu nível de ameaça mensurado e sete espécies tinham registros duvidosos. Um esforço para avaliar o estado de conservação e os dados de distribuição das espécies deve ser feito para preencher as lacunas e acelerar nosso conhecimento sobre a biodiversidade. Sem dúvidas, inventários florísticos e tratamentos sistemáticos podem trazer grandes contribuições para a ciência, compreendendo melhor a biodiversidade e fornecendo informações sobre a flora para conservação de áreas prioritárias.

Palavras-chave: Sudeste Brasileiro, Compositae, Flora, Hotspot, Mantiqueira Setentrional.

1. Introduction

We are living the sixth mass extinction on Earth (Pievani, 2014; Cowie *et al.*, 2022). The activities of the biodiversity researchers were never so necessary and there a huge need to accelerate the catalog the life on planet (Daly *et al.*, 2012; Lagomarsino & Frost, 2020). The biodiversity hotspots are key areas, because they hold most of the expected unknown species, as well as, the majority of disappeared species (Joppa *et al.*, 2011a). Floristic and regional “floras” are key elements for accelerate the biodiversity reseach program, enabling increase sampling, discover new species, increase the knowledge about taxonomy, morphology, biogeography and evolution (Joppa *et al.*, 2011a; Funk 2018). Perform floristic surveys in

biodiversity hotspots is a very straightforward way to achieve the biodiversity goals (Funk, 2006).

The Atlantic Forest is the world's richest tropical forest with 21.196 species being 7.646 endemic species (Flora e Funga do Brasil, 2023). The Atlantic Forest is a hotspot for biodiversity conservation, due its great biology diversity, high levels of endemism and the extensive habitat loss (Myers *et al.*, 2000; Mittermeier *et al.*, 2011). Antropical activities are the main reason to habitat loss that threatens biodiversity (Dirzo *et al.*, 2014; Lughadha *et al.*, 2020). The Atlantic Forest already lost almost 70% of original vegetation to farming, mining, and urbanization (Ribeiro *et al.*, 2009; MapBiomas, 2023).

Caparaó National Park (CNP, hereafter) is an Atlantic Forest conservation unit, which have been highlighted about its richness and endemism (Moreira *et al.*, 2020; Araújo *et al.*, 2021). It is situated on northern portion of Mantiqueira Range between the states of Minas Gerais and Espírito Santo (IBDF, 1981). The CNP holds a remarkable plant diversity, roughly 1.791 species, 891 endemic species and 198 families (Moreira *et al.*, 2020). Asteraceae is the second richest in the park with 139 species being 74 endemics (Moreira *et al.*, 2020).

Asteraceae is the largest family of vascular plants with 32.000 species and 1.600-1.700 genera (Cheek *et al.*, 2020), corresponding 10-12% of flowering plants (Mandel *et al.*, 2017). The family originated about 83 million years ago in South America and remained exclusively in the continent by 33 million years (Mandel *et al.*, 2019). Asteraceae is cosmopolitan, but the South America has the highest diversity (6.312 spp.) on Earth (Panero & Crozier 2016).

One of the most intriguing complexes of the family are the early-diverging tribes, because they share several morphological characters and a complex evolutionary history (Funk *et al.*, 2005; Katinas *et al.*, 2008; Mandel *et al.*, 2019). Barnadesieae was the first lineage to diverge, a tribe with 91 species and an unshared feature into family (presence of axillary spines on branches) (Jansen & Palmer, 1987; Mandel *et al.*, 2019). The following tribes have diverged later compounding the basal clades jointly Barnadesieae: Famatinantheae, Stifftieae, Hyalideae, Onoserideae, Nassauvieae, Mutisieae, Wunderlichieae, Gochnatieae, Hecastocleideae and Pertyeae (Susanna *et al.*, 2020).

Brazil is a center of basal clades diversity, where occurs 8 tribes representing 73% of basal clades, 30 genera and 140 species, only Famatinantheae, Hecastocleideae and Pertyeae do not occurs in Brazilian territory (Hind, 2011; Panero *et al.*, 2014; Roque *et al.*, 2017; Flora e Funga do Brasil, 2023; SpeciesLink, 2023). The Atlantic Forest is the richest phytogeographical domain for the basal subfamilies and tribes, which holds 42.8% plant diversity with 60 species (Sussana *et al.*, 2020; Flora e Funga do Brasil, 2023).

In the Caparaó National Park, Moreira *et al.* (2020) registered 13 species to basal clades. It is expected that the number of species from early-diverging tribes to be higher, because there is a need for further exploration in the area and for gathering the collections from the park. Beyond the large richness and endemism on Caparaó region, there is a few researches investigating its flora (Araújo *et al.*, 2018; Moreira *et al.*, 2020; Araújo *et al.*, 2021) and for Asteraceae, particularly, the studies are scarcer (Lopes *et al.* 2021).

Whereas floristic inventories are the key to know the biodiversity and thus increase the possibilities to conserve it and their habitats (Funk *et al.*, 2006; Cheek *et al.*, 2020), more floristic surveys are necessary to investigate the Caparaó flora, in special Asteraceae, one of largest family in Atlantic Forest.

The aims of present research are to perform a floristic inventory and a systematic treatment for Basal clades in Asteraceae from Caparaó National Park.

2. Material and Methods

Study area

Caparaó National Park is a fully protected conservation unit with around 32.000 hectares of Atlantic Forest on boundaries of Minas Gerais and Espírito Santo states (ICMBio, 2023), between 41°51'W and 41°43'W latitudes, 20°36'S and 20°18'S longitudes (Fig.1). The Caparaó is located at northern portion of the Mantiqueira mountain range (Araçuaí Orogen) (Heilbron *et al.*, 2004; Pedrosa-Soares *et al.*, 2007) one of the highest regions of Brazilian southeastern (IBDF, 1981). The Caparaó National Park is popular known by peak named “Pico da Bandeira”, the third highest peak in Brazil, reaching 2.890 meters above sea level (ICMBio, 2015; IBGE 2023). Others peak also are attractive in the park, such as “Pico do Calçado” with 2.849 meters and “Pico do Cristal” with 2.770 meters (ICMBio, 2023).

The climate is classified as subtropical highland, Cwb I according Koeppen's classification (IBDF, 1981, Beck *et al.*, 2018; Mindat, 2023). Annual averages from 16°C-22°C and in summer the elevation prevent reach the daily maximum temperature, on the other hand, in coldest months (June-August) the temperature can hit -4°C at highest peak (IBDF, 1981; ICMBio, 2015). Annual rainfall averages from 750–2.250 mm and relative air humidity usually above 70% (IBDF, 1981; ICMBio, 2015).

Two different seasons are recorded in CNP, rainy-summer from October to March and dry-winter from April to September which has a short rain declive (IBDF, 1981; ICMBio, 2015).

In the CNP the vegetation is montane. There are Montane Semideciduous Forest (Fig. 2A), Montane Mixed Ombrophilous Forest (Fig. 2B), Upper Montane Mixed Ombrophilous Forest (700-1.780m), vegetation of transition between forest and high-altitude grassland called here by “Candeal” (Fig. 2C) due the abundance of *Eremanthus erythropappus* (DC) MacLeish (1.800-2.000m) and high-altitude grassland (Fig. 2D-F). The high-altitude grassland can be “scrube” when there are herbaceous, subshrubby and shrubby plants ≥ 60 cm scattered, *Chusquea* sp. grassland (Fig. 2E) and “clean” grassland characterized by rock outcrops (Fig. 2F) with a few herbaceous and small subshrubby/shrubby plants < 60 cm tall scattered (2.000-2.800m) (IBGE, 2012; ICMBio, 2015; Moreira *et al.*, 2020; informations also from our expedition).

The Caparaó region has an intensive coffee monoculture. The adjacent areas of the park are highly fragmented and anthropic activities are allowed (Silva *et al.*, 2021).

Floristic inventory

The collections from CNP were studied consulting the main herbaria for region: BHCB, ESA, HUFU, RB, HUEMG and requesting loans from CAP, GFJP, VIES, UEC. The acronyms cited follow Thiers (2023).

A field expedition was carried out to improve the knowledge about the taxa. The collections were done during spring with a period of 5 days. The specimens sampled on expedition were georeferenced and had their biology informations recorded like habit, height, flower and involucre color, vegetation and altitude occurrence. Afterwards, the specimens were herborized according traditional methodology (Rotta *et al.*, 2008), having support of HUEMG. The specimens were incorporated at HUFU Herbarium, Instituto de Biologia, Universidade Federal de Uberlândia, Minas Gerais state and duplicates were sent to reference herbaria for Caparaó region (HUEMG and VIES).

Distribution, phenology and conservation status

The distribution data were checked through “Flora e Funga do Brasil” (<http://reflora.jbrj.gov.br/>), Plants of the World Online (<https://powo.science.kew.org/>) and SpeciesLink (<https://specieslink.net/>). Regarding phenology, the data was extracted from tags attached to the analyzed specimens.

For the conservation status was consulted the online database CNCFlora (<http://www.cncflora.jbrj.gov.br/>), IUCN Red List (<https://www.iucnredlist.org/>) and the Red List of Brazilian Flora by Martinelli & Moraes (2013).

Systematic Treatment

Identifications were done through specific bibliography for basal clades in Asteraceae, consulting descriptions and identification keys (Katinas 2008; Monge *et al.*, 2017; Pasini 2017; Saavedra 2017). Monography for genera (Katinas *et al.*, 1996; Freitas, 2014; Saavedra *et al.*, 2018) and regional Floras (Monge, 2011; Monge; Semir, 2012) also were used.

Furthermore, comparisons with specimens of the HUFU herbarium and records from SpeciesLink (<https://specieslink.net/>) and Virtual Herbarium Reflora (<http://reflora.jbrj.gov.br/>) helped in identification. The type specimens also were seen on Jstor Plant Sciences (<https://plants.jstor.org/>).

The treatment for species has identification keys, descriptions, examined material, distribution, phenology and conservation data and taxonomic comments. The descriptions were systematized within the genera, species belonging different genus had not descriptions closely standardized. The descriptions and examined material were done using MonographR package from R program (The R Foundation for Statistical Computing 2021). For genera and tribes, we intended to create taxonomic comments and identification keys covering all taxa within each group, in order to facilitate the recognition of new records.

In this way, the taxonomic comments for tribes and genera, as well as identification keys, was made with support of literature such as, Funk *et al.* (2009), Katinas (2008), Roque *et al.* (2017) and original descriptions of species and genera. Images of specimens available on SpeciesLink and “Flora e Funga do Brasil” also helped.

The nomenclature followed IPNI (<https://www.ipni.org/>) and Tropicos (<https://www.tropicos.org/>). The terminology followed Ellis *et al.* (2009), Hickey (1973) and Radford (1986) for vegetative structures, and Funk *et al.* (2009) for reproductive structures.

3. Results

Floristic inventory

We recorded 15 species and six genera of basal clades belonging Barnadesieae, Gochnatieae, Mutisieae and Nassauvieae tribes. Mutisieae (7 species; 2 genera) and

Nassauvieae (5 species; 2 genera) were the richest tribes. The genera *Chaptalia* Vent. (4 spp.) and *Trixis* P. Browne (4 spp.) had the largest number of species per genus.

A total of six species has a narrower distribution. *Chaptalia denticulata* (Baker) Zardini (Fig. 4A-E), *Dasyphyllum flagellare* (Casar.) Cabrera (Fig. 3A-D) and *Trixis glaziovii* Baker are restricted to Brazil, *Holocheilus pinnatifidus* (Less.) Cabrera (Fig. 3E-H) and *Trixis verbascifolia* (Gardner) Blake (Fig. 3I-L) to Atlantic Forest, and *Mutisia lutzii* G.M.Barroso (Fig. 4L-N) endemic to Caparaó.

Three new records were found, *Chaptalia integerrima* (Vell.) Burkart, *Moquiniastrum polymorphum* (Less.) G.Sancho and *Mutisia coccinea* A.St.-Hill. According to Moreira *et al.* (2020), the latest list has been compiled for the basal groups of Asteraceae in Caparaó, only *Moquiniastrum densicephalum* (Cabrera) G.Sancho have not been found here. Consulting the specimen of *M. densicephalum* cited by Moreira on SpeciesLink (UEC122970), was seen that not corresponded the species, it is indeed an Orchidaceae, and this specimen was collected in Itacambira – Minas Gerais far from Caparaó region. Furthermore, *M. densicephalum* did not occurs in Caparaó or was not found there yet.

Distribution, phenology and conservation status

Data about distribution and phenology are presented in the systematic treatment to each species found here. During the analysis, was seen that informations about the distribution of *Chaptalia nutans*, *C. piloselloides* (Fig. 4F-K), *Holocheilus pinnatifidus*, *Mutisia campanulata*, *M. coccinea*, *Trixis lessingii* and *T. verbascifolia*, have had records difficult to validate by absence of photographs to confirm the specimen's identification and the lack of consensus among plataforms. One way out was to review the literature, eliminate improbable records, contact with herbaria, search on more online platforms and verify if has a consensus between two or more.

A total of eleven species (73%) are not evaluated, being five them restricted for Brasil (*C. denticulata*, *D. flagellare*) Atlantic Forest (*T. verbascifolia*) and Caparaó mountain (*M. lutzii*). Only four species were categorized, *Dasyphyllum brasiliense*, *M. polymorphum* and *H. pinnatifidus*, as Least Concern (LC) and *Trixis glaziovii* as Vulnerable (VU).

Systematic treatment

A total of 98 specimens were analyzed, with 44 specimens (44.8%) not being identified or having their identification corrected during the research. Fourteen specimens with names of non-valid synonyms (not updated), twelve with incomplete identifications

(only name of genus), twelve incorrectly identified, six without identification and five specimens have had uncertain identifications added of “aff” or “cf”.

3.1. Identification key for basal tribes of Asteraceae in the Caparaó National Park

1. Presence of spines in leaf-axils or trunks; leaves and involucral bracts with apex mucronate or spinescent; corolla often pseudobilabiate (4+1); anthers with bidentate apical appendages (*Dasyphyllum*) Barnadesieae
- 1'. Lack of spines in leaf-axils or trunks; leaves and involucral bracts without apex mucronate or spinescent; corolla never pseudobilabiate (4+1); anthers with entire apical appendages 2
2. Pappus 1–3-seriate; when 1-seriate bristles of pappus connate at the base Gochnatieae
- 2'. Pappus 1-seriate; bristles of pappus not connate at the base 3
4. Branches, leaves or involucral bracts with lanose indument; capitula heterogamous; style branches obtuse, acute or clavate, glabrous or papillose Mutisieae
- 4'. Branches, leaves or involucral bracts without lanose indument; capitula homogamous; style branches frequently truncate, penicellate Nassauvieae

3.2. Barnadesieae D. Don, Trans. Linn. Soc. London 16(2): 273 (1830)

Barnadesieae is recognized by shrubby or tree habit, rarely herbaceous, presence of spines in leaf-axils or trunks, leaves and involucral bracts with apex mucronate or spinescent, acrodomous, actinodromous or paralello-dromous venation, capitula discoid or radiate, flower 1–numerous, corolla tubulose, ligulate, bilabiate or pseudobilabiate, pappus plumose, rarely barbellate or scales. Trichomes “Barnadesioides” (3-cell) in corolla or cypsela.

In the CNP Barnadesieae is represented by *Dasyphyllum* (2 spp.).

3.2.1 *Dasyphyllum* Kunth, Nov. Gen. Sp. [H.B.K.] 4(14): 13 (ed. fol.) (1818).

The genus *Dasyphyllum* can be recognized by coriaceous and stiff involucral bracts, leaves with acrodomous venation, capitula discoid, receptacle pilose, anthers with bidentate apical appendage and pappus plumose.

3.2.1.1. Identification key to *Dasyphyllum* in the Caparaó National Park

1. Presence of lenticels in branches; axillary spines 2.5–3.3 cm long, straight; receptacle flat; anthers with sagittate basal appendages; cypselas cylindrical or ellipsoid *D. brasiliense*
 1'. Absent of lenticels in branches; axillary spines 0.3–0.8 cm long, recurvated; receptacle concave; anthers with obtuse basal appendages; cypselas obovoid *D. flagellare*

3.2.1.2. *Dasyphyllum brasiliense* (Spreng.) Cabrera, Revista Mus. La Plata, Secc. Bot. 9: 72 (1959)

Scandent shrubs or trees, 2.0–5.0 m tall; branches densely tomentose-sericeous, glabrescent, trichomes bristly, yellow-brownish, lenticels present; axillary spines 2.5–3.3 cm long, straight. **Leaves** alternate, petiole 1.5–2.0 cm long; lamina 6.5–24.5x2.3–9.6 cm, elliptic or obovate, membranaceous, cartaceous or coriaceous, base acute, margin entire, apex acute, acuminate or mucronate, venation acrodomous basal or suprabasal, concolor, both surfaces tomentose-sericeous, glabrescent, trichomes bristly, brownish. **Co-inflorescence** corymb-paniculiform, capitula pedunculated; involucre 0.8–1.5x0.4–0.6 cm, campanulate or cylindrical, 8–12-seriate; involucral bracts imbricate, sericeous, glabrescent, outer bracts ovate or elliptical, apex acute or mucronate, not revolute, inner bracts linear, apex acute, revolute; receptacle flat. **Flowers** bisexual, corolla 0.7–0.9 cm long, tubulose, tube glabrous, lobes pilose; anthers with basal appendages sagittate, apical appendages bidentate; style branches rounded, papillose. **Cypselas** cylindrical or ellipsoid, densely setose, trichomes brownish, ribs not evident; carpodium inconspicuous; pappus 1-seriate, beige.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto, Caparaó National Park, “Macieira”, 13 August 2011 (vg.), M. Monge *et al.* 986 (UEC169879). Iúna, “Comunidade do Rio Claro”, Montane Semideciduous Forest, 20°22'09"S, 41°49'53"W, 19 March 2014 (vg.), M. Monge *et al.* 2723 (UEC193437). Minas Gerais: Alto Caparaó, Caparaó National Park, nearly “Córrego Caparaó”, 1.200 m, 07 August 1996 (fl., fr.), L.S. Leoni 3424 (ESA28079, HUFU81503).

Distribution, Phenology and Conservation: *Dasyphyllum brasiliense* was collected at Montane Semideciduous Forest around 1.200 meters asl, with reproductive period during August. The species occurs in Argentina, Bolivia, Brazil, Paraguay, Peru and Uruguay. In Brazil it is distributed by Atlantic Forest, Brazilian savanna “Cerrado” and Southern grassland “Pampa”. Regarding the conservation status, *D. brasiliense* is Least Concern (LC).

Taxonomic comments: *Dasyphyllum brasiliense* is a scandent shrub or a tree up to around 5.0 m tall recognized by lenticels in branches, straight axillary spines, leaves elliptic or obovate with basal or suprabasal acrodomous venation, receptacle flat, anthers with basal appendages sagittate and cypselas cylindrical or ellipsoid.

Dasyphyllum brasiliense differs of *Dasyphyllum flagellare* easily by larger axillary spines 2.5–3.3 cm long (vs. 0.2–0.6 cm long), larger leaves 6.5–24.5x2.3–9.6 cm (vs. 0.5–4.0x 0.5–1.6 cm), receptacle flat (vs. concave) and anthers with appendages sagittate (vs. obtuse).

3.2.1.3. *Dasyphyllum flagellare* (Casar.) Cabrera, Revista Mus. La Plata, Secc. Bot. 9(38): 60 (1959)

Fig. 3A-D

Scandent shrubs, 0.8–1.5 m tall; branches densely tomentose-villous, glabrescent, trichomes not bristly, yellow-brownish, lenticels absent; axillary spines 0.3–0.8 cm long, recurvated. **Leaves:** alternate, petiole 0.2–0.6 cm long; lamina 0.5–4.0x 0.5–1.6 cm, elliptic or orbicular, cartaceous or subcoriaceous, base obtuse, margin entire, apex cuspidate or mucronate, venation basal acrodromous, concolor, abaxial surface tomentose-sericeous, glabrescent, trichomes not bristly, brownish, adaxial surface strigose, glabrescent, trichomes not bristly, brownish. **Co-inflorescence** corymbiform, capitula pedunculated; involucre 1.0–1.5x0.5–0.8 cm, campanulate, 8–10-seriate; involucral bracts imbricate, tomentose or villous, glabrescent, outer bracts ovate, apex mucronate, not revolute, inner bracts linear, apex acute, revolute; receptacle concave. **Flowers** bisexual, corolla 0.7–0.8 cm long, tubulose, tube glabrous, lobes pilose; anthers with basal appendage obtuse, apical appendage bidentate; style branches rounded, glabrous. **Cypselas** obovoid, densely setose, trichomes whitish, ribs not evident; carpodium inconspicuous; pappus 1-seriate, beige.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto, Caparaó National Park, “Farofa” waterfall, 20°27'58"S, 41°49'01"W, 2.223 m, 16 March 2004 (bd.), M. Monge *et al.* 2621 (UEC 193282). Pedra Menina, Caparaó National Park, “Farofa” waterfall trail, Montane Semideciduous Forest, 20°28'21"S, 41°49'40"W, 1.937 m, 12 October 2022 (fr.), P. Renon 535 (HUFU83170). Minas Gerais: Alto Caparaó, Caparaó National Park, High-altitude grassland, 2.200 m, 05 May 2001 (fl., fr.), L.S. Leoni 4658 (HUFU27020); *ibidem*, “Macieira”, 20.4333°S, 41.8683°W, 21 June 2013 (fl., fr.), V.C. Manhães *et al.* 345 (UEC193958); *ibidem*, “Tronqueira-Terreirão” trail, 20°26'00"S, 41°53'00"W, 21 September

2012 (fl., fr.), M. Monge *et al.* 1278 (UEC197756); *ibidem*, High-altitude grassland, 20°24'49"S, 41°49'58"W, 2.086 m, 09 October 2022 (fr.), P. Renon 515 (HUFU83151); *ibidem*, “Terreirão”, High-altitude grassland, 23 November 2006 (fl., fr.), A.M. Teles *et al.* 293 (BHCB103990, RB468834).

Distribution, Phenology and Conservation: *Dasyphyllum flagellare* was collected at High-altitude grassland and Montane Semideciduous Forest around 1.930–2.220 meters asl, with reproductive period from March to November. The species is restricted from Brazil and spread through Atlantic Forest and Brazilian savanna “Cerrado”. *Dasyphyllum flagellare* is Least Concern (LC).

Taxonomic comments: *Dasyphyllum flagellare* is recognized by scandent shrubby habit, axillary spines recurvated, leaves elliptic or orbicular, apex cuspidate or mucronate, venation basal acrodomous, receptacle concave, anthers with obtuse basal appendage and cypselas densely setose, obovoid.

3.3. Gochnatieae Panero & V.A.Funk, Proc. Biol. Soc. Washington 115(4): 913 (2002)

Gochnatieae can be shrubs, subshrubs, herbs or trees, monoecious or rarely gynodioecious or polygamo-dioecious, leaves alternate or rosulate, flowers 3–300, corolla tubulose, bilabiate or pseudobilabiate, anthers with apical appendage acuminate or apiculate, cypselas villous or sericeous, pappus 1–3-seriate, barbellate, sometimes plumose at the apex, rarely paleaceous, bristles equal or unequal in length, connate or not at the base. In the CNP, *Moquiniastrum* (1 sp.) represents the tribe.

3.3.1. *Moquiniastrum* (Cabrera) G.Sancho, Phytotaxa 147(1): 29 (2013)

The genus *Moquiniastrum* can be recognized by shrubby or tree habit, branches, leaves and involucral bracts with trichomes 2–3-armed, leaves discolor, co-inflorescence paniculiforme, corymbiform or racemiform, style branches glabrous, pappus 2–3-seriate, unequal in length.

3.3.1.1. *Moquiniastrum polymorphum* (Less.) G.Sancho, Phytotaxa 147(1): 32 (2013)

Shrub or tree, 2.0–5.0 m tall; branches densely tomentose-incanous, persistent, trichomes 2-armed, whitish. **Leaves** alternate, petiole 0.4–2.0 cm long; lamina 3.5–16.0x1.5–8.0 cm long, elliptic or obovate, cartaceous or coriaceous, base acute or obtuse,

margin irregular entire or serrate, apex acute or obcordate, venation eucamptodromous, abaxial surface densely tomentose-incanous, persistent, trichomes 2-armed (Y-shaped), persistent, adaxial surface tomentose, glabrescent, trichomes 2-armed (Y-shaped), whitish. **Co-inflorescence** corymb-racemiform or paniculiform; capitula discoid, pedunculated; involucre, 0.4–0.6x0.3–0.5 cm, campanulate, 6-seriate; involucre bracts imbricate, membranaceous, tomentose-villous, glabrescent, trichomes 2-armed, whitish, outer bracts ovate, apex acute, inner bracts elliptic or narrowly elliptic, apex acute; receptacle convex, glabrous. **Flowers** bisexual, corolla 0.6–0.7 cm long, tubulose, tube glabrous, lobes glabrous; anthers with basal appendage calcarate, apical appendage acuminate; style branches obtuse, glabrous. **Cypselas** ellipsoid, setose, trichomes whitish, 5–6-ribs; carpodium inconspicuous; pappus barbellate, stramineous.

Examined material: Brazil. Espírito Santo: Iúna, “Comunidade do Rio Claro”, Ciliar Forest, 20°22'09"S, 41°49'53"W, 1.079 m, 19 March 2014 (vg.), M. Monge *et al.* 2713 (UEC193691). Minas Gerais: Alto Caparaó, Caparaó National Park, “Macieira”, 20°49'81"S, 41°97'14"W, 18 June 2013 (fr.), J.P.F. Zorzanelli *et al.* 751 (VIES31989). Espera Feliz, Caparaó National Park, “Macieira” trail, 20°28'48"S, 41°49'57"W, 1.841 m, 05 March 2010 (fr.), M.O. Bünger *et al.* 367 (BHCB136323); *ibidem*, “Macieira”, 1.870 m, July 2005 (fl., fr.), L.S. Leoni & M.J. Rocha 6232 (HUFU81498).

Supplementary material: Brazil. Minas Gerais: Lima Duarte, Conceição do Ibitipoca, road to “Moreiras”, 12 January 2002 (fl., fr.), D.S., Pifano & A. Valente 285 (HUFU26481).

Distribution, Phenology and Conservation: *Moquiniastrum polymorphum* was collected at Montane Forest around 1.000–1.900 meters asl. Its reproductive period is around January to March. The species occurs in Argentina, Brazil, Paraguay and Uruguay. In Brazil can be found in Atlantic Forest, Brazilian savanna “Cerrado” and Southern grassland “Pampa”. Regarding the conservation status, *M. polymorphum* is Least Concern (LC).

Taxonomic comments: *Moquiniastrum polymorphum* is easily recognized by indument densely tomentose-incanous of 2-armed trichomes (Y-shaped) in branches, abaxial leaf-surface and involucre bracts, leaves petiolate, coriaceous or cartaceous, elliptic or obovate, co-inflorescence corymb-racemiform or paniculiform, capitula pedunculated. During the analysis of the specimens, it was observed that *M. polymorphum* has been mistakenly identified as *Critoniopsis* Sch.Bip. or *Eremanthus* Less., both genera belonging to a lately-

diverging tribe (Vernonieae Cass.). Although *M. polymorphum* has features that also occurs in Vernonieae such as, arborial habit, 2–3-seriate pappus and discolor leaves with dense incanus trichomes, it possible to distinguish *M. polymorphum* from Vernonieae by style branches obtuse (vs. acute or acuminate), briefly bifurcated (vs. longly bifurcated) and glabrous (vs. pilose).

3.4. Mutisieae Cass., J. Phys. Chim. Hist. Nat. Arts 88: 199-200 (1819).

Mutisieae is recognized by herbaceous and climbing habit, lanose indument in branches, leaves, involucral bracts or corolla, leaves alternate, opposite or rosulate, entire or lobed, capitula heterogamous, radiate or disciform, flowers dimorphic or trimorphic, corolla liguliform, bilabiate, filiform or tubulose, anthers with basal appendage calcarate or sagittate, pappus plumose, barbellate or scabrid. In the CNP *Chaptalia* (4 spp.) and *Mutisia* (3 spp.) represents the tribe.

3.4.1. Identification key to Mutisieae in the Caparaó National Park

1. Herbs; leaves rosulate; tendrils absent in leaf-apex; flowers ≤ 2.0 cm long, trimorphic; disc flowers tubulose or filiform; anthers with apical appendage obtuse or acute; cypselas generally papillose, rostrate (except in *C. denticulata*); pappus barbellate *Chaptalia*
 1'. Scandent woody plant; leaves alternate, opposite or subopposite; tendrils in leaf-apex; flowers >2.0 cm long, dimorphic; disc flowers bilabiate; anthers with apical appendage apiculate; cypselas glabrous, not rostrate; pappus plumose *Mutisia*

3.4.2. *Chaptalia* Vent., Descr. Pl. Nouv. ad t. 61 (1802)

The species from *Chaptalia* are small herbs, leaves arrangemented in rosette, flowers trimorphic, ray flowers concolor, disc flowers tubulose or filiform, anthers with apical appendage obtuse or acute, cypselas generally papillose, rostrate (except in *C. denticulata*), pappus barbellate.

3.4.2.1. Identification key to *Chaptalia* genus in the Caparaó National Park

1. Older leaves twisted, leaves narrowly oblong or oblanceolate; scape bracteate; style branches clavate *C. piloselloides*

- 1'. Older leaves not twisted, leaves cordiform, elliptic or spatulate; scape not bracteate; style branches obtuse 2
2. Leaves cordiform, petiole not winged; involucre bracts elliptic; ray flowers with 4-nerve; cypselas cylindrical, not rostrate, 8-ribs *C. denticulata*
- 2'. Leaves elliptic or spatulate, petiole winged; involucre bracts linear; ray flowers with 3-nerve; cypselas fusiform, rostrate, 4–5-ribs 3
3. Leaves elliptic, entire; receptacle flat; disc flowers 1.3–1.4 cm long, anthers with apical appendage acute; carpodium inconspicuous *C. integerrima*
- 3'. Leaves spatulate, lobed; receptacle convex; disc flowers 1.0–1.2 cm long; anthers with apical appendage obtuse, carpodium conspicuous *C. nutans*

3.4.2.2. *Chaptalia denticulata* (Baker) Zardini, Darwiniana 19: 728 (1975)

Fig. 4A-E

Herbs, ca. 0.1–0.3 m tall; stem not evident. **Leaves** rosulate, petiole 2.5–13.0 cm long, not winged, sheaths absent; lamina 2.0–3.5 × 1.5–2.5 cm, cordiform, membranaceous, base cordate, margin runcinate, revolute, apex obtuse or rarely acute, venation eucamptodromous, discolor, abaxial surface densely lanose, persistent, trichomes beige or yellowish, adaxial surface lanose, glabrescent, trichomes beige or yellowish, older leaves not twisted. **Capitula** radiate, solitary; scape 5.0–28.0 cm long, not bracteate, densely lanate, glabrescent; involucre 1.0–1.3 × 0.6–0.8 cm, campanulate, 4–5-seriate; involucre bracts subimbricate, membranaceous, lanose, narrowly elliptic or elliptic, apex acuminate or acute; receptacle flat, glabrous. **Flowers** trimorphic; ray flowers pistillate, corolla 1.3–1.5 cm long, liguliform, 3-lobed, 4-nerve, white, glabrous; disc flowers bisexual or pistillate, corolla 0.5–0.7 cm long, tubulose or filiform, whitish, tube glabrous, lobes glabrous; anthers with basal appendage calcarate, apical appendage obtuse; style branches obtuse, papillose. **Cypselas** cylindrical, 0.1–0.2 cm long, papillose, glabrescent, trichomes apparently not glandular, 8-ribs; rostrum absent; carpodium inconspicuous; pappus 1-seriate, yellowish.

Examined material: Brazil. Minas Gerais, Caparaó mountain, 2.500 m, 1941 (fr.), A.C. Brade 17003 (HUFU81285). Alto Caparaó, “Pico do Cristal” trail, humid area, 23 November 2006 (fl., fr.), A.M. Teles *et al.* 284 (BHCB64241).

Distribution, Phenology and Conservation: *Chaptalia denticulata* was found at High-altitude grassland in a humid area, around 2.500 meters asl, with reproductive period around November. It is restricted to Brazil occurring in Atlantic Forest and in Brazilian savannas “Cerrado” and “Caatinga”. Regarding conservation status, *Chaptalia denticulata* is not evaluated.

Taxonomic comments: *Chaptalia denticulata* is easily recognized by leaves cordiform, margin runcinated, petiole prolonged reaching nearly 13.0 cm long, not winged, ray flowers with 4-nerve, cypselas not rostrate with 8-ribs.

3.4.2.3. *Chaptalia integerrima* (Vell.) Burkart, Darwiniana 6: 576 (1944)

Herbs, ca. 0.3–0.6 m tall; stem not evident. **Leaves** rosulate, petiole 1.5–2.5 cm long, winged, sheaths present; lamina 3.5–21.5x1.5–3.0 cm, elliptic, membranaceous, base attenuate or decurrent, margin dentate, slightly revolute, apex acute, venation eucamptodromous, discolor, abaxial surface densely lanose, persistent, trichomes yellowish, adaxial surface lanose, glabrescent, trichomes yellowish, older leaves not twisted. **Capitula** radiate, solitary; scape 30.0–46.0 cm long, not bracteate, lanose, glabrescent; involucre 1.7–2.4x1.5–2.4 cm, campanulate, 4–8-seriate; involucral bracts imbricate, membranaceous, lanose, linear, apex acuminate; receptacle flat, glabrous. **Flowers** trimorphic; ray flowers pistillate, corolla 1.4–1.6 cm long, liguliform, 3–4-lobed, 3-nerve, white, glabrous; disc flowers bisexual or pistillate, corolla 1.3–1.4 cm long, tubulose or filiform, whitish or yellowish, tube glabrous, lobes glabrous; anthers with basal appendage calcarate, apical appendage acute; style branches obtuse, glabrous. **Cypselas**: fusiform, 0.3–0.4 cm long, papillose, persistent, trichomes apparently glandular, 4-ribs; rostrum 0.5–1.0 cm long; carpopodium inconspicuous; pappus 1-seriate, white-yellowish.

Examined material: Brazil. Minas Gerais: Alto Caparaó, Caparaó National Park, High-altitude grassland, 2.200 m, 24 November 1998 (fl., fr.), L.S. Leoni 4063 (GFJP).

Supplementary material: Brazil. Minas Gerais: Diamantina, Biribiri State Park, 18°10'59.3"S, 43°46'34.5"W, 03 December 2012 (fl., fr.), I.M. Franco *et al.* 1141 (HUFU66421).

Distribution, Phenology and Conservation: *Chaptalia integerrima* was collected at High-altitude grassland around 2.200 meters asl, with reproductive period around November and

December. It is distributed by Argentina, Bolivia, Guyana, Paraguay, Peru, Venezuela and Uruguay. In Brazil, the species occurs in Atlantic Forest, Brazilian savannas “Cerrado” and “Caatinga”, and Southern grassland “Pampa”. Regarding conservation status, *Chaptalia integerrima* is not evaluated.

Taxonomic comments: *Chaptalia integerrima* is recognized by leaves elliptic, entire, anthers with apical appendage acute, cypselas with 4-ribs and carpopodium inconspicuous. The species is similar to *C. nutans*, but can be distinguished mainly by leaves elliptic and entire (vs. spatulate and lobed), receptacle flat (vs. receptacle convex), ray flowers white (vs. lilac or rosaceous), anthers with apical appendage acute (vs. obtuse) and carpopodium inconspicuous (vs. conspicuous).

3.4.2.4. *Chaptalia nutans* (L.) Pol., Linnaea 41(7): 582 (1878)

Herbs, ca. 0.3–0.6 m tall; stem not evident. **Leaves** rosulate, petiole 0.5–3.0 cm long or absent, winged, sheaths present; lamina 3.0–25.0x1.2–7.5 cm, spatulate, lobed at base, membranaceous, base decurrent, margin dentate, serrate or crenate, slightly revolute, apex acute, venation eucamptodromous, discolor, abaxial surface densely lanose, glabrescent, trichomes white or beige, adaxial surface lanose, glabrescent, trichomes white or beige, older leaves not twisted. **Capitula** radiate, solitary; scape 8.3–72.2 cm long, not bracteate, lanose, glabrescent; involucre 1.3–2.0x0.8–1.5 cm, campanulate, 5–8-seriate; involucral bracts imbricate, membranaceous, lanose, linear, apex acute or acuminate; receptacle convex, glabrous. **Flowers** trimorphic; ray flowers pistillate, corolla 1.3–1.4 cm long, liguliform, 3-lobed, 3-nerve, lilac or rosaceous, glabrous; disc flowers bisexual or pistillate, corolla 1.0–1.2 cm long, tubulose or filiform, cream or albescent, tube glabrous, lobes papillose; anthers with basal appendage calcarate, apical appendage obtuse; style branches obtuse, glabrous. **Cypselas** fusiform, 1.4–1.6 cm long, papillose, persistent, trichomes apparently glandular, 4–5-ribs; rostrum ca. 1.0 cm long; carpopodium conspicuous; pappus 1-seriate, whitish or brownish.

Examined material: Brazil. Espírito Santo: Patrimônio da Penha, Caparaó mountain, 18 May 2007 (fl., fr.), T. Chimalli s.n. (HUFU83413). Minas Gerais: Alto Caparaó, Caparaó National Park, “Tronqueira” trail, 20.2600°S, 41.5260°W, 18 September 2012 (fl., fr.), M. Monge *et al.* 1181/1184 (UEC204308, UEC204305); *ibidem*, “Vale Verde” trail, Montane Semideciduous Forest, 20°25'11"S, 41°50'41"W, 1,352 m, 06 October 2022 (fl., fr.), P. Renon 490

(HUFU83179); *ibidem*, “Tronqueira” trail, Montane Semideciduous Forest, 20°24'30"S, 41°50'36"W, 1.616 m, 07 October 2022 (fl., fr.) P. Renon 500 (HUFU83134).

Distribution and Conservation: *Chaptalia nutans* was found at Montane Semideciduous Forest around 1.300–1.600 meters asl, being its reproductive period during September to May. The species is widely spread in New World occurring in Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Cuba, El Salvador, Ecuador, Guatemala, Guiana, Haiti, Honduras, Jamaica, Leeward Island, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Dominican Republic, Suriname, Trinidad-Tobago, Uruguay, Venezuela and Windward Island. In Brazil, *Chaptalia nutans* is distributed across all phytogeography domains. The species is not evaluated regarding conservation status.

Taxonomic comments: *Chaptalia nutans* is easily recognized by leaves spatulate and lobed, scape very prolonged reaching nearly 72.0 cm long, ray flowers lilac or rosaceous, receptacle convex and cypsela with carpopodium conspicuous.

3.4.2.5. *Chaptalia piloselloides* (Vahl) Baker, Fl. Bras. (Martius) 6(3): 378-379 (1884)

Fig. 4F-K

Herbs, ca. 0.1–0.4 m tall; stem not evident. **Leaves** rosulate, petiole 2.0–7.0 cm long, winged, sheaths present; lamina (1.5)3.0–19.0x0.3–1.2 cm, narrowly oblong or oblanceolate, membranaceous, margin entire or serrate, revolute, base attenuated or decurrent, apex acute, venation eucamptodromous, discolor, abaxial surface densely lanose, glabrescent, trichomes whitish, adaxial surface lanose, glabrescent, trichomes whitish, oldest leaves twisted. **Capitula** radiate, solitary; scape 8.5–32.5 cm long, bracteate, lanose, glabrescent; involucre 1.5–1.9x0.8–2.0 cm, campanulate, 4–6-seriate; involucre bracts imbricate, membranaceous, lanate, glabrescent, lanceolate or linear, apex acute or acuminate; receptacle flat, glabrous. **Flowers** trimorphic; ray flowers pistillate, corolla 0.7–1.0 cm long, liguliform, 3-lobed, 4-nerve, white, glabrous; disc flowers bisexual or pistillate, 0.5–0.7 cm long, tubulose or filiform, white, tube glabrous, lobes glabrous; anthers with basal appendage calcarate, apical appendage obtuse; style branches clavate, papillose. **Cypselas** cylindrical or ellipsoid, 0.3–0.5 cm long, papillose, persistent, trichomes apparently glandular, 5–6-ribbed; rostrum 0.2–0.4 cm long; carpopodium inconspicuous; pappus 1-seriate, yellowish.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto, Caparaó National Park, “Macieira”, 1.897 m, 20 June 2005 (fl., fr.), L.S. Leoni & M.J.R Rocha 6196 (HUFU81504, RB747197); *ibidem*, “Casa Queimada” trail, Upper Montane Forest, 13 August 2011 (fl., fr.), M. Monge *et al.* 971 (UEC169879). Iúna, Caparaó National Park, High-altitude grassland, 20°24'36,1"S, 41°48'29,6"W, 18 February 2000 (fl., fr.), V.C. Souza *et al.* 23347 (RB738985); *ibidem*, nearly “Rancho dos Cabritos”, High-altitude grassland, 18 February 2000 (fl., fr.), V.C. Souza *et al.* 23392 (RB739018). Minas Gerais: Caparaó mountain, “Luiz Ignácio” peak, 2.300 m, 09 September 1941 (fl., fr.), A.C. Brade 16890 (RB45888, UEC155984). Alto Caparaó: Caparaó National Park, High-altitude grassland, 2.100 m, 29 February 1995 (fl., fr.), L.S. Leoni *et al.* 3090 (HUFU81470, RB739000); *ibidem*, High-altitude grassland, 2.200 m, 14 October 1998 (fr.), L.S. Leoni 4037 (HUFU27019); *ibidem*, “Pico da Bandeira” trail, 20.4333°S, 41.8683°W, 19 September 2013 (fl., fr.), V.C. Manhães *et al.* 435 (UEC193964); *ibidem*, “José Pedro” watercourse, Montane Semideciduous Forest, 20.2600°S, 41.5260°W, 18 September 2012 (fr.), M. Monge *et al.* 1209 (UEC197481); *ibidem*, “Vale Encantado”, 20.2600°S, 41.5260°W, 19 September 2012 (fl., fr.), M. Monge *et al.* 1218 (UEC204309); *ibidem*, “Tronqueira” trail, High-altitude grassland, 20°26'00"S, 41°53'00"W, 21 September 2012 (vg.), M. Monge *et al.* 1282 (UEC197843); *ibidem*, “Tronqueira-Terreirão”, High-altitude grassland, 20°26'00"S, 41°53'00"W, 22 September 2012 (fl., fr.), M. Monge *et al.* 1290 (UEC197850); *ibidem*, “Pico da Bandeira” trail, rock outcrops, humid area, 20°24'57"S, 41°53'37"W, 2.145 m, 17 March 2014 (fl., fr.), M. Monge *et al.* 2633 (UEC193509). Espera Feliz: Caparaó National Park, High-altitude grassland, 2.200 m, 21 April 2004 (fr.), L.S. Leoni *et al.* 5710 (HUFU81496).

Distribution, Phenology and Conservation: *Chaptalia piloselloides* was collected at high-altitude grassland around 1.900–2.300 meters asl. Its reproductive period is during February to September. The species occurs in Argentina, Brazil, Bolivia, Paraguay, Uruguay and Venezuela. In Brazil is spread through Atlantic Forest and Southern grassland “Pampa”. Regarding conservation status, *Chaptalia piloselloides* is not evaluated.

Taxonomic comments: *Chaptalia piloselloides* differs from others species due to its leaves narrowly oblong or oblanceolate, the oldest leaves twisted, scape bracteate and style branches clavate.

3.4.3. *Mutisia* L.f., Suppl. Pl. 57: 373 (1782)

The genus *Mutisia* is recognized by its climbing habit, branches frequently quadrangular, leaves alternate, opposite or subopposite, lobed, venation acrodromous or actinodromous, tendrils in leaf-apex, ray flowers discolor, disc flowers bilabiate, anthers with apical appendage apiculate, cypsela cylindrical, glabrous, pappus plumose.

3.4.3.1. Identification key to genus *Mutisia* in the Caparaó National Park

1. Leaves with 9–13 pairs of lobes; lobes opposite or subopposite, base truncate; involucre 5–6-seriate; outer involucral bracts not recurved; receptacle flat; pappus 2.0–2.5 cm long *M. lutzii*
- 1'. Leaves with 4–6 pairs of lobes; lobes alternate or rarely subopposite, base attenuate, obtuse or cuneate; involucre 8–10-seriate; outer involucral bracts recurved; receptacle concave; pappus 3.0–3.5 cm long 2
2. Branches winged; leaves with abaxial surface lanose-tomentose; involucre campanulate; corolla lobes of disc flowers without glandular-dots; cypsela with 4 ribs *M. campanulata*
- 2'. Branches not winged; leaves with abaxial surface lanose-villous; involucre cylindrical; corolla lobes of disc flowers with glandular-dots; cypsela with ca. 6 ribs *M. coccinea*

3.4.3.2. *Mutisia campanulata* Less., Linnaea 5(2): 269 (1830)

Scandent woody plant; branches quadrangular, winged, lanose, glabrescent, trichomes whitish to brownish. **Leaves:** alternate, sessile; lamina 11.0–20.0x5.5–12.0 cm, lobed, 4–6 pair of lobes; lobes alternate or rarely subopposite; lobes lamina 2.5–6.5x1.0–2.2 cm, elliptic or ovate, membranaceous, margin irregular entire, base attenuate, obtuse or cuneate, apex acute or obtuse, venation basal acrodromous, discolor, abaxial surface densely lanose-tomentose, persistent, trichomes whitish or brownish, adaxial surface lanose, glabrescent, trichomes whitish or brownish; tendrils in leaf-apex. **Capitula** radiate, solitary; involucre 3.5–4.0x2.0–2.5 cm, campanulate, 8–10-seriate; involucral bracts imbricate, cartaceous or membranaceous, densely lanose-tomentose, glabrescent, trichomes beige or brownish, outer bracts lanceolate, apex caudate, recurved, inner bracts oblong to ovate, apex acuminate, apiculate or obtuse, not recurved; receptacle concave, glabrous. **Flowers** dimorphic; ray flowers pistillate, 14–16 flowers per capitulum; corolla 4.5–5.8 cm long, liguliform, 2-lobed,

14–16-nerves, red or vinaceous, limb and lobes densely lanose-tomentose in abaxial surface; disc flowers bisexual, ca. 60 flowers per capitulum; corolla 3.8–4.0 cm long, bilabiate, 5-lobed, yellowish or orange, tube glabrous, lobes lanose; anthers with basal appendages calcarate; style branches obtuse, papillose. **Cypselas** ca. 0.2 cm long, 4-ribs; carpodium inconspicuous; pappus 1-seriate, 3–3.5 cm long, brownish.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto, Caparaó National Park, 13 August 2011 (vg.), M. Monge *et al.* 982 (UEC169875). Minas Gerais: Caparaó mountain, Transitional vegetation, 1.700 m, 10 August 1979 (vg.), A.F.M. Albuquerque s.n. (RB296782); Caparaó National Park, 1.400–1.600 m, 31 October 1922 (fl., fr.), P. Campos Porto 1174 (RB4986); *ibidem*, 01 May 1996 (vg.), L.S. Leoni 3321 (RB662572); *ibidem*, “Pico da Bandeira”, 1.500–1.600 m, 06 September 1977 (fl., fr.), G.J. Shepherd *et al.* 5753 (UEC2888). Alto Caparaó, Caparaó National Park, 06 January 1999 (fl., fr.), L.S. Leoni 4078 (RB748166); *ibidem*, 21 February 2000 (fl., fr.), V.C. Souza *et al.* 23631 (ESA64779). Espera Feliz, Caparaó National Park, “Macieira” trail, 1.400–1.870 m, 20 September 2016 (bd), C.D.M. Ferreira *et al.* 357 (RB665775).

Distribution, Phenology and Conservation: *Mutisia campanulata* have been found at Montane Semideciduous Forest and “Candéal” (transitional vegetation), around 1.400–1.900 meters asl. Its reproductive period is nearly September to February. The species occurs in Argentina, Brazil, Chile and Paraguay. In Brazil it is distributed in Atlantic Forest and Southern grassland “Pampa”. Regarding conservation status, *Mutisia campanulata* is not evaluated.

Taxonomic comments: *Mutisia campanulata* is easily recognized by winged branches, involucre campanulate and cypselas 4-ribbed. Despite the similarity between *M. campanulata* and *M. coccinea*, due to their leaves with the same number of lobes (4–6 pairs), lamina of lobes elliptic to ovate with obtuse base or cuneate, involucre 8–10-seriate, outer involucre bracts recurved and receptacle concave, both species can be distinguished mainly by branches never winged in *M. coccinea* (vs. winged), involucre cylindrical (vs. campanulate) and cypselas ca. 6-ribbed (vs. 4-ribbed).

3.4.3.3. *Mutisia coccinea* A.St.-Hil., Voy. Distr. Diam. 1: 386 (1833)

Scandent woody plant; branches quadrangular, not winged, lanose, glabrescent, trichomes whitish or yellowish. **Leaves:** alternate, sessile; lamina 9.0–10.5x5.0–6.5 cm, lobed, 5–6 pair of lobes; lobes alternate; lobes lamina 1.5–3.0x0.5–1.0 cm, elliptic to ovate, membranaceous, base obtuse or slightly cuneate, margin irregular entire, apex acute, venation basal acrodromous, discolor, abaxial surface densely lanose-villous, persistent, trichomes whitish or yellowish, adaxial surface lanose, glabrescent, trichomes whitish or yellowish; tendrils in leaf-apex. **Capitula** radiate, solitary; involucre ca. 3.5x2.5 cm, cylindrical, ca. 10-seriate; involucre bracts imbricate, membranaceous or cartaceous, densely lanose-villous, glabrescent, trichomes whitish or yellowish, outer bracts lanceolate, apex caudate, recurved, inner bracts elliptic to ovate, apex acute or acuminate; receptacle concave, glabrous. **Flowers** dimorphic; ray flowers pistillate, ca. 13 flowers per capitulum; corolla ca. 5.5 cm long, liguliform, 3-lobed, ca. 13-nerve, red with yellow, limb and lobes densely lanose-tomentose in abaxial surface; disc flowers bisexual, ca. 60 flowers per capitulum; corolla 3.5–3.8 cm long, bilabiate, yellowish, tube glabrous, lobes lanose with glandular-dots; anthers with basal appendages calcarate; style branches obtuse, papillose. **Cypselas** ca. 0.2 cm long, ca. 6-ribs; carpodium inconspicuous; pappus 1-seriate, ca. 3.5 cm long, brownish.

Examined material: Brazil. Minas Gerais: Espera Feliz, Caparaó National Park, “Bonita” waterfall, Ombrophilous Forest, 41°83'73"S, 20°40'65"W, 1.818 m, 16 September 2016 (fl., fr.), J.A.M. Paiva *et al.* 1067 (BHCB182961).

Distribution, Phenology and Conservation: *Mutisia coccinea* was collected at Ombrophilous Forest around 1.820 meters asl, with flowers and fruits in September. The species occurs in Argentina, Brazil, Paraguay and Uruguay. In Brazil, it is distributed in Atlantic Forest and Southern grassland “Pampa”. *Mutisia coccinea* is not evaluated regarding conservation status.

Taxonomic comments: *Mutisia coccinea* is recognized by leaves and involucre bracts with lanose-villous indument, involucre cylindrical with recurved outer bracts, corolla of disc flowers glandular-dotted and cypselas ca. 6-ribbed.

3.4.3.4. *Mutisia lutzii* G.M.Barroso, Mem. Inst. Oswaldo Cruz 53: [357], fig (1955)

Fig. 4L-N

Scandent woody plant; branches quadrangular, not winged, lanose, glabrescent, trichomes whitish or beige. **Leaves** alternate, sessile; lamina 8.0–14.0x2.0–4.5 cm, lobed, 9–13 pair of lobes; lobes opposite or subopposite; lobes lamina 0.3–2.6x0.4–1.1 cm, elliptic to ovate, membranaceous, base truncate, margin irregular entire, apex acute or obtuse, venation basal acrodromous, discolor, abaxial surface densely lanose-tomentose, persistent, trichomes beige or whitish, adaxial surface lanose, glabrescent, trichomes whitish to beige; tendrils in leaf-apex. **Capitula** radiate, solitary; involucre 2.3–2.5x1.4–1.8 cm, cylindrical, 5–6-seriate; involucre bracts imbricate, membranaceous or cartaceous, densely lanose-tomentose, glabrescent, trichomes whitish or beige, outer bracts lanceolate, apex caudate or acuminate, not recurved, inner bracts oblong or elliptic, apex acute or acuminate; receptacle flat, glabrous. **Flowers** dimorphic; ray flowers pistillate, ca. 12 flowers per capitulum; corolla 5.0–6.1 cm long, liguliform, 3-lobed, ca. 12-nerve, red or vinaceous, limb and lobes densely lanose in abaxial surface; disc flowers bisexual, ca. 40 flowers per capitulum; corolla 2.9–3.2 cm long, bilabiate, cream, lobes lanose; anthers with basal appendage calcarate; style branches obtuse, papillose. **Cypselas** ca. 0.2 cm long, 8–10-ribs; carpodium inconspicuous; pappus 1-seriate, 2–2.5 cm long, brownish.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto, Caparaó National Park, “Macieira” trail, 22 March 2012 (fl., fr.), J. Kuntz *et al.* 598 (RB649284); *ibidem*, “Farofa” waterfall, 20°29'00"S, 41°49'37"W, 16 March 2014 (fl., fr.), M. Monge *et al.* 2576 (UEC194236); *ibidem*, “Lajão”, 20°27'58"S, 41°49'01"W, 2.223 m, 16 March 2014 (fl., fr.), M. Monge *et al.* 2580 (UEC194143). Iúna, Caparaó National Park, nearly “Rancho dos Cabritos”, High-altitude grassland, 18 February 2000 (fl., fr.), V.C. Souza *et al.* 23399 (HUFU56659, RB570526, RB662503, UEC178502). Minas Gerais: Alto Caparaó, nearly “Casa Queimada”, High-altitude grassland, 20°27'32"S, 41°48'34"W, 02 May 2019 (fl., fr.), J.P.F. Zorzanelli & L. Batista 1901 (HUFU83414). Espera Feliz: Caparaó National Park, nearly “Lajão”, Transitional vegetation, 14 May 2016 (fl., fr.), L.S. Leoni. & I.T.F.V. Lopes 10148 (HUFU72640).

Distribution, Phenology and Conservation: *Mutisia lutzii* is endemic to Caparaó, where it has been found at High-altitude grassland and “Candeal” (transitional vegetation) around 2.200 meters asl. Its reproductive period occurs in February to May approximately. The species is not evaluated regarding conservation status.

Taxonomic comments: *Mutisia lutzii* is easily recognized, differing from others species within the genus by its leaves with 9–13 pairs of lobes, lobes opposite or subopposite with base truncate, involucre bracts not recurved, receptacle flat and cypselas with 8–10-ribs.

3.5. Nassauvieae Cass., J. Phys. Chim. Hist. Nat. Arts 88: 198-199 (1819)

Nassauvieae is recognized by herbaceous, shrubby or climbing habit, leaves alternate or rosulate, entire, palmatifid, pinnatifid or pinnatisect, capitula homogamous, flowers isomorphic or dimorphic, bilabiate, bilabiate-liguliform or rarely tubulose, anthers with basal appendage calcarate or caudate, apical appendage acute, apiculate or falciform, style branches truncate, rarely rounded, panicellate, rarely papillose, cypselas with pappus uni-multiserial, barbellate, paleaceous, plumose or absent. In the CNP, *Holocheilus* (1 sp.) and *Trixis* (4 spp.) represent the tribe.

3.5.1 Identification key to Nassauvieae in the Caparaó National Park

1. Involucre up to 3-seriate; receptacle glabrous; corolla glabrous in inner portion; anthers blackened *Holocheilus*
 1'. Involucre up to 5-seriate; receptacle pilose; corolla pilose in inner portion; anthers brownish, yellowish or orange *Trixis*

3.5.2. *Holocheilus* Cass., Bull. Sci. Soc. Philom. Paris 1818: 73 (1818)

The genus *Holocheilus* is recognized by herbaceous habit, leaves heteromorphic, basal rosulate, petiolate, entire, pinnatifid or pinnatisect, apical alternate, sessile, entire generally with semi-aplexicaul base, co-inflorescence corymbiform, involucre up to 3-seriate, receptacle glabrous, corolla isomorphic, glabrous in inner portion and anthers blackened.

3.5.2.1. *Holocheilus pinnatifidus* (Less.) Cabrera, Revista Mus. La Plata, Secc. Bot. 11(50): 4 (1968)

Fig. 3E-H

Herbs, ca. 0.6 m tall; branches fistulose, strigose-villous, glabrescent, trichomes multicellular, whitish. **Leaves** basal rosulate, petiole 6.0–10.0 cm long; lamina 3.5–26.2x1.3–5.5 cm, pinnatisect, base attenuate, apex acute; **leaves** apical alternate, sessile; lamina 4.0–

11.0x0.5–2.0 cm, lanceolate, base hastate or semi-amplexicaul, apex acuminate; both basal and apical leaves membranaceous, margin denteate, venation cladodromous, concolor, both surfaces strigose, glabrescent, trichomes whitish. **Co-inflorescence** with corymbs aphyllous; capitula discoid, penduculated; peduncle papillose with trichomes apparently glandular; involucre 0.4–0.6x0.3–0.5 cm, campanulate, 3-seriate; involucre bracts imbricate, membranaceous or cartaceous, strigose, trichomes whitish, glabrescent, outer and inner bracts obovate or oblong, apex acute; receptacle flat or convex. **Flowers** isomorphic, ca. 10 per capitulum, bisexual; corolla 0.5–0.8 cm long, bilabiate-liguliform, white, glabrous in inner portion, papillose in outer portion, trichomes apparently glandular; lobes glabrous; anthers with basal appendage calcarate, apical appendage apiculate; style branches truncate, penicellate. **Cypselas** ellipsoid or obovate, strigose, tector trichomes recurved, apex acute, glandular trichomes cylindrical, apex capitate, 4-ribs or absent; carpodium conspicuous; pappus 1-seriate, barbellate, stramineous.

Examined material: Brazil. Espírito Santo: Caparaó National Park, “Macieira”, 18 January 2019 (fl., fr.), L. H. Silva & L.J. Lieven 270 (HUFU83635). Minas Gerais: Caparaó National Park, High-altitude grassland, humid area, 19 November 1988 (fl., fr.), L. Krieger *et al.* 555 (HUFU83313). Alto Caparaó, Caparaó Natinal Park, “Vale Encantado”, 2.100 m, 01 December 2000 (fl., fr.), L.S. Leoni 4536 (GFJP6028, GFJP s.n.); *ibidem*, “Morro da Jumenta”, 20°25'18,1"S, 41°49'16,1"W, 2.330 m, 20 February 2000 (fl., fr.), V.C. Souza *et al.* 23564 (RB748136); *ibidem*, “Macieira” trail, 20°49'46.9"S, 41°49'46.9"W, 1.854 m, 23 January 2008 (fl., fr.), B.V. Tinti *et al.* 442 (HUFU73532).

Distribution, Phenology and Conservation: *Holocheilus pinnatifidus* was found at “Candeal” (transitional vegetation) and High-altitude grassland, mainly in humid areas, around 1.850–2.330 meters asl. Its reproductive period is during November to February. The species is restricted to Brazilian Atlantic Forest. Regarding conversation status, *Holocheilus pinnatifidus* is Least Concern (LC).

Taxonomic comments: *Holocheilus pinnatifidus* is easily distinguished from others species within *Holocheilus* due to its large pinnatisect basal leaves and co-inflorescence laxa with numerous capitula. The pinnatisect basal leaves are found solely in *H. pinnatifidus*.

3.5.3. *Trixis* P. Browne, Civ. Nat. Hist. Jamaica 312: (1756)

The genus *Trixis* is recognized by herbaceous and shrubby habitat, branches, leaves, involucre bracts, corolla or cypselas with glandular trichomes, leaves homomorphic or heteromorphic, entire, receptacle pilose, epaleaceous, involucre up to 5-seriate, corolla dimorphic or isomorphic, pilose in inner portion and anthers brownish, yellowish or orange.

3.5.3.1. Identification key to genus *Trixis* in the Caparaó National Park

1. Basal leaves alternate; co-inflorescence pluricephala corymbiform or racemiform 2
- 1'. Basal leaves in rosette; capitulum solitary or co-inflorescence paucicephala in dichasial cyme 3
2. Branches not winged; leaves petiolate, lamina 2.3–16.5x0.5–3.6 cm, membranaceous; ca. 10 flowers per capitulum; periphery flowers with 2-nerve; cypselas with 5-ribs *T. antimenorrhoea*
- 2'. Branches winged; leaves sessile, lamina 2.5–34.5x1.0–11.0 cm, cartaceous; 60–80 flowers per capitulum; periphery flowers with 4-nerve; cypselas with 8–10 ribs *T. verbascifolia*
3. Branches not fistulous, strigose-pubescent; trichomes in branches and leaves with base expanded apparently glandular; leaf-margin dentate or serrate, venation brochidodromous; receptacle flat; foliaceous subinvolucral bracts absent; carpodium conspicuous *T. glaziovii*
- 3'. Branches fistulous, sericeous or tomentose; trichomes in branches and leaves without base expanded; leaf-margin entire, venation semicraspedodromous or paralellodromous; receptacle convex, foliaceous subinvolucral bracts present, carpodium inconspicuous *T. lessingii*

3.5.4. *Trixis antimenorrhoea* (Schrank) Mart. ex Baker, Fl. Bras. (Martius) 6(3): 385 (1884)

Shrubs, 2.0–4.0 m tall; branches not fistulous, not winged, strigose-pubescent, glandular, glabrescent, tector trichomes recurved, base expanded, apex acute, whitish, glandular trichomes cylindrical, not recurved, base not expanded, apex capitate, brownish. **Leaves** homomorphic, alternate, petiole 0.3–1.0 cm long; lamina 2.3–16.5x0.5–3.6 cm,

elliptic or lanceolate, membranaceous, base acute, margin entire with uncinata trichomes, apex acuminate, venation broquidodromous, concolor, abaxial surface densely strigose-sericeous, glabrescent, trichomes whitish, adaxial surface strigose-pubescent, glabrescent, trichomes whitish. **Co-inflorescence** pluricephala, corymbiform-racemiform; capitula discoid, pedunculated; involucre 0.8–1.2x0.5–1.0 cm, campanulate, 2–3-seriate; involucral bracts subimbricate, cartaceous or membranaceous, strigose-pubescent, tector trichomes cylindrical, apex acute, whitish, glandular trichomes cylindrical, apex capitate, brownish, bracts linear or elliptic, apex acute; receptacle flat. **Flowers** dimorphic, ca. 10 per capitulum, periphery flowers bisexual; corolla 1.1–1.2 cm, bilabiate-liguliform, 2-nerves; disc flowers bisexual; corolla 1.0–1.2 cm long, bilabiate; both periphery and disc flowers yellowish or cream; corolla-limb glandular in outer portion, trichomes cylindrical, apex capitate, pubescent in inner portion, trichomes cylindrical, apex acute; lobes strigose, glandular in outer portion, glabrous in inner portion; anthers basal appendage calcarate, apical appendage apiculate or falciform; style branches truncate, penicellate. **Cypselas** narrowly cylindrical or elipsoid, densely glandular, trichomes cylindrical, apex capitate, 5-ribs; carpodium conspicuous; pappus 1-seriate, barbellate, stramineous.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto, Caparaó National Park, “Macieira” road, 20°29'33.8"S, 41°49'18.2"W, 1.546 m, 07 June 2008 (fl., fr.), B.V. Tinti *et al.* 579 (HUFU73468). Iúna, “São João do Príncipe” farm, 20°20'30"S, 41°49'14"W, 1.107 m, 14 July 2021 (fr.), M.I.A. Horst *et al.* 160 (HUFU83412). Minas Gerais: Caparaó National Park, “Vale Verde”, 15 June 1991 (fl., fr.), G. Hatschbach *et al.* 55546 (HUFU26417).

Distribution, Phenology and Conservation: *Trixis antimenorrhoea* was found at Montane Semideciduous Forest around 1.100–1.550 meters asl, with reproductive period in July and June approximately. The species is spread around Argentina, Brazil, Bolivia, Colombia, Ecuador, Paraguay, Peru and Venezuela. In Brazil occurs in Atlantic Forest and Brazilian savanna “Cerrado”. Regarding the conservation status, *Trixis antimenorrhoea* is not evaluated.

Taxonomic comments: *Trixis antimenorrhoea* can be distinguished from others species due to its leaves homomorphic, petiolate, elliptic or lanceolate, co-inflorescence laxa, pluricephala, corymbiform-racemiform, capitula ca. 10 flowers and periphery flowers with 2-nerves.

3.5.6. *Trixis glaziovii* Baker, Fl. Bras. (Martius) 6(3): 391 (1884)

Herbs or subshrubs, ca. 0.4 m tall; branches not fistulose, slightly winged, strigose-pubescent, glabrescent, trichomes recurved, base expanded apparently glandular, apex acute, whitish or brownish. **Leaves** heteromorphic; basal leaves rosulate, sessile; lamina 3.5–12.5x1.4–5.0 cm; apical leaves alternate, sessile; lamina 1.3–11.0x0.5–2.5 cm; both elliptic or obovate, cartaceous, margin dentate or serrate, spinescent, base attenuate or decurrent, apex obtuse or acute, venation brochidodromous, concolor, adaxial and abaxial surfaces strigose-pubescent, glabrescent, trichomes with base apparently glandular, whitish or brownish. **Inflorescence** paucicephala, dichasial cyme or solitary capitulum; capitula discoid, pedunculated; involucre 1.0–1.3x1.8–2.5 cm, campanulate, 2–3-seriate; involucral bracts subimbricate, cartaceous or membranaceous, densely strigose-pubescent, trichomes with base apparently glandular, brownish, bracts linear or elliptic, apex acute or acuminate; receptacle flat. **Flowers** dimorphic, 20–85 per capitulum; periphery flowers bisexual; corolla 1.6–1.8 cm long, bilabiate-liguliform, 4-nerve; disc flowers bisexual; corolla 1.3–1.5 cm long, bilabiate; both periphery and disc flowers yellowish or orangish; corolla-limb glabrous in outer portion, strigose-pubescent in inner portion; lobes strigose-setose in outer portion, glabrous in inner portion; anthers basal appendage calcarate, apical appendage apiculate; style branches truncate, panicellate. **Cypselas** narrowly cylindrical, densely strigose-pubescent, glandular, tector trichomes slender, bristly, apex acute, glandular trichomes cylindrical, apex capitate, 10-ribs; carpodium conspicuous; pappus 1-seriate, barbellate, stramineous.

Examined material: Brazil. Minas Gerais: Alto Caparaó, Caparaó National Park, “Pico da Bandeira” trail, High-altitude grassland, humid area, 20°25'32"S, 41°48'05"W, 2,581 m, 17 March 2014 (fr.), M. Monge *et al.* 2654 (UEC194055); *ibidem*, nearly “Terreirão”, High-altitude grassland, 2,300 m, 20°25'S, 41°49'W, 17 February 2000 (fl., fr.), V.C. Souza *et al.* 23302 (HUFU56670, UEC204176); *ibidem*, High-altitude grassland, 12 February 1996 (fl., fr.), L.S. Leoni 3198 (HUFU27029, RB736216, RB736222).

Distribution, Phenology and Conservation: *Trixis glaziovii* was found at High-altitude grassland and it can be associated with humid locations, the altitude mentioned between around 2,300–2,600 meters asl. Its reproductive period is around February and March. The species is restricted to Brazil occurring in Atlantic Forest and Brazilian savanna “Cerrado”. *Trixis glaziovii* is Vulnerable (VU), regarding conservation status.

Taxonomic comments: *Trixis glaziovii* is recognized by branches slightly winged, leaves rosulate at base, sessile, elliptic or obovate with base attenuate to decurrent, capitulum solitary or dichasium paucicephalo. During the analysis of the specimens, it was observed that *Trixis glaziovii* and *Trixis lessingii* were often confused, both are species very similar, but they can be mainly differentiated by branches, leaves, subinvolucral bracts and carpopodium. *Trixis glaziovii* has non-fistulosus branches, leaves with margin dentate or serrate, subinvolucral bracts lacking and carpopodium conspicuous. On the other hand, *Trixis lessingii* has fistulous branches, leaves with margin entire, subinvolucral bracts foliaceous covering the capitulum and carpopodium inconspicuous.

3.5.7. *Trixis lessingii* DC., Prodr. [A. P. de Candolle] 7(1): 70 (1838)

Herbs or subshrubs, ca. 0.8 m tall; branches fistulous, not winged, densely sericeous or tomentose, glabrescent, trichomes slender, base not expanded, apex acute, whitish or brownish. **Leaves** heteromorphic; basal leaves rosulate, sessile; lamina ca. 45.0x3.2 cm, oblong or lanceolate, base attenuate, apex cuspidate or acute, venation semicraspedodromous; apical leaves alternate, sessile; lamina 3.2–38.0x1.6–2.0 cm, elliptic, base acute or obtuse, apex cuspidate or acute, venation parallelodromous; both basal and apical leaves cartaceous, margin irregular entire, spinescent, concolor, abaxial and adaxial surfaces strigose or strigose-sericeous, glabrescent, tector trichomes slender, whitish or brownish. **Co-inflorescence** paucicephala, dichasial cyme; capitula discoid, pedunculated; involucre 1.2–1.5x0.8–1.3 cm, campanulate, 1–2-seriate; involucral bracts subimbricate, cartaceous or membranaceous, densely strigose-sericeous, trichomes slender, whitish or brownish, bracts linear or lanceolate, apex acute or acuminate; receptacle convex. **Flowers** dimorphic, 25–95 per capitulum; periphery flowers bisexual; corolla 1.3–1.5 cm long, bilabiate-liguliform, 4-nerve; disc flowers bisexual; corolla 1.2–1.3 cm long, bilabiate; both periphery and disc flowers yellowish or orangish; corolla-limb glandular in outer portion, trichomes cylindrical, apex rounded, pubescent in inner portion, trichomes cylindrical, apex acute; lobes strigose in outer portion, trichomes apparently with glandular base, glabrous in inner portion; anthers basal appendage calcarate, apical appendage apiculate; style branches truncate, penicellate. **Cypselas** narrowly cylindrical, densely pubescent-tomentose, glandular, tector trichomes cylindrical, slender, apex acute, whitish or stramineous, glandular trichomes cylindrical, apex clavate, brownish, ribs not evident; carpopodium inconspicuous; pappus 1-seriate, barbellate, stramineous.

Examined material: Brazil. Minas Gerais: Alto Caparaó, Caparaó National Park, “Aurélio” waterfall trail, 20°28'S, 41°50'W, 1.834 m, 01 December 2010 (fl., fr.), T.M. Machado *et al.* 253 (RB540281); *ibidem*, “Macieira”, 20°28'54.2"S, 41°50'11.3"W, 1.833 m, 22 January 2008 (fl., fr.), B.V. Tinti *et al.* 433 (HUFU73457).

Distribution and Conservation: *Trixis lessingii* was found probably at “Candeal” (transitional vegetation) around 1.830 meters asl. The species is distributed in Brazil, Paraguay and Uruguay. Regarding the conservation status, *Trixis lessingii* is not evaluated.

Taxonomic comments: *Trixis lessingii* is recognized mainly by fistulous branches, leaves heteromorphic, basal leaves rosulate, lamina reaching ca. 45 cm long, oblong, lanceolate or elliptic, venation semicraspedodromous or parallelodromous, subinvolucral bracts foliaceous, involucre 1–2-seriate and co-inflorescence paucicephala in dichasial cyme.

3.5.8. *Trixis verbascifolia* S.F.Blake, Contr. U.S. Natl. Herb. 22: 655 (1924)

Fig. 3I-L

Herbs or subshrubs, 0.5–2.0 m tall; branches not fistulous, winged, densely tomentose-strigose, glandular, glabrescent, tector trichomes recurved, base expanded apparently glandular, apex acute, whitish, glandular trichomes cylindrical, apex capitate, brownish. **Leaves** homomorphic, alternate, sessile; lamina 2.5–34.5x1.0–11.0 cm, elliptic or lanceolate, cartaceous, base decurrent, margin dentate or serrate, spinescent, apex acute or acuminate, venation brochidodromous, concolor, abaxial surface densely villous, glabrescent, tector trichomes cylindrical, yellowish, glandular, persistent, glandular trichomes rounded, brownish, adaxial surface strigose or strigose-pubescent, glabrescent, trichomes with expanded base apparently glandular. **Co-inflorescence** pluricephala, corymbiform; capitula discoid, pedunculated; involucre 1.2–1.6x1.5–2.0 cm, campanulate, 3-seriate; involucral bracts subimbricate, cartaceous or membranaceous, densely strigose or strigose-sericeous, glandular, tector trichomes cylindrical, apex acute, glandular trichomes rounded or cylindrical with apex capitate; receptacle convex. **Flowers** dimorphic, 60–80 flowers per capitulum; periphery flowers bisexual; corolla 1.6–2.0 cm long, bilabiate-liguliform, 4-nerve; disc flowers bisexual; corolla 1.3–1.5 cm long, bilabiate; both periphery and disc flowers yellowish or orangish; corolla-limb glabrous in outer portion, strigose-pubescent in inner

portion; lobes glabrous in outer and inner portion; anthers basal appendage calcarate, apical appendage apiculate; style branches truncate, penicellate. **Cypselas** narrowly cylindrical, densely glandular, trichomes cylindrical, apex capitate, 8–10-ribs; carpodium inconspicuous; pappus 1-seriate, barbellate, stramineous.

Examined material: Brazil: Caparaó National Park, 1.800 m, 18 May 1971 (fl., fr.), A.P. Duarte 13972 (RB 149003); *ibidem*, “Pico da Bandeira”, 1.500-1.600 m, 06 September 1977 (fl., fr.), G.J. Shepherd *et al.* 5764 (UEC2904). Espírito Santo: Caparaó National Park, nearly “Pico da Bandeira”, 2.600-2.800 m, 05 February 1985 (fl., fr.), P.E. Berry *et al.* 4526 (RB363245). Dores do Rio Preto, Caparaó National Park, 20 June 2005 (fl., fr.), L.S. Leoni 6198 (HUFU83415). Ibitirama, Caparaó National Park, “Casa Queimada” trail, High-altitude grassland, 20°26'17”S, 41°47'56”W, 2.810 m, 10 May 2014 (fl., fr.), A. Salino *et al.* s.n. (BHCB169855). Minas Gerais: Caparaó mountain, 2.200 m, September 1941 (fr.), A.C. Brade 17063 (RB45908); Caparaó National Park, path to “Pico da Bandeira”, 1.500-1.600 m, 06 September 1977 (fl., fr.), G.J. Shepherd *et al.* 5764 (UEC2904). Alto Caparaó, Caparaó National Park, High-altitude grassland, 21 March 2012 (fl., fr.), J. Kuntz *et al.* 582 (RB674530); *ibidem*, “Terreirão”, High-altitude grassland, 2.370 m, 27 March 1996 (fl., fr.), L.S. Leoni 3242 (GFJP3512); *ibidem*, nearly “Tronqueira”, 1.500 m, June 1996 (fl., fr.), L.S. Leoni 3389 (GFJP3724); *ibidem*, “Aurélio” waterfall trail, 20.4333°S, 41.8683°W, 30 August 2013 (fl., fr.), V.C. Manhães *et al.* 342 (UEC194010); *ibidem*, “Pico da Bandeira” trail, High-altitude grassland, humid area, 20°25'47”S, 41°48'03”W, 2.656 m, 17 March 2014 (fl., fr.), M. Monge *et al.* 2656 (UEC193483); *ibidem*, trail between “Tronqueira” and “Pico da Bandeira”, High-altitude grassland, 20°25'15”S, 41°51'12.6”W, 2.000-2.890 m, 11 April 2010 (fl., fr.), G.O. Romão *et al.* 2729 (HUFU74962, RB575037); *ibidem*, “Pico da Bandeira” trail, High-altitude grassland, 20°25'S, 41°48'W, 1.790-2.400 m, 12 February 1998 (fl., fr.), J.P. Souza *et al.* 2130 (HUFU56669); *ibidem*, “Aurélio” waterfall trail, 20°28'49”S, 41°49'59”W, 1.848 m, 2013 (fr.), J.P.F. Zorzanelli 1471 (HUFU83602); *ibidem*, “Aurélio” waterfall trail, 18 June 2013 (fl., fr.), J.P.F. Zorzanelli *et al.* 752 (HUFU83416). Espera Feliz, Caparaó National Park, 20.2733°S, 41.4836°W, 13 August 2011 (fl., fr.), M. Monge *et al.* 981Y37 (UEC201208).

Distribution, Phenology and Conservation: *Trixis verbascifolia* was collected at Montane Semideciduous Forest and High-altitude grassland in humid or dry locations, around 1.500–2.890 meters asl. Its reproductive period is during March to September. The species is

restricted to Brazilian Atlantic Forest. Regarding conservation status, *Trixis verbascifolia* is not evaluated.

Taxonomic comments: *Trixis verbascifolia* is easily recognized by its branches winged, leaves homomorphic, sessile, elliptic or lanceolate with decurrent base, 60–80 flowers per capitulum, involucre 3-seriate and co-inflorescence laxa, pluricephala, corymbiform.

4. Discussion

Floristic inventory

Among the basal tribes of Asteraceae in the Caparaó National Park, Mutisieae and Nassauvieae stood out as the most diverse. They also exhibit the largest species richness, overall, compared to the other early-diverging tribes within family (Susanna *et al.*, 2020). Mutisieae includes a total of 254 species, while Nassauvieae comprises 313 species, both primarily distributed throughout South America (Katinas *et al.*, 2008; Funk *et al.*, 2009; Susanna *et al.*, 2020). In Brazil, the Atlantic Forest has the major representativity of Mutisieae (4 genera; 16 species) and Nassauvieae (6 genera; 27 species), being *Trixis* (9 spp.) and *Chaptalia* (7 spp.) the most diverse genera for the tribes in domain (Flora e Funga do Brasil, 2023).

Chaptalia and *Trixis* were well represented in the CNP, being the richest genera within basal clades in the park. Based in total of occurring species in the Atlantic Forest, the CNP represented 57% of genus *Chaptalia* and 44% of genus *Trixis*.

The Caparaó National Park protects populations of six species (40% of total) with narrow distribution, one of which is *Mutisia lutzii*, endemic to the region. This highlights the importance of preserving natural environments, especially hotspots. Does not preserving the hotspot areas must drive many species to extinction since they are harboring a large diversity of species with restricted distribution. It is important to consider that the distribution can be extremely limited, as well as *M. lutzii*, occurring only in a specific location.

Chaptalia integerrima, *Moquiniastrum polymorphum* and *Mutisia coccinea* have not been previously documented in literature for Caparaó National Park, were documented for the first time in the Caparaó National Park, expanding the latest list compiled by Moreira *et al.* (2020). Floristic inventories based on collections and field expeditions are an effective way to enhance our understanding about the biodiversity (Funk 2006; Funk 2018). Beyond that, accurate species recognition is crucial to ensure a realible listing.

Distribution, phenology and conservation status

The informations regarding the geographical distribution of seven species has doubtful records that are difficult to validate. The shortfall in species distribution within databases have arisen due to the absence of specimens images accompanying records, inconsistencies in data across online platforms, deficiency in linking specimens from herbaria to online databases, and incorrect or missing identifications. Consequently, it has become harder or even impossible to corroborate several records.

For conservation status, there is a lack of information on online databases to the species found here. The majority were not evaluated or have equivocal data in CNCFlora, IUCN Red List or “Flora e Funga do Brasil”.

Taking into account the ongoing environmental degradation over time, an effort must be made to evaluate the threat level for uncategorized species, particularly species with restricted distribution. Additionally, species that have been evaluated should be periodically reviewed.

Systematic treatment

Almost half of the analyzed specimens (44 specimens from 98 specimens; 45%) had their identifications corrected during our study, highlighting the importance of species recognition and the relevance of taxonomic works. The taxonomic works enhance the knowledge about species morphology and provide a review of the specimens in herbaria, enabling the determination or correction of several materials. According Funk *et al.* (2006), the studies in biodiversity will be better drive when biological collections and taxonomists are closely linked.

Taxonomic works are not important only for filling identification gaps in collections, but they also play a crucial role supporting several studies in biodiversity that require to recognize a taxon, consult plant morphology or gather biogeography and phenology data. According Lagomarsino & Frost (2020), the taxonomic studies are increasingly used to understand the ecology and evolutive patterns of species, encompassing a wide range of scientific knowledge areas.

Despite the taxonomic studies are seen as less relevant by scientific community, where the publishment of studies becomes challenging due to page limitations in periodics and the lack of acceptance in high-impact journals, they can greatly contribute to scientific progress overall as well as to support the species conservation planning.

Through taxonomy, the science can recognize the existing species and discover new ones (Joppa *et al.*, 2011b). When there is knowledge about a species, it is possible to incorporate them into conservation planning, thereby increasing their probability of protection, but if the species remains unknown the capacity of protection decreases (Joppa *et al.* 2011a; Lagomarsino & Frost 2020).

5. Conclusion

The Caparaó National Park harbors a diverse flora to basal clades in Asteraceae with species of restricted distribution and endemic species as example *Mutisia lutzii*. An intensive floristic survey accompanying all seasons should be made in the park and surrounding areas. It is possible that there are additional species in the region that have not been recorded yet and could be endemic.

The western portion of the CNP is a region that has been little investigated due to its difficult access. The mountain peak from western areas remains unexplored. The park should consider creating a trail to allow access to the peak from the west, allowing collections that contribute to the knowledge regarding the Caparaó flora. The surrounding areas of the park also require attention, as they are mountain ranges located within a biodiversity hotspot, probably harboring a high level of endemism. However, these areas are currently being disturbed by extensive coffee monoculture.

A notable shortfall in the conservation status of the species on online databases reveals the need for further studies aiming to evaluate the threat level for the plant species. The presence of dubious records to seven species highlights the importance of having images attached with records and an accurate identification for the specimens.

However, floristic inventories associated with taxonomic studies plays a significant role in science. Through the collections and taxonomy, it become possible to acquire a better understanding of biodiversity and their distribution, recognize the species and fulfill gaps caused by wrong or missing identifications.

6. References

Araújo EA, Kunz SH, Dias HM, Carrijo TT & Zorzanelli JPF (2018) Inventários florísticos na região do Caparaó Capixaba revelam novos registros para a flora do Espírito Santo. *Rodriguésia* 69: 1953-1963. <https://doi.org/10.1590/2175-7860201869429>

Araújo EA, Kunz SH, Dias HM, Zorzanelli JPF & Callegaro RM (2021) Vascular plant checklist in an area of extreme biological importance: filling gaps in the Caparaó National Park-ES, Brazil. *Biota Neotropica* 21: e20201024. <https://doi.org/10.1590/1676-0611-bn-2020-1024>

Beck HE, Zimmermann NE, McVicar TR, Vergopolan N, Bergl A & Wood EF (2018) Present and future Köppen-Geiger climate classification maps at 1-km resolution. *Scientific Data* 5: 180214. <https://doi.org/10.1038/sdata.2018.214>

Cheek M, Lughadha EN, Kirk P, Lindon H, Carretero J, Looney B, Douglas B, Haelewaters D, Gaya E, Llewellyn T, Ainsworth AM, Gafforov Y, Hyde K, Crous P, Hughes M, Walker BE, Forzza RC, Wong KM & Niskanen T (2020) New scientific discoveries: Plants and fungi. *Plants People Planet* 2: 371-388. <https://doi.org/10.1002/ppp3.10148>

CNCFlora. Centro Nacional de Conservação da Flora. Available at: <http://cncflora.jbrj.gov.br/>. Access on 03 May 2023.

Cowie RH, Bouchet P & Fontaine B (2022) The Sixth Mass Extinction: fact, fiction or speculation? *Biological Reviews* 97: 640-663. <https://doi.org/10.1111/brv.12816>

Daly M, Herendeen PS, Guralnick RP, Westneat MW & McDade L (2012) Systematics Agenda 2020: The Mission Evolves. *Systematic Biology* 61: 549-552. <https://doi.org/10.1093/sysbio/sys044>

Dirzo R, Young HS, Galetti M, Ceballos G, Isaac NJB, Collen B (2014) Defaunation in the Anthropocene. *Science* 345: 401-406. <https://doi.org/10.1126/science.1251817>

Ellis B, Daly DC, Hickey LJ, Johnson KR, Mitchell JD, Wilf P & Wing SL (2009) Manual of leaf architecture. The New York Botanical Garden Press, New York. Pp. 1-191. <https://doi.org/10.1079/9781845935849.0000>

Flora e Funga do Brasil. Jardim Botânico do Rio de Janeiro. Available at <http://floradobrasil.jbrj.gov.br/>. Access on 03 May 2023.

Freitas AK (2014) O gênero *Moquiniastrum* (Asteraceae, Gochnatioideae, Gochnatieae) na região sul do Brasil. Dissertação de Mestrado. Universidade Federal do Rio Grande do Sul, Rio Grande do Sul. 94p.

Funk VA *et al* (2005) Everywhere but Antarctica: Using a supertree to understand the diversity and distribution of the Compositae. *Biologiske Skrifter* 55: 343–373.

Funk VA (2006) Floras: a model for biodiversity studies or a thing of the past? *Taxon* 55: 581-588. <https://doi.org/10.2307/25065635>

Funk VA, Susanna A, Stuessy TF & Bayer RJ (2009) Systematics, Evolution, and Biogeography of Compositae. IAPT, Vienna. Pp. 171-189.

Funk VA (2018) Collections-based science in the 21st Century. *Journal of Systematics and Evolution* 56: 175-193. <https://doi.org/10.1111/jse.12315>

Heilbron M, Pedrosa-Soares AC, Neto MCC, Silva LC, Trouw RAJ & Janasi VA (2004). Província Mantiqueira. In: Mantesso-Neto V, Bartorelli A, Carneiro CDR, Brito-Neves BB (eds.) *Geologia do Continente Sul-Americano: Evolução da Obra de Fernando Flávio Marques de Almeida*. BECA, São Paulo. Pp. 203-234.

Hickey LJ (1973) Classification of the architecture of dicotyledonous leaves. *American Journal of Botany* 60: 17-33. <https://doi.org/10.1002/j.1537-2197.1973.tb10192.x>

Hind DJN (2011) An annotated preliminary checklist of the Compositae of Bolivia. Version 2. The Herbarium, Library, Art & Archives. Royal Botanic Gardens, Kew: 1-644.

IBGE. Instituto Brasileiro de Geografia e Estatística (2012). *Manual técnico da vegetação brasileira*. 2. Ed. IBGE, Rio de Janeiro, Pp. 1-271.

IBGE. Instituto Brasileiro de Geografia e Estatística. Geociências: IBGE revê as altitudes de sete pontos culminantes. Available at: < <https://agenciadenoticias.ibge.gov.br/>>. Access on 02 May 2023.

IBDF. Instituto Brasileiro de Desenvolvimento Florestal (1981) Plano de Manejo Parque Nacional do Caparaó. Brasília: Fundação Brasileira para a Conservação da Natureza. p. 1-135.

ICMBio. Instituto Chico Mendes de Conservação da Biodiversidade. Parque Nacional do Caparaó. Available at: <<https://www.icmbio.gov.br/>>. Access on 03 May 2023.

ICMBio. Instituto Chico Mendes de Conservação da Biodiversidade. Plano de Manejo para o Parque Nacional do Caparaó. MMA, Brasília. Pp. 1-517.

IPNI. International Plant Names Index. Available at: < <https://ipni.org/>>. Access on 03 May 2023.

IUCN Red List. The IUCN Red List of Threatened Species. Available at: <<https://www.iucnredlist.org/>>. Access on 03 May 2023.

Jansen RK & Palmer JD (1987) A chloroplast DNA inversion marks an ancient evolutionary split in the sunflower family (Asteraceae). PNAS 84: 5818-5822.
<https://doi.org/10.1073/pnas.84.16.5818>

Joppa LN, Roberts DL, Myers N & Pimm SL (2011a) Biodiversity hotspots house most undiscovered plant species. PNAS 108: 13.171-13.176.
<https://doi.org/10.1073/pnas.1109389108>

Joppa LN, Roberts DL & Pimm SL (2011b) The population ecology and social behaviour of taxonomists. Trends in Ecology & Evolution 26: 551–3.
<https://doi.org/10.1016/j.tree.2011.07.010>

JSTOR. Global Plants. Available at: < <https://plants.jstor.org/>>. Access on 03 May 2023.

Katinas L (1996) Revisión de las especies sudamericanas del género *Trixis* (Asteraceae, Mutisieae). *Darwiniana* 34: 27-108.

Katinas L, Pruski J, Sancho G, Tellería MC (2008) The Subfamily Mutisioideae (Asteraceae). *Botanical Review* 74: 469-716. <https://doi.org/10.1007/s12229-008-9016-6>

Lagomarsino LP, Frost LA (2020) The central role of taxonomy in the study of neotropical biodiversity. *Annals of the Missouri Botanical Garden* 105: 405-421. <https://doi.org/10.3417/2020601>

Lopes ITFV, Marques D, Nakajima JN (2021) The Eupatorieae tribe (Asteraceae) in Caparaó National Park, Espírito Santo/ Minas Gerais, Brazil. *Rodriguésia* 72: 1-30. <https://doi.org/10.1590/2175-7860202172113>

Lughadha EN *et al.* (2020) Extinction risk and threats to plants and fungi. *Plants People Planet* 2: 389-408. <https://doi.org/10.1002/ppp3.10146>

Mandel J, Barker MS, Bayer RJ, Dikow RB, Gao TG, Jones KE, Keeley S, Kilian N, Ma H, Siniscalchi CM, Susanna A, Thaphal R, Watson L & Funk VA (2017) The Compositae Tree of Life in the age of phylogenomics. *Journal of Systematics and Evolution* 55: 405–410. <https://doi.org/10.1111/jse.12265>

Mandel JR, Dikow RB, Siniscalchi CM, Thapa R, Watson LE & Funk VA (2019) A fully resolved backbone phylogeny reveals numerous dispersals and explosive diversifications throughout the history of Asteraceae. *PNAS* 116: 14083-14088. <https://doi.org/10.1073/pnas.1903871116>

MapBiomias. Estatísticas. Available at: < <https://mapbiomas.org/>>. Access on 03 May 2023.

Martinelli G., Valente ASM, Maurenza D, Kutschenko DC, Judice DM, Silva DS, Fernandez EP, Martins EM, Barros FSM, Sfair JC, Filho LAFS, Abreu MB, Moraes MA, Monteiro NP, Pietro PV, Fernandes RA, Hering RLO, Messina T & Penedo RSA (2013) Avaliações de risco de extinção de espécies da flora brasileira. In: Martinelli, G., Moraes, M. A. (eds.) Livro

vermelho da flora do Brasil. Rio de Janeiro: Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Pp 60-78.

Mindat. The Köppen Climate Classification. Available at:
<<https://www.mindat.org/climate.php>>. Access on 03 May 2023.

Mittermeier RA, Turner WR, Larsen FW, Brooks TM & Gascon C (2011) Global Biodiversity Conservation: The Critical Role of Hotspots. In: Zachos FE & Habel JC (eds.) Biodiversity Hotspots: Distribution and protection of conservation priority areas. 2011th Ed. Springer, New York. Pp. 3–22. https://doi.org/10.1007/978-3-642-20992-5_1

Monge M (2011) As tribos Barnadesieae e Mutisieae S. L. (Asteraceae) no estado de São Paulo, Brasil. Dissertação de Mestrado. Universidade Estadual de Campinas, São Paulo, 199p.

Monge M, Semir J (2012) Asteraceae Brecht. & J. Presl. na Serra do Japi. In: Vasconcellos-Neto J, Polli PR & Pentead-Dias AM (eds.) Novos Olhares, Novos Saberes sobre a Serra do Japi. CRV, Curitiba, Pp. 221–250

Monge M, Souza-Buturi FO, Semir J, Katinas L (2017) Tribo Nassauvieae Cass. In: Roque N, Teles AM, Nakajima JN (eds.) A família Asteraceae no Brasil: classificação e diversidade. EDUFBA, Salvador, Pp. 51–56. <https://doi.org/10.7476/9788523219994.0006>

Moreira MM *et al* (2020) A list of land plants of Parque Nacional do Caparaó, Brazil, highlights the presence of sampling gaps within this protected area. Biodiversity Data Journal 8: 1-26. <https://doi.org/10.3897/BDJ.8.e59664>

Myers N, Mittermeier RA, Mittermeier CG, Fonseca GAB & Kent J. (2000) Biodiversity hotspots for conservation priorities. Nature 403: 853–858. <https://doi.org/10.1038/35002501>

Panero JL, Freire SE, Espinar LA, Crozier BS, Barboa GE & Cantero JJ (2014) Resolution of deep nodes yields an improved backbone phylogeny and a new basal lineage to study early evolution of Asteraceae. Molecular Phylogenetics and Evolution 80: 43–53. <https://doi.org/10.1016/j.ympev.2014.07.012>

Panero JL & Crozier BS (2016) Macroevolutionary dynamics in the early diversification of Asteraceae. *Molecular Phylogenetics and Evolution* 99: 116–132.

<https://doi.org/10.1016/j.ympev.2016.03.007>

Pasini E (2017) Tribo Mutisieae Cass. In: Roque N, Teles AM & Nakajima JN (eds.) A família Asteraceae no Brasil: classificação e diversidade. EDUFBA, Salvador, Pp. 43–50.

<https://doi.org/10.7476/9788523219994.0005>

Pedrosa-Soares AC, Noce CM, Alkmim FF, Silva LC, Babinski M, Cordani U, Castañeda C (2007) Orógeno Araçuaí: síntese do conhecimento 30 anos após Almeida 1977. *Geonomos* 15: 1–16.

Pievani T (2014) The sixth mass extinction: Anthropocene and the human impact on biodiversity. *Rendiconti Lincei* 25: 85–93. <https://doi.org/10.1016/B978-0-12-409548-9.09216-2>

Plants of the World Online. Royal Botanic Gardens, Kew. Available at: <https://powo.science.kew.org/>. Access on 03 May 2023.

Radford AE (1986) *Fundamentals of Plant Systematics*. Harper & Row Publishers, New York. Pp. 1–498.

Reflora. Herbário Virtual Reflora. Jardim Botânico do Rio de Janeiro. Available at: <https://floradobrasil.jbrj.gov.br/reflora/>. Access on 03 May 2023.

Ribeiro MC, Metzger JP, Martensen AC, Ponzoni FJ & Hirota MM (2009) The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation* 142: 1141–1153. <https://doi.org/10.1016/j.biocon.2009.02.021>

Roque N, Teles AM & Nakajima JN (2017) A família Asteraceae no Brasil: classificação e diversidade. EDUFBA, Salvador. Pp. 260. <https://doi.org/10.7476/9788523219994>

Rotta E, Carvalho LC & Zonta BM (2008) Manual de prática de coleta e herborização de material botânico. Embrapa Florestas, Colombo. Pp. 1–31.

R. The R Foundation for Statistical Computing 2021. Available at: <<https://www.r-project.org/>>. Access on 03 May 2023.

Saavedra MM & Roque N (2017) Tribo Barnadesieae D. Don. In: Roque N, Teles AM, Nakajima JN (eds.) A família Asteraceae no Brasil: classificação e diversidade. EDUFBA, Salvador, Pp. 37–42. <https://doi.org/10.7476/9788523219994.0004>

Saavedra MM, Guimarães EF, Loeuille B, Forzza RC (2018). Taxonomic Revision of *Dasyphyllum* sect. *Macrocephala* (Asteraceae: Barnadesioideae). Systematic Botany 43: 297-315. <https://doi.org/10.1600/036364418X696888>

Silva RG, Santos AR, Pelúzio JBE, Fiedler NC, Juvanhol RS, Souza KB & Branco ERF (2021) Vegetation trends in a protected area of the Brazilian Atlantic forest. Ecological Engineering 162: 106180. <https://doi.org/10.1016/j.ecoleng.2021.106180>

SpeciesLink. CRIA - Centro de Referência em Informação Ambiental. Available at: <<https://specieslink.net/>>. Access on 03 May 2023.

Susanna A, Baldwin BG, Bayer RJ, Bonifacino JM, Garcia-Jacas N, Keeley SC, Mandel JR, Ortiz S, Robinson H & Stuessy TF (2020). The classification of the Compositae: A tribute to Vicki Ann Funk (1947–2019). Taxon 69: 807–814. <https://doi.org/10.1002/tax.12235>

Thiers B. 2023. Index herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's virtual herbarium. Published at <http://sweetgum.nybg.org/science/ih/> [accessed 03 May 2023].

Tropicos. Missouri Botanical Garden. Available at: < <https://www.tropicos.org/home>>. Access on 03 May 2023.

7. FIGURES

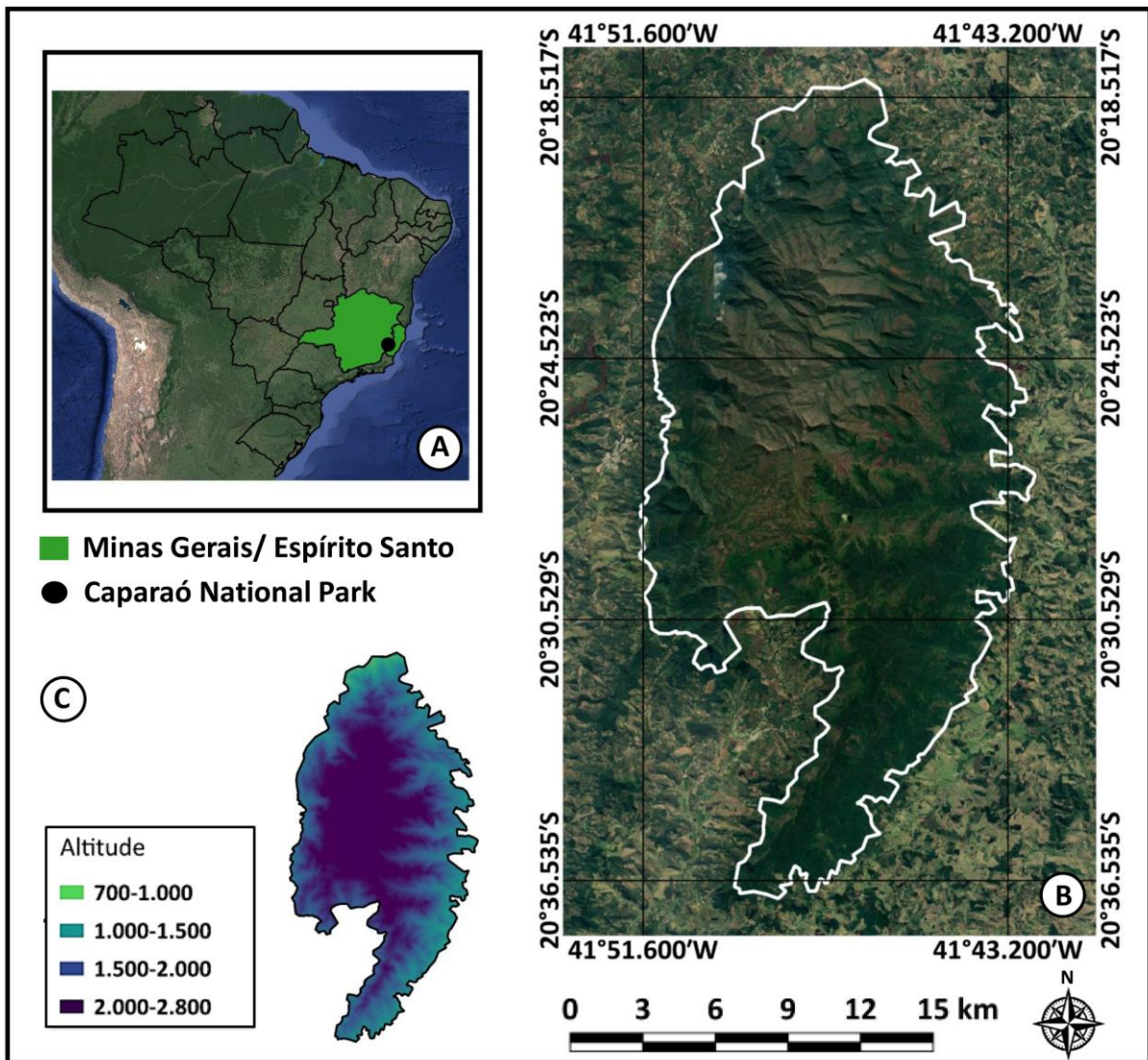


Figure 1. Study area. **A.** Caparaó National Park location; Brazil, Minas Gerais and Espírito Santo states. **B.** Boundaries of the Caparaó National Park and coordinates. **C.** Altitude in meters of the park. Coordinates in EPSG: 4674 – SIRGAS 2000. QGIS Development Team.

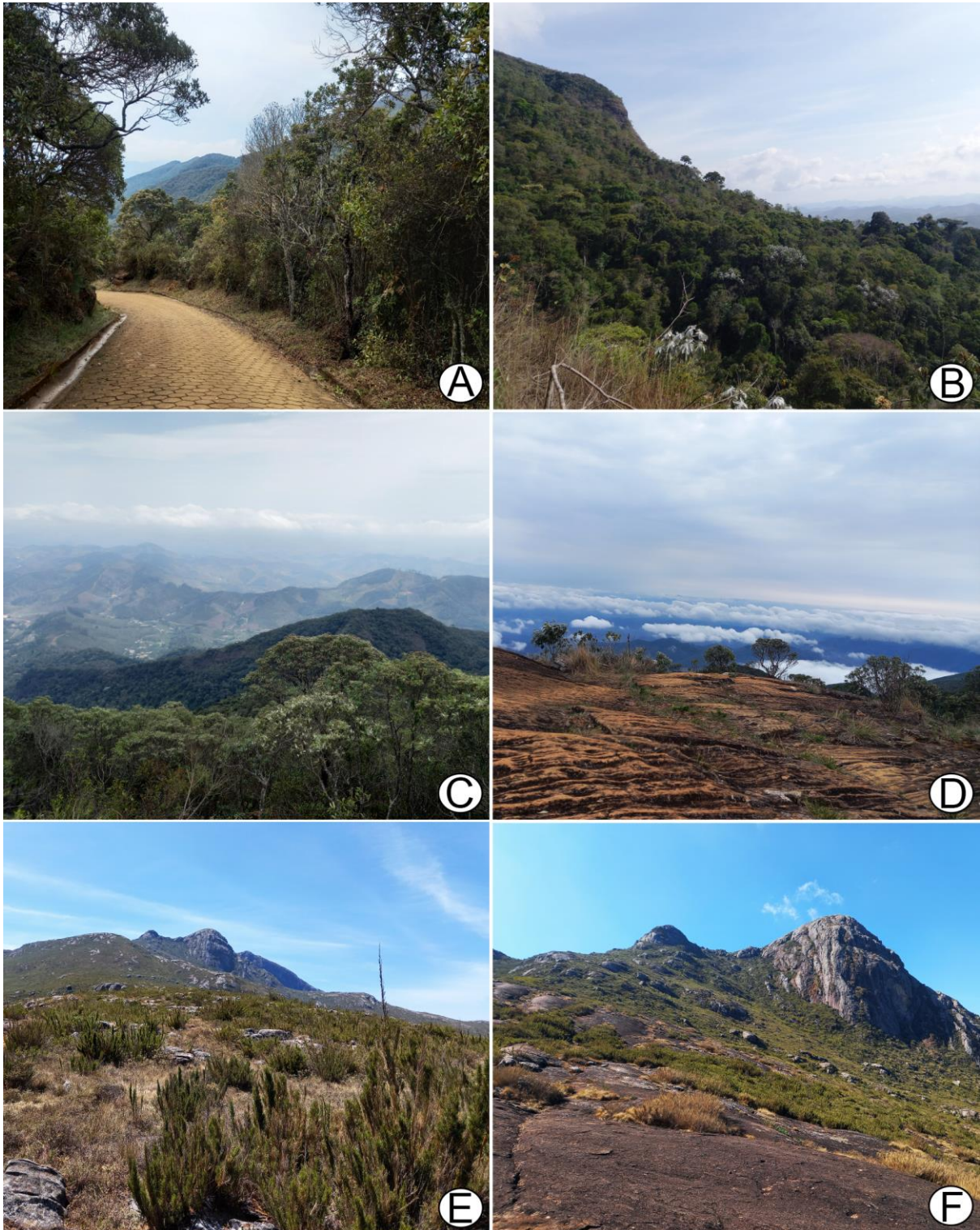


Figure 2. Phytophysiognomies of the Atlantic Forest in Caparaó National Park. **A.** Montane Semideciduous Seasonal Forest. **B.** Montane Ombrophilous Forest. **C.** Transitional vegetation between Montane Forest and High-altitude grassland, called here by “Candeal”. **D.** High-altitude grassland with scattered shrubs (scrub). **E.** *Chusquea* sp. grassland. **F.** High-altitude grassland. (Photos: P Renon).

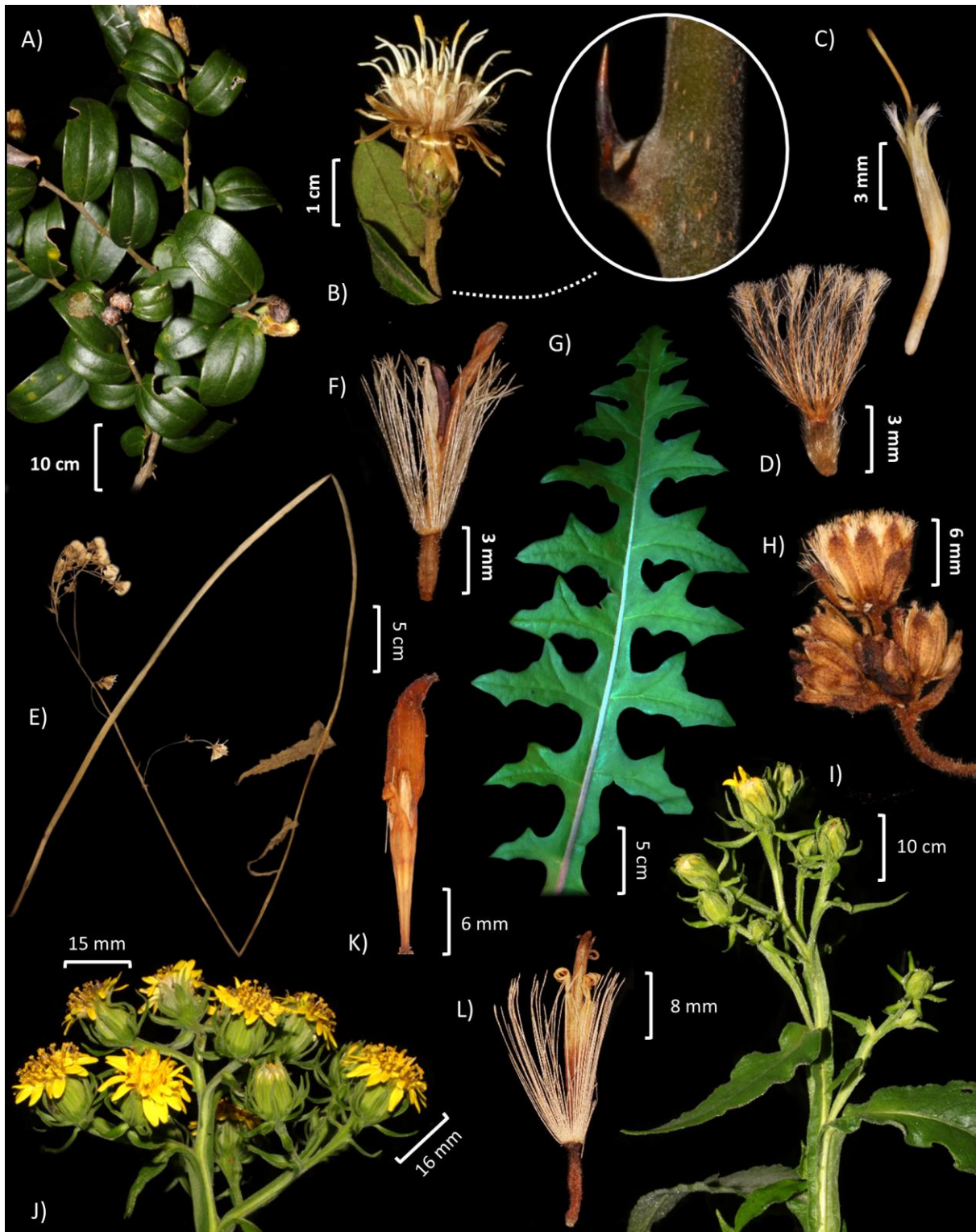


Figure 3. Barnadesiaceae. *Dasyphyllum flagellare* A. Habit. B. Capitulum discoide and axillary spines. C. Corolla bilabiate. D. Cypsela densely setose and pappus plumose. *Nassauvieae. Holocheilus pinnatifidus* E. Habit. F. Flower bilabiate and cypsela ellipsoid with pappus barbellate. G. Basal leaf pinnatissecta. H. Co-inflorescence cymose and capitulum with involucral bracts 2–3-seriate. *Trixis verbascifolia* I. Habit. J. Co-inflorescence corymbiform. K. Peryphery flower with corolla bilabiate-liguliform. L. Disc flower with corolla bilabiate and cypsela cylindrical. (Photos: A-F, H, K, L: GM Paranhos; G: M Pastore; I-J: M Monge).



Figure 4. Mutisieae. *Chaptalia denticulata* A. Habit. B. Capitulum. C. Leaves cordiform with runcinated margin, abaxial surface densely lanose. D. Ray flower. E. Cypsela not rostrate and pappus barbellate. *Chaptalia piloselloides* F. Habit. G. Capitulum. H. Front view of capitulum showing the ray and disc flowers. I. Ray flower. J. Disc flower. K. Cypsela rostrate. *Mutisia lutzii*. L. Habit. M. Disc flower and cypsela. N. Ray flower and anthers with apical appendage apiculate. (Photos: A-D, J, K, M, N: GM Paranhos; E, F, G, L: M Monge; H: P Renon).

Chapter II

Vernonieae (Asteraceae) in the Caparaó National Park Espírito Santo/ Minas Gerais, Atlantic Forest, Brazil**Abstract:**

Vernonieae is a highly diverse tribe and displays an important representation in mountain habitats, particularly in the Atlantic Forest. The Caparaó National Park is a notable conservation unit of Atlantic Forest due its high-altitude, owing the third highest peak in Brazil, and for having a diverse and endemic flora. Thus, a floristic inventory and a taxonomic treatment of Vernonieae to the park was made here. For that, the collections from representative herbaria to Asteraceae in Caparaó National Park were consulted and an expedition was carried out to complement the species' list. The taxonomic treatment involved analyzes of vegetative and reproductive structure using stereoscopic, microscope and specific literatures to terminology. Descriptions were systematized under support by Monographar package in R program. Additional informations about distribution and conservation status were checked on online databases. The floristic survey resulted 27 species and nine genera distributed in five subtribes. *Vernonanthura* (8 spp.) and *Lepidaploa* (7 spp.) were the richest genera in the park. The subtribes more representativity were Lepidaploinae (9 spp.), and Vernoniinae (9 spp.). In total, 17 species (63%) have a narrower distribution, being six restricted to Brazil, eight to Atlantic Forest, two to Brazilian southeast and one endemic to Caparaó. Vernonieae occurs in all phytophysionomies in the Caparaó National Park, but the forest environment highlighted with 18 species, in particular the Montane Semidecidial Seasonal Forest (11 spp.). Here we documented seven new records to the Caparaó and we expanded the last list compiled for Vernonieae with nine additional species. *Hololepis pedunculata* is recorded for the first time to the Caparaó, Espírito Santo state and Atlantic Forest (Montane Ombrophilous Forest). A great percentual of Brazilian species in Vernonieae is found in the Caparaó National Park, reflecting that natural areas are fundamental to ensure the conservation of species mainly in hotspots regions.

Keywords: Biodiversity, Brazilian Flora, Compositae, Hotspots, Mantiqueira.

Resumo:

Vernonieae é uma tribo altamente diversa e exibe uma representação importante em habitats de montanha, particularmente na Mata Atlântica. O Parque Nacional do Caparaó é uma notável unidade de conservação da Mata Atlântica devido à sua grande altitude, abrigando o terceiro pico mais alto do Brasil, e por possuir uma flora diversa e endêmica. Portanto, um inventário florístico e um tratamento taxonômico de Vernonieae para o parque foi feito aqui. Para isso, as coleções de herbários representativos para Asteraceae no Parque Nacional do Caparaó foram consultadas e uma expedição foi realizada para complementar a lista de espécies. O tratamento taxonômico envolveu análises de estruturas vegetativa e reprodutiva usando estereoscópio, microscópio e literaturas específicas para as terminologias. Descrições foram sistematizadas sob o auxílio do pacote Monographar do programa R. Informações adicionais sobre distribuição e status de conservação foram verificadas nos bancos de dados online. O levantamento florístico resultou 27 espécies e nove gêneros distribuídos em cinco subtribos. *Vernonanthura* (8 spp.) e *Lepidaploa* (7 spp.) foram os gêneros mais ricos no parque. As subtribos mais representativas foram Lepidaploinae (9 spp.) e Vernoniinae (9 spp.). No total, 17 espécies (63%) apresentam uma distribuição mais restrita, sendo seis restritas ao Brasil, oito para Mata Atlântica, duas para o sudeste brasileiro e uma endêmica do Caparaó. Vernonieae ocorre em todas as fitofisionomias no Parque Nacional do Caparaó, mas o ambiente florestal destacou com 18 espécies, em particular a Floresta Estacional Semidecidual Montana (11 spp.). Aqui, documentamos sete novos registros para o Caparaó e ampliamos a última lista compilada para Vernonieae com nove espécies adicionais. *Hololepis pedunculata* é registrado pela primeira vez para o Caparaó, Espírito Santo e Mata Atlântica (Floresta Ombrófila Montana). Um grande percentual de espécies endêmicas brasileiras em Vernonieae é encontrado no Parque Nacional do Caparaó, refletindo que áreas naturais são fundamentais para assegurar a conservação das espécies principalmente em regiões de *hotspots*.

Palavras-chave: Biodiversidade, Compositae, Flora Brasileira, Hotspots, Mantiqueira.

1. Introduction

The Caparaó National Park is a fully protected conservation unit enclosing around 32.000 hectares of native area on boundaries of Minas Gerais and Espírito Santo states (ICMBio, 2023). The Caparaó region has one of the highest mountain chain of Brazilian southeastern and it is popularly known by owning the third highest peak of Brazil (“Pico da Bandeira”) with 2.890 meters above the sea level (IBDF, 1991). Beyond the great beauty of mountain landscape, the Caparaó park protects remaining of Atlantic Forest (ICMBio, 2023), harboring a rich and endemic flora (Moreira *et al.*, 2020).

The Atlantic Forest is one of the biggest and richest tropical forest of America, highly threat due anthropic activities (Galindo-Leal & Câmara, 2005; Paglia *et al.*, 2008; Ribeiro *et al.*, 2009; Martinelli & Moraes 2013). Farming, mining and urbanization suppressed until nowadays approximately 73.521.395 hectares (67.72%) of domain (MapBiomas, 2023), threatening the biodiversity, geomorphology and natural resource.

According literature, the Atlantic Forest domain is considered a center of diversity and endemism of the world, being internationally recognized as one of thirty-four hotspots existant in Earth (Myers *et al.*, 2000; Mittermeier *et al.*, 2004; Mittermeier *et al.*, 2011).

Asteraceae is among the richest families in Atlantic Forest and the second richest in Caparaó National Park (Colli-Silva *et al.*, 2020; Moreira *et al.*, 2020). The family is highlight in terms of diversity for the Brazil and world (Cheek *et al.* 2020, Flora e Funga do Brasil, 2023). According Cheek *et al.* (2020), Asteraceae has 32.000 species spread around the world, being the richest of flowering plants. And according Flora e Funga do Brasil database Asteraceae is the second richest of country.

Studies indicates that Asteraceae has great representativity in mountain habitats, generally being the richest family (Borges *et al.*, 2010; Lombardi *et al.*, 2012; Salimena *et al.* 2013, Meireles *et al.*, 2014; Santiago *et al.*, 2018; Cruz *et al.*, 2020; Araújo *et al.* 2021) and the altitude has effect under community patterns influencing in richness and abundance of species (Zidorn, 2010; Bhat *et al.*, 2018; Chaves *et al.*, 2019; Ghafari *et al.*, 2020; Portella *et al.*, 2021).

Inside Asteraceae, Vernoniae is a tribe of 1.500 species belonging the central clades, being in interval between basal lineages and more recently lineages (Susanna *et al.*, 2020). In Brazil, Vernoniae contains plants widely known by population with great importance to economy and tradicional medicine, for example, species of genus *Lychnophora* (“Arnica”),

Eremanthus (“Candeia”) and *Vernonanthura* (“Assa-peixe) (Souza & Felfili, 2006; Leitão *et al.*, 2014; Pádua *et al.*, 2016; Santos *et al.*, 2016; Vargem *et al.*, 2022). The tribe is the second most diverse on country with 459 species distributed in 51 genera (Esteves *et al.*, 2017; Flora e Funga do Brasil, 2023).

Commonly, Vernonieae is among the richest tribe of Asteraceae in mountain landscapes, being well represented in these habitats of high elevation (Borges *et al.*, 2010; Reis *et al.*, 2015; Moreira *et al.*, 2020). But, despite the great notoriety of Vernonieae in Brazil and representativity in mountain habitats, there is a scarcity of knowledge for tribe on Caparaó National Park, one of most important conservation unit of Atlantic Forest. It is not known certainly how many species are there, how the species are morphologically, how we can separate it, how many species are threatened and have restrict distribution.

However, the present research aims to performed a floristic inventory of Vernonieae tribe in Caparaó National Park jointly with a systematic treatment for species, approaching distribution, habitat, conservation status, descriptions, taxonomic comments, identification keys, specimens analyzed and photographs.

2. Material and Methods

Study area

The Caparaó National Park (CNP) is a fully protected conservation unit protecting 32.000 hectares of Atlantic Forest (ICMBio, 2023). The park is situated on boundaries of Minas Gerais and Espírito Santo states between 41°51’W and 41°43’W latitudes, 20°36’S and 20°18’S longitudes (Fig.1A-B).

Under the Mantiqueira Province northern portion (Araçuaí Orogen), one of the highest of brazilian southeastern, originated during the Gondwanaland around 880-480 million years ago (IBDF, 1981; Pedrosa-Soares *et al.*, 2001; Heilbron *et al.*, 2004; Alkmim *et al.*, 2006; Pedrosa-Soares *et al.*, 2007), the park region displays of mountain landscapes with altitudes varying from 700-2.890 meters above sea level (Fig.1).

The high altitude has influence under climatic conditions in Caparaó, keeping a milder climate (IBDF, 1981). Annual averages from 16°C–22°C, in summer the elevation not allow the temperature reaches the daily maximum and in winter the coldest months (june-august) can hit -4°C at highest peaks (IBDF, 1981; ICMBio, 2015). Annual rainfall averages from 750–2.250 mm and relative air humidity usually above 70% (IBDF, 1981; ICMBio, 2015).

According to Köppen classification, the climate of Caparaó region is Cwb, subtropical highland climate (Beck *et al.*, 2018; Mindat, 2023). Two different seasons are well defined, rainy-summer from October to March and dry-winter from April to September which has a short rain decline (IBDF, 1981; ICMBio, 2015).

The vegetation in Caparaó National Park encloses the following Atlantic Forest phytophysiognomies: Montane Semideciduous Forest, Montane Mixed Ombrophilous Forest (Fig.1C) or Upper Montane Mixed Ombrophilous Forest (700–1.780m), vegetation of transition between forest and high-altitude grassland called here by “Candéal” due the abundance of *Eremanthus erythropappus* (1.800–2.000m), and high-altitude grassland (Fig.1D-E) which can be scrube, “dirty” grassland characterized by grasses, herbaceous, subshrubby and small shrubby plants, *Chusquea* sp. grassland (Fig.1D), “clean” grassland characterized by exposed rock outcrops (Fig.1E) with scattered grasses, herbaceous and small subshrubby/shrubby plants <80cm tall (2.000–2.800m) (IBGE, 2012; ICMBio, 2015; Moreira *et al.*, 2020; informations also from our expedition).

The coffee monoculture is the main economic resource of Caparaó region, which has been suppressed intensively native areas of Atlantic Forest. In surrounding areas of Caparaó National Park are harshly disturbed, antropic activities are allowed there (Silva *et al.*, 2021).

Floristic inventory

For floristic inventory a survey of most representative herbaria to Asteraceae in Caparaó National Park was made. The collections from BHCB, CAP, CESJ, ESA, GFJG, HUEMG, HUFU, RB, UEC were consulted and grants or load of selected specimens were requested. The acronyms mentioned follow Thiers (2023).

An expedition in the park was carried out aiming to complement the list of species and improve the knowledge about taxa. The expedition was done in October, at the beginning of rainy season, during 5 days. The collections were focused on the eastern portion of the park, where it has accesses (from Alto Caparaó-MG and Pedra Menina-ES district of Dores do Rio Preto-ES).

The sampled specimens were georeferenced and had their biology informations recorded, habitat, hight, color of flowers and involucre, vegetation and altitude. Later, the specimens were herborized according traditional methodology (Rotta *et al.*, 2008), having support of HUEMG to drying the material.

The specimens collected during expedition were incorporated in HUFU herbarium and duplicates were sent to HUEMG and VIES.

Distribution data and conservation status

The distribution data followed “Flora e Funga do Brasil” (<http://reflora.jbrj.gov.br/>), GBIF (<https://www.gbif.org/>), POWO (<https://powo.science.kew.org/>), SpeciesLink (<https://specieslink.net/>) and Tropicos (<https://www.tropicos.org/>). In terms of conservation status, it was consulted CNCFlora (<http://www.cncflora.jbrj.gov.br/>), IUCN Red List (<https://www.iucnredlist.org/>) and the Red List of Brazilian Flora by Martinelli & Moraes (2013). For species that were recently described, their conservation status was verified in the respective publication.

Systematic treatment

Taxonomic treatments involve mainly the knowledge about morphological characters to recognize a taxon. Here the taxonomic treatment was done through analyzes of vegetative and reproductive characteristics using stereoscopic, microscope and caliper. The following literatures to terminology follow Ellis *et al.* (2009), Hickey (1973), Radford (1986) and Funk *et al.* (2009).

The identifications of specimens were done using identification keys, descriptions and illustrations in bibliographies (Baker, 1873; Smith, 1982; Robinson, 1987; Robinson, 1988; Robinson, 1990; Robinson, 1999; Robinson, 2007; Smith & Coile, 2007, Marques *et al.*, 2018). Also, the original description of taxon was used, which can be found in Biodiversity Heritage Library (<https://www.biodiversitylibrary.org/>) and Bibliothèque Nationale de France (<https://www.bnf.fr/fr>).

Comparisons with specimens already identified from HUFU collection and from database, Jstor Plant Science (<https://plants.jstor.org/>), SpeciesLink (<https://specieslink.net/>) and Virtual Herbarium’s Re flora (<http://reflora.jbrj.gov.br/>) helped improving the accurate of identification.

Systematizations of descriptions and examined material were performed using the package Monographar in R project (The R Project for Statistic Computing). Descriptions were systematized between species of same genus. The currently nomenclature were checked through database IPNI (<https://www.ipni.org/>) and Tropicos (<https://www.tropicos.org/>).

3. Results

Floristic inventory

The floristic survey resulted 27 species, nine genera and five subtribes. *Vernonanthura* (8 spp.) and *Lepidaploa* (7 spp.) were the richest genera in the park. Lepidaploinae (9 spp.), comprising the genera *Lepidaploa* and *Lessingianthus*, and Vernoniinae (9 spp.) with *Cyrtocymura* and *Vernonanthura*, were the subtribes that exhibited the greatest representativity, following Piptocarphinae (5 spp.), Lychnophorinae (3 spp.) and Elephantopodinae (1 sp.).

Among the found species, 17 species (63%) have a narrower distribution. Six are restricted to Brazil, eight species are restricted to Atlantic Forest, whereas *Lepidaploa estevesiana* M.Monge (Fig. 2D), Leoni & Nakajima was found only in High-altitude grassland, two species are restricted to Brazilian southeast (*Hololepis pedunculata* DC. and *Lepidaploa subsquarrosa* (DC.) H.Rob.) and one species (*Critoniopsis bradeana* (G.M.Barroso) G.Souares & Loeuille) endemic to Caparaó mountain (Fig. 2A).

Vernonieae occurs in all phytophysiognomies of Atlantic Forest in the Caparaó National Park, but the forest environment highlights with 18 species in total. The Montane Semidecidual Seasonal Forest has the largest diversity (11 species occurring), followed by Montane Ombrophilous Forest (9 spp.). The High-altitude grassland was the third most diverse (7 spp.), lastly transitional vegetation (5 spp.) and disturbed environment (2 spp.).

The shrubby habit, occurring in 11 species, was the most frequently among Vernonieae in the park. The second most frequently was arboreal habit (10 spp.), posteriorly subshrubs (7 spp.), vines (2 spp.) and herbs (1 sp.).

In comparison with the number of species listed by Moreira *et al.* (2020) for Vernonieae in the Caparaó, we expanded the list with nine additional species: *Critoniopsis bradeana*, *Hololepis pedunculata*, *Lepidaploa cotoneaster* (Willd. ex Spreng.) H.Rob., *L. estevesiana* M.Monge, Leoni & Nakajima, *L. salzmännii*, *L. subsquarrosa* (DC.) H.Rob., *Piptocarpha notata* Baker, *P. reitziana* Cabrera and *Vernonanthura phaeoneura* (Toledo) H.Rob (Fig. 2I). From this total, only *Critoniopsis bradeana* and *Lepidaploa estevesiana* have ever been documented for the Caparaó in Soares & Loeuille (2021) and Monge *et al.* (2023), all the remaining species are new records.

Hololepis pedunculata is a new record for Caparaó National Park, Espírito Santo state and Atlantic Forest (Montane Ombrophilous Forest). The species had been recorded, until now, only in Brazilian savanna “Cerrado” from Minas Gerais state, particularly in “Campo rupestre” and Ciliary or Gallery Forest. There is one record on SpeciesLink for *H. pedunculata* in Espírito Santo state, however, the identification is wrong, these specimen belongs the collect of *Hololepis hatschbachii* H.Rob. (from G. Hatschbach 61125).

Eremanthus glomerulatus Less., *Lepidaploa decumbens* (Gardner) H.Rob. and *Vernonanthura laxa* (Gardner) H.Rob. are listed in Moreira *et al.* (2020), however, these species apparently does not occurs in the park or were not found yet. The record of *E. glomerulatus* for the park is indeed *E. erythropappus* (DC.) MacLeish, *L. estevesiana* was wrongly called by *L. decumbens* and for the record of *V. laxa*, the correct species is *V. montevidensis* (Spreng.) H.Rob.

Distribution data and conservation status

The distribution data searched on online database were utilized in systematic treatment of the species. During the searches was possible to note incongruity of records between database, records difficult to validate due the absence of specimens' photographs and invalid records caused by wrong identification. *Lepidaploa sororia*, for example, on Flora and Funga it is restricted to Brazil, on SpeciesLink have records to Argentina (but in this case had photographs and was possible to verify that is *Cyrtocymura* sp.), on Tropicos and Plants of World Online are registered that the species occurs also in Bolivia, however there are no records available to confirm them. On database of GBIF there are records of *Lepidaploa sororia* for Brazil, Argentina, Bolivia and Paraguay, but, the records of Argentina are indeed *Cyrtocymura* and some of them were not possible to confirm and the records for Bolivia and Paraguay are of *Vernonia scorpioides* var. *sororia* which is considered synonym of *L. sororia*, but they are independent taxa.

Therefore, considering that, the specimens type of *Lepidaploa sororia* and their synonyms are all from Brazil in regions of Rio de Janeiro, Espírito Santo and Minas Gerais add the difficulty to diferenciate *Lepidaploa sororia* and *Cyrtocymura scorpioides* (which has a widely distribution in South America), was considered here *Lepidaploa sororia* restricted to Brazil accordingly with Flora and Funga do Brasil.

Regarding the status conservation, 14 species are not evaluated (52%), 9 species are Least Concern (LC) and 1 species was available as Endangered (EN) (*Lepidaploa estevesiana*) in Monge *et al.* (2023).

Systematic treatment

For the systematic treatment were analyzed 142 specimens which 94 specimens were determined or updated during the research. Specimens of Vernonieae can be recognized mainly by phyllotaxy, morphology of style branche and pappus. In general, the species belonging Vernonieae has leaves alternate, a style branche lengthy acute or acuminate with

hairs prolonging below the bifurcation of style, and pappus bisseriate or trisseriate (except *H. pedunculata* here).

The genera into Vernoniaceae in the Caparaó National Park are mostly differentiated by habit, type of trichome in branches and leaves, arrange of the inflorescence, deciduity of involucre bracts, number of flowers per capitulum, morphology of cypsela and pappus.

3.1. Identification key to Vernoniaceae in the Caparaó National Park

1. Presence of lepidotes and/or trichomes stellate in branches, leaves or involucre bracts ... 2
- 1'. Absence of lepidotes and/or trichomes stellate in branches, leaves or involucre bracts ... 5
2. Pappus 3-seriate 3
- 2'. Pappus 1–2-seriate 4
3. Leaf-blade concolor; involucre 8–10-seriate; cypsela with carpopodium conspicuous; pappus stramineous *Critoniopsis*
- 3'. Leaf-blade discolor; involucre 2–5-seriate; cypsela with carpopodium inconspicuous; pappus frequently rosaceous or purplish *Eremanthus*
4. Leaves glandular-dotted; co-inflorescence terminal; capitula monocephalous; subinvolucre bracts foliaceous; involucre bracts persistent; pappus paleaceous *Hololepis*
- 4'. Leaves not glandular-dotted; co-inflorescence axillar; capitula in glomerulous; subinvolucre bracts absent; involucre bracts deciduous; pappus barbellate *Piptocarpha*
5. Capitula grouped in glomerulous; up to 4-flowers per capitulum; corolla zygomorph *Elephantopus*
- 5'. Capitula not grouped in glomerulous; more than 4-flowers per capitulum; corolla actinomorph 6
6. Inflorescence with leaves or bracts at capitulum base 7
- 6'. Inflorescence without leaves or bracts at capitulum base 8
7. Capitula sessile; 8–35 flowers per capitulum; corolla 0.6–0.8 cm long; cypsela usually with ribs not evident (except in *L. cotoneaster* and *L. salzmannii* here) *Lepidaploa*
- 7' Capitula subsessile to pedunculate; 7–150 flowers per capitulum; corolla 1.0–1.4 cm long; cypsela with ribs evident *Lessingianthus*
8. Herbs or subshrubs; co-inflorescence scorpioide; inner involucre bracts persistent; cypsela with carpopodium inconspicuous *Cyrtocymura*

8'. Trees or shrubs; co-inflorescence cyme-seriate, corymbiform or paniculiform; inner involucre bracts generally deciduous; cypsela with carpopodium conspicuous
 *Vernonanthura*

3.2. *Critoniopsis* Sch.Bip., Jahresber. Pollichia 20-21: 430 (1863)

The genus *Critoniopsis* is recognized by shrubby or tree habit, branches, leaves or involucre bracts with trichomes stellate or lepidotes, leaves opposite or alternate, involucre 8–10-seriate, inner involucre bracts deciduous, 2–16 flowers per capitulum, corolla lobes glandular or sometimes hairy. In the CNP, *Critoniopsis bradeana* represents the tribe.

3.2.1. *Critoniopsis bradeana* (G.M.Barroso) G.Souares & Loeuille, Phytotaxa 522(2): 140 (2021)

Fig. 2A

Shrub or subshrub, 0.5–1.5 m tall; branches densely covered by lepidote, persistent, trichomes whitish; leaf scars evident. **Leaves** alternate; leaf sheath present; petiole 1.0–1.5 cm long; lamina 3.2–7.0x1.3–3.4 cm, elliptic to obovate, cartaceous or subcoriaceous, concolor, base acute, margin irregular entire irregular or crenate, apex obtuse, venation brochidodromous, abaxial and adaxial surfaces glandular-dotted, veins covered by lepidote and/or trichomes stellate, 3–5-armed, whitish, deciduous. **Co-inflorescence** corymbiform; capitula pedunculated; peduncle 0.2–1.0 cm long; involucre 0.5–1.0x0.3–0.4 cm, cylindrical, 8–10-seriate, purplish to vinaceous, villous and with lepidotes, trichomes whitish, glandular-dotted; involucre bracts imbricate, bracts ovate, apex acute or mucronate, outer bracts persistent, inner bracts deciduous; receptacle: flat, glabrous. **Flowers** 5 per capitulum, bisexual; corolla 0.8–0.9 cm long, actinomorphic, tubulose, 5-lobed, glandular-dotted, lilac; lobes ca. 0.3 cm long, glandular-dotted; anthers with basal appendage calcarate, apical appendage acute; style branches acute, pilose. **Cypselas**: cylindrical to obconic, densely strigose and covered by glandular trichomes, 10-ribs; carpopodium conspicuous; pappus 3-seriate, stramineous, outer serie paleaceous, inner series barbellate, apparently deciduous.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto: Caparaó National Park, “Casa Queimada” trail, High-altitude grassland, 2.000 m, 14 September 2017 (fl., fr.), I.T.F.V Lopes *et al.* 246 (HUFU75265). Pedra Menina: Caparaó National Park, path to “Pico do Calçado”, High-altitude grassland, 20°27'4"S, 41°48'4"W, 2.489 m, 13 October 2022 (fl., fr.), P. Renon 545 (HUFU83175). Minas Gerais: Alto Caparaó: Caparaó National Park, path to

“Pico da Bandeira”, 20.4333°S, 41.8683°W, 19 September 2013 (fl., fr.), V.C. Manhães *et al.* 424 (HUFU83511, UEC193970, VIES35508).

Distribution and Conservation: *Critoniopsis bradeana* was found at High-altitude grassland around 2.000–2.500 meters asl. The species is endemic to Caparaó. Regarding conservation status, *C. bradeana* is not evaluated.

Taxonomic comments: *Critoniopsis bradeana* can be recognized by branches with leaf scars evident, leaves petiolate, sheath present, glandular-dotted in both surfaces, veins covered by lepidote and/or trichomes 3–5-armed, inflorescence corymbiform, terminal, involucre cylindrical, 5-flowers per capitulum, cypsela densely strigose and glandular, pappus 3-seriate.

3.3. *Cyrtocymura* H.Rob., Proc. Biol. Soc. Washington 100(4): 849 (1987)

Cyrtocymura is recognized by herbaceous or shrubby habit, co-inflorescence scorpioide, capitulum sessile, inner involucre bracts persistent, without bracts at capitulum base. In the CNP, the genus is represented by *C. scorpioides*.

3.3.1. *Cyrtocymura scorpioides* (Lam.) H.Rob., Proc. Biol. Soc. Washington 100(4): 852 (1987)

Fig. 2B

Subshrub, ca. 1.0 m tall; branches densely villous, tomentose, or pubescent, glabrescent, trichomes simple, brownish; leaf scars not evident. **Leaves:** alternate; petiole 0.2–2.5 cm long; lamina 1.0–9.5x0.5–4.0 cm, elliptic or lanceolate, membranaceous or cartaceous, concolor, base acute or attenuate, margin serrate or irregular entire, apex acute or acuminate, venation brochidodromous, abaxial surface densely villous or tomentose, glabrescent, adaxial surface densely strigose-tomentose, glabrescent, both surfaces glandular-dotted, trichomes albescent or brownish. **Co-inflorescence** scorpioide; capitula sessile; involucre 0.3–0.4x0.3–0.4 cm, cylindrical to campanulate, 4-seriate, greenish to purplish, densely setose or villous, trichomes albescent to brownish; involucre bracts imbricate, outer bracts ovate or oblong, apex acute, inner bracts elliptic, apex acute or acuminate, both outer and inner bracts persistent; receptacle flat, glabrous. **Flowers** 15–25 per capitulum, bisexual; corolla 0.4–0.5 cm long, actinomorphic, tubulose, 5-lobed, glabrous, lilac; lobes ca. 0.2 cm long, setose; anthers with basal appendage sagittate, apical appendage acute; style branches acute or

acuminate, pilose. **Cypselas** obconic, setose, 10-ribs; carpopodium inconspicuous; pappus 2-seriate, whitish, outer serie paleaceous, inner serie barbellate, persistent.

Examined material: Brazil. Espírito Santo: Alegre: Caparaó National Park, 20°26'45"S, 41°44'07"W, Ciliar Forest, 1.110 m, 22 February 2000 (fl., fr.). V.C. Souza *et al.* 23769 (ESA64917). Divino de São Lourenço, Patrimônio da Penha: Caparaó, 16 August 2007 (fl., fr.) T. Chimalli s.n. (HUFU83637). Dores do Rio Preto: “Farofa” waterfall, 20°27'58"S, 41°49'01"W, 2.223 m, 16 March 2014 (fl., fr.), M. Monge *et al.* 2625 (UEC193999). Minas Gerais: Caparaó National Park, nearly watercourse, 20°23'40"S, 41°44'10"W, 1.085 m, 08 March 2010 (fl., fr.), M.O. Bünger *et al.* 430 (BHCB136361); *ibidem*, “Vale Verde”, 19 September 1988 (fl., fruit); Lkrieger *et al.* 23142 (UEC152893); *ibidem*, “Córrego Ignácio”. 17 December 1988 (fl., fr.), Lkrieger *et al.* 23320 (UEC152892); *ibidem*, 20 December 1988 (fl., fr.), Lkrieger *et al.* 23991 (UEC152891). Alto Caparaó: Caparaó National Park, path to “Tronqueira”, 12 January 2010 (fl., fr.), G.D. Colletta & T.B. Flores 319 (RB516129); *ibidem*, “Tronqueira” trail, 20°25'2"S, 41°51'3"W, 1.363 m, 07 October 2022 (fl., fr.), P. Renon 491 (HUFU83123).

Distribution and Conservation: *Cyrtocymura scorpioides* was collected at Montane Semideciduous Seasonal Forest along watercourse or not, and “Candeal” around 1.100–2.200 meters asl. The species is widely distributed in South America and Central America, occurring in Argentina, Belize, Brazil, Bolivia, Colombia, Ecuador, French Guyana, Guatemala, Guyana, Haiti, Honduras, Mexico, Nicaragua, Paraguay, Peru, Suriname, Trinidad-Tobago, Uruguay and Venezuela. In Brazil is spread through all phytogeographic domains. Regarding conservation status, the species is not evaluated.

Taxonomic comments: *Cyrtocymura scorpioides* is recognized mainly by leaves petiolate, petiole up to 3.0 cm long, lamina elliptic or lanceolate with acute or acuminate base, margin slightly serrate or irregular entire.

3.4. *Elephantopus* L., Sp. Pl. 2: 814 (1753)

The genus *Elephantopus* is recognized by herbaceous or subshrubby habit, basal leaves rosulate, capitulum in glomerulus, 2–4 flowers per capitulum, corolla zygomorph, pappus 1–2-seriate, bristles barbellate with paleaceous base. In the CNP, the genus is represented by *Elephantopus mollis*.

3.4.1. *Elephantopus mollis* Kunth, Nov. Gen. Sp. [H.B.K.] 4(14): 20 (ed. fol.) (1818)

Herb, ca. 0.5 m tall, branches strigose-hirsute or strigose-setose, glabrescent, trichomes simple, whitish; leaf scars not evident. **Leaves** sessile; basal leaves rosulate, lamina 4.0–8.0x2.0–3.6 cm; apical leaves alternate, lamina 1.5–4.5x0.6–2.5 cm, both basal and apical leaves elliptic, cartaceous, concolor, base acute, margin crenate or serrate, apex obtuse or acute, venation cladodromous, abaxial surface densely strigose-sericeous, adaxial surface sparsely strigose, trichomes simple, whitish. **Co-inflorescence** dichasial cyme; capitula grouped in glomerulus, sessile; involucre 0.5–0.7x0.1–0.2 cm, cylindrical, 4-seriate, greenish to stramineous, strigose-setose; involucral bracts subimbricate, bracts lanceolate to elliptic, apex acuminate or apiculate, persistent; receptacle flat, glabrous. **Flowers** 04 per capitulum, bisexual; corolla 0.5–0.6 cm long, zygomorph, tubulose, 5-lobed, glabrous, whitish; lobes 0.2–0.3 cm long, glabrous; anthers with basal appendage sagittate, apical appendage acute; style branches acute, pilose. **Cypselas** cylindrical, setose, 8–10-ribs; carpodium inconspicuous; pappus 1-seriate with 5 bristles, whitish, persistent.

Examined material: Brazil. Espírito Santo: Iúna: “Rio Claro” community, Semideciduous Forest, 20°20'24"S, 41°50'36"W, 19 March 2014 (fl., fr.), M. Monge *et al.* 2695 (UEC193451). Minas Gerais: Alto Caparaó: Caparaó National Park, nearly the trail, 1.100 m, 14 January 2009 (fl., fr.), L.S. Leoni 7308 (RB745319); *ibidem*, “Vale Verde”, 20°25'11"S, 41°50'54"W, 1.127 m, 02 March 2010 (fl. Fr.), D.R.M. Neves *et al.* 619 (BHCB140883).

Distribution and Conservation: *Elephantopus mollis* was found at montane semideciduous seasonal forest around 1.100–1.120 meters asl. The species is widely spread in South America and Central America, occurring in Argentina, Belize, Brazil, Bolivia, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, French Guyana, Guatemala, Guyana, Haiti, Honduras, Jamaica, Leeward Island, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Suriname, Trinidad-Tobago, Uruguay, Venezuela and Windward Island. In Brazil, it is occurring in all phytogeographic domains. Regarding the conservation status, *E. mollis* is not evaluated.

Taxonomic comments: *Elephantopus mollis* is recognized by herbaceous habit, branches, leaves and involucral bracts strigose, leaf-blade with margin crenate or serrate, 4-flowers per capitulum, pappus 1-seriate with 5 bristles subpaleaceous.

3.5. *Eremanthus* Less., Linnaea 4(3): 317 (1829)

Eremanthus is recognized by tree or shrubby habit, trichomes stellate (5–6-armed) or trichomes T-shaped (2-armed) in branches, leaves or involucral bracts, leaves usually discolor, co-inflorescence terminal, capitula generally sessile, in glomerulous, 1–11 flowers per capitulum, pappus 3–5-seriate, often whitish, rosaceous or purplish. In the CNP, *E. crotonoides* and *E. erythropappus* represent the tribe.

3.5.1. Identification key to genus *Eremanthus*

1. Indument in branches, leaves and involucral bracts compound of trichomes stellate (5–6-armed); leaves 2.2–19.0x1.2–11.0 cm, lamina ovate, apex and base obtuse; involucre 4–5-seriate, not glandular-dotted; receptacle paleaceous; 5 flowers per capitulum, anthers with basal appendage sagittate, pappus barbellate and paleaceous *E. crotonoides*
- 1'. Indument in branches, leaves and involucral bracts compound of lepidotes and trichomes T-shaped (2-armed); leaves 3.5–8.5x1.0–3.3 cm, lamina elliptic, apex and base acute; involucre 2–3-seriate, glandular-dotted; receptacle glabrous; 3–4 flowers per capitulum; anthers with basal appendage calcarate, pappus barbellate *E. erythropappus*

3.5.2. *Eremanthus crotonoides* Sch.Bip., Jahresber. Pollichia 20-21: 396 (1863)

Tree, 3.0–5.0 m tall, branches densely tomentose, persistent, trichomes stellate (5–6-armed), whitish; leaf scars not evident. **Leaves** alternate, petiole 0.5–3.0 cm long; lamina 2.2–19.0x1.2–11.0 cm, ovate, cartaceous, discolor, base obtuse, margin irregular entire, apex obtuse, venation cladodromous or broquidodromous, abaxial surface densely tomentose, persistent, trichomes stellate (5–6-armed), whitish, adaxial surface tomentose and glandular-dotted, glabrescent, trichomes stellate (5–6-armed), whitish. **Co-inflorescence** corymbiform; capitula grouped or not grouped, sessile to briefly penduculate, involucre 0.3–0.5x0.2–0.3 cm, cylindrical, 4–5-seriate, greenish, densely tomentose, glabrescent, trichomes stellate (5–6-armed), whitish; involucral bracts imbricate, outer bracts ovate, apex acute, inner bracts lanceolate, apex acute, both outer and inner bracts apparently persistent; receptacle flat, paleaceous. **Flowers** 5 per capitulum, bisexual; corolla 0.5–0.6 cm long, actinomorphic, tubulose, 5-lobed, glabrous, lilac; lobes ca. 0.2 cm long, setose; anthers with basal appendage sagittate, apical appendage acute; style branches acute, pilose. **Cypselas**:

obovate, setose and glandular, 8-ribs; carpopodium inconspicuous; pappus 3-seriate, purplish-rosaceous, outer serie paleaceous, inner serie barbellate, deciduous.

Examined material: Brazil. Minas Gerais: Alto Caparaó: Caparaó National Park, “Vale Verde”, Montane Semideciduous Forest, 20.2600°S, 41.5260°W, 20 September 2012 (fr.), M. Monge *et al.* 1250 (UEC200281); *ibidem*, nearly “Córrego Caparaó”, 1.257 m, 14 January 2010 (fl. fr.), T.M. Moura & L.S. Leoni 842 (UEC181502); *ibidem*, “Vale Verde”, 05 April 1996 (fl., fr.) L.S. Leoni 3265 (GFJP3535, RB741895).

Distribution and Conservation: *Eremanthus crotonoides* was found at Montane Semideciduous Seasonal Forest around 1.120–1.250 meters asl. The species is distributed in Brazil occurring at Atlantic Forest and Brazilian savanna “Cerrado”. Regarding conservation status, *Eremanthus crotonoides* is Least Concern (LC).

Taxonomic comments: *Eremanthus crotonoides* is recognized by leaves ovate with apex and base obtuse, petiole up to ca. 3.0 cm long, 5-flowers per capitulum, pappus purplish or rosaceous. The species differs of *E. erythropappus* mainly due its large leaves ovate with base and apex obtuse, trichomes stellate in branches, leaves or involucral bracts, the capitula can not be fused forming glomerulous, and each one has 5 flowers, receptacle paleaceous and pappus dimorphic (barbellate/paleaceous), while, *E. erythropappus* has leaves smaller than *E. crotonoides*, lamina elliptic with apex and base acute, trichomes T-shaped or lepidotes in branches, leaves or involucral bracts, the capitula always forming glomerulus, and each one having 3–4 flowers, receptacle glabrous and pappus isomorphic (only barbellate).

3.5.3. *Eremanthus erythropappus* (DC.) MacLeish, Ann. Missouri Bot. Gard. 74(2): 284 (1987)

Fig. 2C

Tree or shrub, 2.0–10.0 m tall; branches densely covered by lepidotes, glabrescent, trichomes whitinsh; leaf scars not evident. **Leaves** alternate or subopposite, petiole 0.5–1.0 cm long; lamina 3.5–8.5x1.0–3.3 cm, elliptic, cartaceous, discolor, base acute, margin irregular entire, apex acute, venation broquidodromous, abaxial surface densely covered by lepidotes, persistent, whitish, adaxial surface covered by lepidotes and glandular-dotted, glabrescent, lepidotes whitish. **Co-inflorescence** corymbiform; capitula grouped in glomerulus, sessile; involucre 0.2–0.3x0.2–0.3 cm, cylindrical, 2–3-seriate, greenish,

tomentose and glandular-dotted, trichomes T-shaped (2-armed), whitish; involucre bracts subimbricate, linear to obovate, apex acute, bracts deciduous; receptacle flat, glabrous. **Flowers** 3–4 per capitulum, bisexual; corolla ca. 0.5 cm long, actinomorphic, tubulose, 5-lobed, glabrous, lilac-rosaceous; lobes ca. 0.2 cm long, glabrous; anthers with basal appendage calcarate, apical appendage obtuse; style branches acute, pilose. **Cypselas** obovate or cylindrical, glandular, 10-ribs; carpodium inconspicuous; pappus 3-seriate, barbellate, rosaceous, deciduous.

Examined material: Brazil: Caparaó National Park, “Macieira”, 30 March 2006 (fr.), C.G. Viana *et al.* 357 (HUFU73520). Espírito Santo: Dores do Rio Preto: Caparaó National Park, “Macieira”, 02 April 2006 (fr.), C.G. Viana *et al.* 68 (HUFU73519). Iúna: Caparaó National Park, “Brás” waterfall, 20°20'49"S, 41°48'55"W, 1.287 m, 18 August 2021 (fl., fr.), M.I.A. Horst *et al.* 177 (HUFU83510); *ibidem*, 20°20'47"S, 41°49'1"W, 1.286 m, 18 August 2021 (fl., fr.) M.I.A. Horst *et al.* 185 (HUFU83509). Minas Gerais: Caparaó National Park, 1.500–1.600 m, 06 September 1977 (fr.), G.J. Shepherd *et al.* 5777 (RB201911); *ibidem*, path from “Pico da Bandeira”, 2.200 m, 06 August 1969 (fr.), A.B. Souza 50 (RB143844). Alto Caparaó: Caparaó National Park, “Tronqueira” trail, “Candéal”, 20°26'00"S, 41°53'00"W, 21 September 2012 (fl., fr.) M. Monge *et al.* 1275 (UEC197839); *ibidem*, High-altitude grassland, 20°24'49"S, 41°49'58"W, 2.085 m, 09 October 2022 (fl., fr.), P. Renon 514 (HUFU83149); *ibidem*, path “Tronqueira” to “Pico da Bandeira, High-altitude grassland, 20°25'54.0"S, 41°48'27.4"W, 1.970–2.890 m, 02 September 1996 (fr.), V.C. Souza *et al.* 12155 (HUFU56673). Espera Feliz: Caparaó National Park, nearly “Macieira”, 1.870 m, 20 September 2016 (fr.), C.D.M. Ferreira *et al.* 353 (RB665771).

Distribution and Conservation: *Eremanthus erythropappus* was found at “Candéal” and High-altitude grassland around 1.500–2.200 meters asl. The species occurs in Brazil through Atlantic Forest and Brazilian savanna “Cerrado”. Regarding conservations status, *Eremanthus erythropappus* is Least Concern (LC).

Taxonomic comments: *Eremanthus erythropappus* is recognized by trichomes T-shaped and lepidotes in branches, leaves and involucre bracts, leaves elliptic, involucre bracts 2–3-seriate, 3–4 flowers per capitulum and pappus barbellate, rosaceous.

3.6. *Hololepis* DC., Ann. Mus. Natl. Hist. Nat. 16: 155, 189, t. 6 (1810)

The genus is recognized by capitulum solitary, pedunculate, bracts subinvolucral foliaceous, ovate to elliptic, involucral bracts coriaceous, capitulum ca. 30 flowers, flowers with large corolla and style branches very long, pappus subpaleaceous. *Hololepis* is a restricted genus of Brazilian southeast.

The genus has two species described *H. hatschbachii* and *H. pedunculata*, both occurring in Espírito Santo and Minas Gerais state. In the Caparaó National Park was found one record of *H. pedunculata* from Ibitirama – ES, west portion of the park, in Upper Montane Ombrophilous Forest. It is a new record for the park, for the Espírito Santo state and for Atlantic Forest (particularly Montane Ombrophilous Forest).

3.6.1. *Hololepis pedunculata* DC., Ann. Mus. Natl. Hist. Nat. 16: 190 (1810)

Shrub, ca. 3.0 m tall; branches densely covered by lepidotes in T-shape, glabrescent, trichomes whitish; leaf scars little evident. **Leaves** alternate, leaf sheath present; petiole 1.0–1.5 cm long; lamina 6.0–12.5 × 3.0–4.0 cm, elliptic or obovate, subcoriaceous, discolor, base acute, margin entire, apex acute to acuminate, venation brochidodromous, abaxial surface densely covered by lepidotes in T-shape, persistent, whitish, glandular-dotted, adaxial surface covered by lepidotes in T-shape, glabrescent, whitish, glandular-dotted. **Co-inflorescence** absent; capitulum solitary in apex of a peduncle; capitula pedunculated, peduncle 4.5–5.5 cm long; bracts subinvolucral alternate to subopposite, sessile; lamina 2.5–4.0 × 1.0–1.5 cm, ovate, subcoriaceous, discolor, base acute, margin entire, apex acute to acuminate, venation acrodromous with 4–5 primary veins or brochidodromous, abaxial surface densely covered by lepidotes in T-shape, persistent, whitish, glandular-dotted, adaxial surface covered by lepidotes in T-shape, glabrescent, whitish, glandular-dotted; involucre ca. 2.6 × 2.0 cm, campanulate, 4–5-seriate, rosaceous, villous, trichomes simple in T-shape, whitish, glandular-dotted, indument glabrescent; involucral bracts imbricate, coriaceous, outer bracts obovate to elliptic, apex acute, inner bracts linear, apex mucronate, bracts persistent; receptacle not seen. **Flowers** ca. 30 per capitulum, bisexual; corolla ca. 2.0 cm long, actinomorphic, tubulose, 5-lobed, rosaceous, sparse trichomes simple in T-shape present; lobes ca. 1.0 cm long, tomentose, trichomes simple in T-shape; anthers with basal appendage calcarate, apical appendage acuminate; style branches ca. 3.3 cm long, acute, pilose. **Cypselas**: prismatic, glabrous, 12–14-ribs; carpodium inconspicuous pappus 1-seriate with uneven bristles, stramineous, deciduous.

Examined material: Brazil. Espírito Santo: Ibitirama, Santa Marta: “Cachoeira Encantada”, Upper Montane Ombrophilous Forest, 22 august 2012 (fl., fr.), H.M. Dias & A.E. Silva 763 (HUFU83612).

Distribution and Conservation: *Hololepis pedunculata* was found at Upper Montane Ombrophilous Forest, the altitude was not mentioned. The species is restricted to Brazil, occurring in Atlantic Forest and Brazilian savanna “Cerrado”. *Hololepis pedunculata* is Least Concern (LC).

Taxonomic comments: *Hololepis pedunculata* is easily recognized by leaves elliptic or obovate, subinvolucral bracts ovate and pappus stramineous.

3.7. *Lepidaploa* (Cass.) Cass., Dict. Sci. Nat., ed. 2. [F. Cuvier] 36: 20 (1825)

Lepidaploa is recognized by herbaceous or shrubby habit, co-inflorescence cyme-seriate, scorpioide or solitary capitulum, leaves frequently at capitulum base, capitula usually sessile, flowers 8–35 per capitulum and cypselas densely indumented. The genus *Lepidaploa* is one of most diverse in the CNP.

3.7.1. Chave de identificação para as espécies de *Lepidaploa*

1. Leaves not glandular-dotted; cypselas with ca. 10-ribs 2
- 1'. Leaves glandular-dotted; cypselas with ribs not evident 3
2. Leaves discolor, venation brochidodromous; corolla pubescent; pappus barbellate and paleaceous *L. cotoneaster*
- 2'. Leaves concolor, venation eucamptodromous; corolla glabrous; pappus barbellate *L. salzmännii*
3. Branches velutinous, indument persistent; leaf-blade with silvery aspect, discolor *L. aff. argyrotrema*
- 3'. Branches tomentose, pubescent, puberulent, strigose or villous, indument glabrescent; leaf-blade without silvery aspect, concolor 4
4. Leaves glandular-dotted in abaxial surface; corolla glandular 5
- 4'. Leaves glandular-dotted in both surfaces; corolla not glandular 6
5. Leaves sometimes purplish, cartaceous; style branch acuminate; involucre 0.8–1.0 cm long; involucral bracts spinescent *L. estevesiana*

- 5'. Leaves never purplish, membranaceous; style branch acute; involucre 0.4–0.6 cm long; involucral bracts not spinescent *L. subsquarrosa*
6. Shrub, 0.5–1.5 m tall; leaf scars evident; petiole absent; co-inflorescence cymecorymbiform or cyme-glomeruliform; 10–20 flowers per capitulum; receptacle flat; outer involucral bracts ovate, not recurved; cypselas densely glandular; pappus whitish *L. macahensis*
- 6'. Shrub, 1.5–2.0 m tall; leaf scars not evident; petiole present; co-inflorescence cymeseriate; ca. 30 flowers per capitulum; receptacle concave; outer involucral bracts lanceolate, recurved; cypselas densely sericeous; pappus stramineous *Lepidaploa* sp.

3.7.2. *Lepidaploa* aff. *argyrotricha* (Sch.Bip. ex Baker) H.Rob., Proc. Biol. Soc. Washington 103: 482 (1990)

Shrub, ca. 0.5 m tall; branches densely velutinous, persistent, trichomes simple, albescent; leaf scars not evident. **Leaves** alternate, briefly petiolate, petiole up to 0.5 cm long; lamina 5.5–10.0 × 1.5–3.8 cm, membranaceous, concolor, elliptic, base obtuse, margin entire, revolute, apex acute, venation eucamptodromous, abaxial surface densely pubescent-strigose, glandular-dotted, persistent, trichomes simple, base expanded apparently glandular, albescent, adaxial surface pubescent-strigose, glabrescent, trichomes simple, base expanded apparently glandular, albescent. **Co-inflorescence** cyme-seriate; capitula sessile; involucre 0.5–0.8 × 0.4–0.5 cm, cylindrical to campanulate, 8-seriate, greenish to purplish, densely pubescent-tomentose, trichomes simple, base expanded, albescent; involucral bracts imbricate, outer bracts ovate, apex mucronate, not recurved, inner bracts elliptic to narrowly elliptic, apex mucronate, not recurved, bracts persistent; receptacle flat, glabrous. **Flowers** 15–20 per capitulum, bisexual; corolla ca. 0.7 cm long, actinomorphic, tubulose, 5-lobed, lilac, glabrous; lobes ca. 0.3 cm long, setose; anthers with basal appendage sagittate, apical appendage acute; style branches acute, pilose. **Cypselas** obconic, densely sericeous, ribs not evident; carpoppodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, pappus albescent, deciduous.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto: Caparaó National Park, path to “Pico da Bandeira”, nearly “Pedra Duas Irmãs”, 20°27'16.5"S, 41°48'4.0"W, 2,448 m, (fl., fr.), B.V. Tinti *et al.* 344 (HUEMG4925).

Distribution and Conservation: *Lepidaploa* aff *argyrotricha* was found at High-altitude grassland around 2.500 meters asl.

Taxonomic comments: *Lepidaploa* aff *argyrotricha* is easily recognized by branches densely velutinous, leaves discolor, lamina elliptic with silvery aspect.

3.7.3. *Lepidaploa cotoneaster* (Willd. ex Spreng.) H.Rob., Proc. Biol. Soc. Washington 103(2): 486 (1990)

Subshrub, ca. 0.5 m tall; branches densely pubescent-tomentose, persistent, trichomes simple, albescent; leaf scars not evident. **Leaves:** alternate, sessile or briefly petiolate, petiole up to 0.3 cm long; lamina 2.2–4.0x0.6–1.0 cm, elliptic, membranaceous, discolor, base acute, margin irregular entire, apex acute, venation brochidodromous, abaxial surface strigose-tomentose, persistent, trichomes simple, base expanded, albescent, adaxial surface densely tomentose, persistent, trichomes simple, base not expanded, albescent. **Co-inflorescence** cyme-seriate; capitula sessile; involucre 0.4–0.6x0.4–0.7 cm, campanulate, ca. 6-seriate, greenish, villous-pubescent, glabrescent, trichomes simple, base not expanded, albescent; involucral bracts imbricate, outer bracts ovate, apex briefly mucronate, not recurved, inner bracts elliptic to lanceolate, apex obtuse to briefly mucronate, not recurved, bracts persistent; receptacle flat, glabrous. **Flowers:** ca. 20 per capitulum, bisexual; corolla ca. 0.6 cm long, actinomorphic, tubulose, 5-lobed, lilac, sparsely pubescent; lobes ca. 0.3 cm long, densely pubescent; anthers with basal appendage sagittate, apical appendage acute; style branches acute, pilose. **Cypselas** cylindrical to obconic, densely setose, glandular, ca. 10-ribs; carpoppodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, pappus albescent, apparently deciduous.

Examined material: Brazil. Espírito Santo: Iúna: Caparaó National Park, “Poços das Antas”, 20°22'25"S, 41°49'38"W, 1.210 m, 04 September 2021 (fl., fr.), M.I.A. Horst *et al.* 227 (HUFU83634).

Distribution and Conservation: *Lepidaploa cotoneaster* was found at Montane Forest along the watercourse around 1.200 meters asl. The species occurs in Brazil, Guyana and Venezuela. In Brazil, *L. cotoneaster* is distributed across Atlantic Forest and Brazilian savanna “Cerrado”. Regarding conservation status, the species is Least Concern (LC).

Taxonomic comments: *Lepidaploa cotoneaster* differs from other species due its leaves elliptic, discolor, abaxial surface densely tomentose and co-inflorescence laxa with sparse capitula.

3.7.4. *Lepidaploa estevesiana* M. Monge, Leoni & Nakajima, Brittonia (2023)

Fig. 2D

Shrub or subshrub, 0.3–0.6 m tall; branches densely tomentose or tomentose-strigose, glandular-dotted, glabrescent, trichomes simple, base expanded, albescent; leaf scars evident. **Leaves:** alternate, briefly petiolate, petiole up to 0.4 cm long; lamina 1.5–6.5x0.5–2.0 cm, elliptic, lanceolate or ovate, cartaceous, concolor, base obtuse or slightly acute, margin slightly serrate, revolute, apex acute to acuminate, venation brochidodromous or eucamptodromous, abaxial surface densely pubescent or pubescent-strigose, glandular-dotted, glabrescent, trichomes simple, base expanded apparently glandular, albescent, adaxial surface pubescent or strigose-pubescent, glabrescent, trichomes simple, base expanded apparently glandular, albescent, trichome base persistent. **Co-inflorescence** cyme-seriate, cyme-corymbiform or solitary capitulum; capitula sessile; involucre 0.8–1.0x0.5–0.8 cm, campanulate, 8-seriate, purplish, densely tomentose or villous, glandular-dotted, glabrescent, trichomes simple, base not expanded, albescent; involucral bracts imbricate, outer bracts ovate to lanceolate, apex acuminate-mucronate, recurved, spinescent aspect, inner bracts oblong, apex mucronate, not recurved, spinescent aspect, bracts persistent; receptacle flat, glabrous. **Flowers** 15–30 per capitulum, bisexual; corolla ca. 0.8 cm long, actinomorphic, tubulose, 5-lobed, lilac to purple, glandular and sparsely puberulent; lobes ca. 0.3 cm long, glandular; anthers with basal appendage sagittate, apical appendage acute; style branches acuminate, pilose. **Cypselas** obconic to obovoid, densely sericeous, ribs not evident; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, pappus albescent, deciduous.

Examined material: Brazil. Minas Gerais: Alto Caparaó: Caparaó National Park, path to “Pico da Bandeira”, rock outcrops, 20°26'05"S, 41°47'45"W, 2.890 m, 09 March 2010 (fl., fr.). M.O. Büniger *et al.* 475 (BHCB136403); *ibidem*, humid grassland, 20°25'48"S, 41°48'13"W, 2.600 m, 26 June 2018 (fl., fr.), L.V.V. Cruz *et al.* 227 (HUFU83314); *ibidem*, “Pico da Bandeira”, 20°26'S, 41°47'53"W, 09 March 2010 (fl., fr.), G. Heringer *et al.* 420 (BHCB136082); *ibidem*, “Terreirão” trail, 20°25'60"S, 41°52'6"W, 10 March 2014 (bd.), V.C. Manhães *et al.* 473 (HUFU83507); *ibidem*, “Tronqueira” trail, 20°24'42"S, 41°50'05"W,

2.037 m, 03 March 2010 (fl., fr.), I.R. Martins da Costa *et al.* 185/190 (BHCB136877, BHCB136882); *ibidem*, High-altitude grassland, 20°24'43"S, 41°50'3"W, 2.052 m, 11 October 2022 (fr.), P. Renon 520 (HUFU83153); *ibidem*, High-altitude grassland, 20°25'16"S, 41°48'46"W, 11 October 2022 (fl., fr.), P. Renon 523 (HUFU83154). Espera Feliz: Caparaó National Park, between “Macieira” and “Casa Queimada”, rock outcrops, 2.216 m, 07 June 2018 (fl., fr.), D.R. Couto *et al.* 3753 (HUFU83600); *ibidem*, High-altitude grassland, 31 March 2021 (fl., fr.), L.S. Leoni 11592 (HUFU82655).

Distribution and Conservation: *Lepidaploa estevesiana* was found at High-altitude grassland around 2.000–2.900 meters asl. The species is restricted to Brazil, occurring in Atlantic Forest. *Lepidaploa estevesiana* is Endangered (EN) according Monge *et al.* (2023).

Taxonomic comments: *Lepidaploa estevesiana* is easily recognized by leaves elliptic, lanceolate or ovate, sometimes purple, corolla glandular and puberulent, involucre bracts recurved with spinescent aspect. The species have similarities with *Lepidaploa macahensis* such as, branches and leaves glandular-dotted, leaves cartaceous, basal leaves deciduous, leaf scars evident and the co-inflorescence can be corymbiform. But, they differ mainly by leaf-margin revolute, involucre bracts with apex acuminate and recurved, and cypsela densely sericeous in *L. estevesiana*, while, *L. macahensis* has leaf-margin flat, involucre bracts do not have an acuminate and recurved apex, and cypsela densely glandular. The co-inflorescence can differentiate the species, in *L. estevesiana* occur cyme-seriate or solitary capitulum, whereas in *L. macahensis*, they never occur.

3.7.5. *Lepidaploa macahensis* (Glaz. ex G.M.Barroso) H.Rob., Proc. Biol. Soc. Washington 103(2): 489 (1990)

Fig. 2E

Shrub, 0.5–1.5 m tall, branches pubescent, puberulent or strigose, glandular-dotted, glabrescent, trichomes simple, albescent; leaf scars evident. **Leaves:** alternate, sessile; lamina 1.0–5.2x0.5–1.7 cm, elliptic or obovate, cartaceous, concolor, base acute, margin serrate or irregular entire, apex acute or obtuse, venation eucamptodromous, both surfaces pubescent or puberulent, glandular-dotted, glabrescent, trichomes simple, albescent. **Co-inflorescence** cyme-corymbiform or cyme-glomeruliform; capitula sessile or briefly pedunculated, peduncle up to 0.3 cm long; involucre 0.5–0.8x0.4–0.6 cm, cylindrical, 6–8-seriate, greenish to vinaceous, densely villous, trichomes simple, albescent; involucre bracts imbricate, outer

bracts ovate, apex acute or mucronate, not recurved, inner bracts lanceolate, ovate or elliptic, apex acute, obtuse or mucronate, not recurved, bracts persistent; receptacle flat, glabrous. **Flowers** 10–20 per capitulum, bisexual; corolla ca. 0.6 cm long, actinomorphic, tubulose, 5-lobed, lilac, pubescent to setose; lobes ca. 0.2 cm long, pubescent; anthers with basal appendage sagittate, apical appendage acuminate; style branches acute, pilose. **Cypselas** prismatic or obovate, densely glandular, ribs not evident; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, whitish, deciduous.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto: Caparaó National Park, “Pico da Bandeira” trail, 20°28.839'S, 41°49.757'W, 20 October 2012 (fr.), T.B. Flores *et al.* 1335 (RB574984); *ibidem*, “Casa Queimada” road, 20.5434°S, 41.7930°W, 20 July 2013 (fl., fr.), V.C. Manhães 362 (UEC193962, VIES35534); *ibidem*, rock outcrops, 13 August 2011 (fl., fr.), M. Monge *et al.* 966 (UEC169762); *ibidem*, “Samarco” tower, 20°35'51.3"S, 41°48'41.3"W, 1.497 m, 28 December 2007 (fl., fr.), B.V. Tinti *et al.* 413 (HUFU73460). Minas Gerais: Caparaó mountain, 2.500 m, 18 September 1941 (fl., fr.), A.C. Brade 16973 (RB45918). Alto Caparaó: Caparaó National Park, “Vale Encantando”, transitional vegetation, 1.700 m, 17 October 2000 (fl., fr.), W. Forster & G.O. Romão 735 (HUFU54164); *ibidem*, “Vale Encantando”, 1.980 m, March 1998 (fl., fr.), L.S. Leoni 3906 (UEC117802); *ibidem*, nearly “Tronqueira”, 03 March 1991 (fl., fr.), L.S. Leoni s.n (RB 736069); *ibidem*, Montane Semideciduous Forest, 20.2600°S, 41.5260°W, 18 September 2012, M. Monge *et al.* 1203/1207 (UEC200306, UEC200302); *ibidem*, “Terreirão” trail, “Candeal”, 20°24'99"S, 41°50'10"W, 1.982 m, 09 October 2022 (fl., fr.), P. Renon 504 (HUFU83138). Espera Feliz: Caparaó National Park, path “Macieira” to “Casa Queimada”, rock outcrops, 2.216 m, 07 June 2018 (fl., fr.) D.R. Couto *et al.* 3746/3751 (HUFU83603, HUFU83601).

Distribution and Conservation: *Lepidaploa macahensis* was found at Montane Semideciduous Seasonal Forest, “Candeal” and High-altitude grassland around 1.700–2.500 meters asl. The species is restricted to Brazil, occurring in Atlantic Forest. It is not evaluated regarding conservation status.

Taxonomic comments: *Lepidaploa macahensis* is easily recognized by leaf scars very evident, leaves elliptic or obovate, sessile, terminal co-inflorescence of cyme corymbiform or glomeruliform, cypselas densely glandular and pappus whitish.

3.7.6. *Lepidaploa salzmannii* (DC.) H.Rob., Proc. Biol. Soc. Washington 103(2): 492 (1990)

Subshrub, ca. 0.8 m tall, branches densely pubescent, glabrescent, trichomes simple, albescent; leaf scars not evident. **Leaves** alternate, sessile; lamina 4.5–7.5x0.7–2.3 cm, lanceolate, oblong or elliptic, cartaceous to subcoriaceous, concolor, base acute, margin entire, apex acuminate, venation eucamptodromous, abaxial surface densely sericeous, glabrescent, trichomes simple, albescent, adaxial surface strigose, glabrescent, trichomes simple, albescent. **Co-inflorescence** cyme-seriate; capitula sessile; involucre 0.5–0.7x0.5–0.6 cm, campanulate, 5–6-seriate, greenish, sericeous, trichomes simple, albescent; involucre bracts imbricate, outer bracts ovate, apex acuminate, not recurved, inner bracts oblong, apex acute or acuminate, not recurved, bracts persistent; receptacle convex, apparently with small paleas. **Flowers** 20–30 per capitulum, bisexual; corolla 0.7–0.8 cm long, actinomorphic, tubulose, 5-lobed, lilac, glabrous; lobes 0.2–0.3 cm long, glabrous; anthers with basal appendage sagittate, apical appendage acute; style branches acute, pilose. **Cypselas**: cylindrical, setose, glandular, 10-ribs; carpodium conspicuous; pappus 2-seriate, barbellate, whitish, deciduous.

Examined material: Brazil. Minas Gerais: Alto Caparaó: Caparaó National Park, “Pico da Bandeira” trail, 11 April 2010 (fl., fr.), G.D. Colletta & T.B. Flores 495 (RB516136). Carangola: “Furriel” road, 11 May 2009 (fl., fr.), M.B. Angulo *et al.* 67 (ESA).

Distribution and Conservation: *Lepidaploa salzmannii* was found at Montane Semideciduous Seasonal Forest around 1.500–1.900 meters asl. The species is widely distributed in South America to Central America occurring in Belize, Brazil, Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru and Venezuela. In Brazil, *L. salzmannii* occurs in Atlantic Forest and Brazilian savanna “Cerrado”. The species is not evaluated regarding conservation status.

Taxonomic comments: *Lepidaploa salzmannii* is recognized by leaves lanceolate, oblong or elliptic, sessile, apex acuminate, capitula usually geminate and pappus barbellate without paleaceous in outer bristles. The species resembles *Lepidaploa subsquarrosa*, both have leaves lanceolate and elliptic, lengthy, adaxial surface strigose, apex acuminate and 20–30 flowers per capitulum. But, they can be differentiated by leaves cartaceous or coriaceous, receptacle convex, co-inflorescence paucicephala with geminate capitula, corolla glabrous,

ribs of cypsela evident and outer bristles of pappus barbellate in *L. salzmannii* vs. leaves membranaceous, receptacle flat, co-inflorescence pluricephala with sparse capitula, corolla pilose and ribs of cypsela not evident and outer bristles of pappus paleaceous in *L. subsquarrosa*.

3.7.7. *Lepidaploa subsquarrosa* (DC.) H. Rob., Proc. Biol. Soc. Washington 103(2): 495 (1990)

Subshrub, ca. 0.5 m tall; branches tomentose-pubescent or tomentose-villous, glabrescent, trichomes simple, lengthy, albescent; leaf scars not evident. **Leaves**: alternate, sessile to briefly petiolate, petiole up to 0.5 cm; lamina 2.5–9.0 × 0.4–3.0 cm, lanceolate, elliptic or obovate, membranaceous, concolor, base acute or slightly oblique, margin entire, revolute, apex acute to acuminate, venation eucamptodromous, abaxial surface pubescent, glandular-dotted, glabrescent, trichomes simple, albescent, adaxial surface strigose-pubescent, glabrescent, trichomes simple, albescent. **Co-inflorescence** cyme-seriate; capitula sessile; involucre 0.5–0.6 × 0.4–0.6 cm, campanulate, 6–8-seriate, greenish, tomentose-villous, glandular-dotted, trichomes simple, albescent; involucre bracts imbricate, outer bracts ovate, apex acuminate, slightly recurved, inner bracts oblong, apex acute to mucronate, not recurved, bracts persistent; receptacle flat, glabrous. **Flowers** ca. 20 per capitulum, bisexual; corolla ca. 0.6 cm long, actinomorphic, tubulose, 5-lobed, albescent, pubescent to puberulent; lobes tube 0.2–0.3 cm long, setose apparently glandular-dotted; anthers with basal appendage briefly sagittate, apical appendage acute; style branches acute, pilose. **Cypselas** obconic, densely sericeous, glandular, ribs not evident; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, albescent, deciduous.

Examined material: Brazil. Espírito Santo: Divino São Lourenço, Patrimônio da Penha: Caparaó, 17 May 2007 (fl., fr.), T. Chimalli s.n. (VIES27837). Iúna: Serra do Valentim, Montane Ombrophilous Forest, 20°21'48"S, 41°28'17"W, 1.422 m, August 2016 (fl., fr.), J.P.F. Zorzanelli 2056 (HUFU83618); *ibidem*, Montane Ombrophilous Forest, 20°21'51"S, 41°28'19"W, 1.382 m, August 2016 (fl., fr.), J.P.F. Zorzanelli 2066 (HUFU83620). Mimoso do Sul, Conceição do Muqui: Rock outcrops, 977 m, 09 August 2013 (fr.), H.V. Pinto Junior 107 (HUFU83613). Minas Gerais: Carangola: “Morro da Torre”, disturbed area, 20°44'S, 42°04'W, 750 m, 28 June 1994 (fl., fr.), L.S. Leoni 2593 (GFJP2744).

Distribution and Conservation: *Lepidaploa subsquarrosa* was found at Montane Ombrophilous Forest, Rock outcrops and disturbed areas around 900–1.500 meters asl. The species is restricted to Brazil, occurring in Atlantic Forest and Brazilian savanna “Cerrado”. Regarding conservation status, *L. subsquarrosa* is not evaluated.

Taxonomic comments: *Lepidaploa subsquarrosa* is recognized by leaves lanceolate, elliptic or ovate, sessile or briefly pedunculated, base slightly oblique or acute, co-inflorescence strongly scorpioide, laxa with sparse capitula.

3.7.8. *Lepidaploa* sp.

Shrub, 1.5–2.0 m tall; branches densely pubescent to puberulent, glabrescent, trichomes simple, albescent; leaf scars not evident. **Leaves:** alternate, petiolate, petiole 0.5–0.7 cm long; lamina 5.5–10.2x1.6–3.8 cm, elliptic or lanceolate, cartaceous or subcoriaceous, concolor, base obtuse, margin entire, apex acute to acuminate, venation eucamptodromous, abaxial surface densely pubescent, persistent, trichomes simple, base expanded apparently glandular, albescent, adaxial surface strigose-pubescent, glabrescent, trichomes simple, base expanded apparently glandular, albescent. **Co-inflorescence** cyme-seriate; capitula sessile; involucre 0.6–0.9x0.7–0.8 cm, campanulate to cylindrical, 6-seriate, greenish, densely villous or setose-pubescent, trichomes simple, albescent; involucral bracts imbricate, lanceolate, apex acuminate or mucronate, recurved, bracts persistent; receptacle concave, glabrous. **Flowers** ca. 30 per capitulum, bisexual; corolla 0.6–0.8 cm long, actinomorphic, tubulose, 5-lobed, lilac, glabrous; lobes 0.3–0.4 cm long, setose; anthers with basal appendage sagittate, apical appendage acute; style branches acute, pilose. **Cypselas** obconic, densely sericeous, ribs not evident; carpoppodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, stramineous, deciduous.

Examined material: Brazil. Minas Gerais: Alto Caparaó: Caparaó National Park, “Tronqueira”, transitional vegetation, 1.980 m, July 2008 (fl., fr.), L.S. Leoni 7196 (HUFU81480, GFJP); *ibidem*, “Tronqueira” trail, Montane Semideciduous Forest, 20°24'13"S, 41°50'27"W, 1.787 m, 07 October 2022 (fl., fr.), P. Renon 501 (HUFU83135).

Distribution and Conservation: *Lepidaploa* sp. was found at Montane Semideciduous Seasonal Forest and transitional vegetation “Candeal”, around 1.700–1.980 meters.

Taxonomic comments: *Lepidaploa* sp. is easily recognized by leaves elliptic or lanceolate, petiolate, cartaceous or subcoriaceous, receptacle concave, ca. 30 flowers per capitulum, involucre bracts recurved, densely indumented.

3.8. *Lessingianthus* H. Rob., Proc. Biol. Soc. Washington 101(4): 939 (1988)

Lessingianthus is recognized by shrubby habit, leaves usually coriaceous or cartaceous, co-inflorescence cyme-seriate, corymbiform, paniculiform, racemiform or solitary capitulum, capitula sessile or briefly pedunculate, 7–150 flowers per capitulum. The genus is very similar to *Lepidaploa*. However, in *Lessingianthus*, the co-inflorescence commonly lacks bracts at the capitulum base, and the style rarely has an expanded base, while *Lepidaploa* frequently has bracts at the capitulum base and style with an expanded base. In the CNP, the genus is represented by *L. dichrous* and *L. macrophyllus*.

3.8.1. Identification key to genus *Lessingianthus*

1. Branches densely lanate, leaf scars evident; leaves up to ca. 3.5 cm long, not glandular-dotted, sessile; co-inflorescence raceme-corymbiform; 20–25 flowers per capitulum; corolla not glandular *L. dichrous*
- 1'. Branches tomentose, leaf scars not evident; leaves up to ca. 24 cm long, glandular-dotted, petiolate; co-inflorescence cyme-seriate; 40–50 flowers per capitulum; corolla glandular *L. macrophyllus*

3.8.2. *Lessingianthus dichrous* (Mart. ex Colla) P.L.R. Moraes & Guglielmone, Harvard Pap. Bot. 18(2): 215 (2013).

Shrub, 4.0–5.0 m tall; branches densely lanate, glabrescent, trichomes simple, albescent; leaf scars evident. **Folhas:** alternate, sessile; lamina 2.5–3.5 × 0.9–1.2 cm, elliptic, subcoriaceous, discolor, base acute, margin entire, apex obtuse, venation brochidodromous, abaxial surface densely lanate, glabrescent, trichomes simple, albescent, adaxial surface glabrous. **Co-inflorescence** raceme-corymbiform; capitula grouped or not grouped, subsessile or pedunculate, peduncle up to 0.8 cm long; involucre 0.7–1.0 × 0.5–0.7 cm, campanulate to cylindrical, 8-seriate, greenish to purplish, tomentose, glabrescent, trichomes simple, albescent, involucre bracts imbricate, outer bracts ovate, apex acute, inner bracts linear, apex acute, outer bracts persistent, inner bracts deciduous; receptacle flat, glabrous. **Flowers** 20–25 per capitulum, bisexual; corolla 1.1–1.4 cm long, actinomorphic, tubulose, 5-lobed, purple,

glabrous; lobes 0.3–0.4 cm long, setose; anthers with basal appendage sagittate, apical appendage acute; style branches acute, pilose. **Cypselas** cylindrical, sericeous, 8-ribs; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, albescent-stramineous, apparently persistent.

Examined material: Brazil. Minas Gerais: Caparaó mountain, 2.100 m, 01 October 1941 (fr.), A.C. Brade 17064 (RB45897). Caparaó: Caparaó National Park, nearly “Congonha”, 02 February 1996 (fl., fr.), L.S. Leoni 3176 (RB736046). Alto Caparaó: Caparaó National Park, “Tronqueira” road, 20 March 2012 (fr.), J. Kuntz 501 (ESA 116392).

Distribution and Conservation: *Lessingianthus dichrous* was found probably at High-altitude grassland around 2.100 meters asl. The species is restricted to Brazil occurring in Atlantic Forest and Brazilian savanna “Cerrado”. About conservation status, it is not evaluated.

Taxonomic comments: *Lessingianthus dichrous* is easily recognized by branches or leaves densely lanate, leaves elliptic, sessile, discolor, co-inflorescence of cyme corymbiform or racemiform with very closely capitula, the capitulum has 20–25 flowers each one.

3.8.3. *Lessingianthus macrophyllus* (Less.) H.Rob., Proc. Biol. Soc. Washington 101(4): 944 (1988)

Shrub, 2.0–3.0 m tall; branches tomentose, glabrescent, trichomes simple, albescent; leaf scars not evident. **Leaves** alternate, petiolate, petiole 0.3–1.8 cm long; lamina 3.0–24.0x0.5–19.5 cm, elliptic to ovate, cartaceous to subcoriaceous, concolor to slightly discolor base obtuse or acute, margin serrate or dentate, apex acute or acuminate, venation brochidodromous, abaxial surface densely tomentose-villous, glandular-dotted, glabrescent, trichomes simple, albescent, adaxial surface strigose, glabrescent, trichome simple, albescent to brownish. **Co-inflorescence** cyme-seriate; capitula not grouped, subsessile or briefly pedunculate, peduncle up to 0.3 cm long; involucre 1.0–1.2x1.0–1.5 cm, campanulate, ca. 8-seriate, greenish to brownish, tomentose-pubescent or sericeous, glandular-dotted, glabrescent, trichomes simple, albescent; involucral bracts imbricate, outer bracts ovate, apex mucronate, inner bracts narrowly lanceolate to linear, apex acute or obtuse, outer bracts persistent, inner bracts deciduous; receptacle flat, glabrous. **Flowers** 40–50 per capitulum bisexual; corolla 1.0 cm long, actinomorphic, tubulose, 5-lobed, whitish to cream, sparsely

pubescent-strigose, glandular-dotted; lobes 0.2 cm long, strigose, glandular-dotted; anthers with basal appendage sagittate, apical appendage acuminate; style branches acute, pilose. **Cypselas** cylindrical, sericeous, ca. 10-ribs; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, pappus stramineous, deciduous.

Examined material: Brazil. Minas Gerais: Alto Caparaó: Parque Nacional do Caparaó, road between “Vale Verde” and lodging, Montane Forest, 01 September 1996 (fl., fr.), V.C. Souza *et al.* 12074 (HUFU26951).

Additional material: Brazil. Minas Gerais: Leopoldina, Tebas: Pasture nearly the forest, 11 August 1973 (fl., fr.), M. Brugger 13267 (HUFU25844).

Distribution and Conservation: *Lessingianthus macrophyllus* was found at Montane Semideciduous Seasonal Forest, the altitude was not mentioned. The species is restricted to Brazil occurring in Atlantic Forest. Regarding conservation status, *L. macrophyllus* is not evaluated.

Taxonomic comments: *Lessingianthus macrophyllus* is mainly recognized by its large leaves reaching ca. 24.0 cm long and ca. 20.0 cm width, petiolate, elliptic or ovate with margin serrate or dentate, co-inflorescence of cyme-seriate, 40–50 flowers per capitulum.

3.9. *Piptocarpha* R.Br., Observ. Compositae 121 (1817)

The genus *Piptocarpha* is recognized by tree, shrubby or climbing habit, trichomes stellate or lepidotes in branches, leaves or involucral bracts, co-inflorescence axillar, rarely terminal, capitula in glomerulus, involucral bracts very deciduous, 1–35 flowers per capitulum, anthers with basal appendage calcarate and cypselas usually glandular. In the CNP, *Piptocarpha* is represented by four species restricted to Brazil, *P. axillaris*, *P. macropoda*, *P. notata* and *P. reitziana*.

3.9.1. Chave de identificação para as espécies de *Piptocarpha*

1. Tree; leaves coriaceous, apex acute or obtuse; co-inflorescence spike-glomeruliform; more than 3-flowers per capitulum; cypselas cylindrical or cylindrical-obconic 2
- 1'. Vine, leaf apex acuminate or caudate, consistency cartaceous, co-inflorescence glomeruliform, 3-flowers per capitulum, cypselas prismatic or prismatic-obconic 3

2. Leaves up to ca. 7 cm long, discolor; 5–10 flowers per capitulum; corolla lobes pubescent; cypsela 10-ribbed *P. axillaris*
- 2'. Leaves up to ca. 20 cm long, concolor; 12–16 flowers per capitulum; corolla lobes papillose; cypsela 6-ribbed *P. macropoda*
3. Branches quadrangular; leaves greenish with lepidote trichomes; cypselas ca. 10-ribs; carpodium conspicuous; pappus stramineous *P. notata*
- 3'. Branches cylindrical; leaves grayish with stellate (5-armed) trichomes; cypselas ca. 6 ribs; carpodium inconspicuous; pappus whitish *P. reitziana*

3.9.2. *Piptocarpha axillaris* (Less.) Baker, Fl. Bras. (Martius) 6(2): 122 (1873)

Tree, 3.0–5.0 m tall, branches cylindrical, densely covered by lepidotes, glabrescent, trichomes brownish; leaf scars little evident. **Leaves** alternate, petiole 0.7–1.5 cm long; lamina 3.5–6.5x1.3–2.7 cm, elliptic or oblong, coriaceous, discolor, base obtuse, margin entire, apex acute, venation eucamptodromous or brochidodromous, abaxial surface densely tomentose, persistent, trichomes stellate (5-armed), brownish, adaxial surface tomentose, glabrescent, trichomes stellate (5-armed), greenish to brownish. **Co-inflorescence** spike-glomeriform; capitula grouped in glomerulus in leaf axils, sessile; involucre cylindrical, 0.8–1.0x0.3–0.5 cm, 8-seriate, greenish to brownish, villous, glabrescent, trichomes simple, brownish, involucre bracts imbricate, outer bracts ovate, apex acute, inner bracts elliptic, apex acute, bracts deciduous; receptacle flat, glabrous. **Flowers**: 5–10 per capitulum, bisexual; corolla 0.7–0.8 cm long, actinomorphic, tubulose, 5-lobed, glabrous, cream; lobes ca. 0.3 cm long, glabrous or sparsely pubescent; anthers with basal appendage calcarate, apical appendage acute; style branches acute, pilose. **Cypselas** cylindrical-obconic, glandular, 10-ribs; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, pappus stramineous, deciduous.

Examined material: Brazil. Minas Gerais: Caparaó mountain, “Macieira”, humid area, 1.800 m, 12 July 1941 (bd.), J. Castro s.n. (RB120263). Alto Caparaó: Caparaó National Park, nearly “Farofa” waterfall, 20°28'17"S, 41°49'42"W, 04 November 2013 (fr.), J.P.F. Zorzanelli 865 (HUFU83621, VIES33044).

Additional material: Brazil. São Paulo: Jundiá: Japi mountain, 09 September 1993 (fl., fr.), CCJ 46 (HUFU 4593).

Distribution and Conservation: *Piptocarpha axillaris* was found at Montane Forest in a humid area around 1.800 meters asl. The species is restricted to Brazil occurring through Atlantic Forest. Regarding conservation status, *P. axillaris* is Least Concern (LC).

Taxonomic comments: *Piptocarpha axillaris* is recognized by tree habit, leaves elliptic or oblong, coriaceous, discolor, involucre 8-seriate, 5–10 flowers per capitulum and corolla lobes pubescent. The species resembles *P. macropoda*, both have a tree habit, branches with leaf scars little evident, leaves elliptic, coriaceous, co-inflorescence spike-glomeriform and cypselas cylindrical. But, they are distinguished by leaves discolor, involucre 8-seriate, 5–10 flowers, corolla lobes pubescent and cypselas with 10 ribs in *P. axillaris*, while *P. macropoda* the leaves are concolor, involucre 10-seriate, 12–16 flowers, corolla lobes papillose and cypselas with 6 ribs.

3.9.3. *Piptocarpha macropoda* (DC.) Baker, Fl. Bras. (Martius) 6(2): 123 (1873)

Fig. 2F

Tree, 9.0–10.0 m tall, branches cylindrical, densely covered by lepidote, glabrescent, trichomes albescent; leaf scars little evident. **Leaves:** alternate, petiole 1.0–3.0 cm long; lamina 3.7–19.0 × 1.5–10.5 cm, elliptic, coriaceous, concolor, base obtuse or acute, margin entire or slightly serrate, apex obtuse or acute, venation brochidodromous, abaxial surface tomentose, persistent, trichomes stellate (5-armed), whitish, adaxial surface tomentose, glabrescent, trichomes stellate (5-armed), whitish. **Co-inflorescence** spike-glomeriform; capitula grouped in glomerulus in leaf axils, sessile; involucre 0.8–1.2 × 0.4–0.5 cm cylindrical, 10-seriate, greenish to brownish, villous, glabrescent, trichomes simple, albescent, involucral bracts imbricate, outer series ovate, apex mucronate or acute, inner series linear, apex obtuse, bracts deciduous; receptacle flat, glabrous. **Flowers** 12–16 per capitulum bisexual; corolla 0.7–0.8 cm long, actinomorphic, tubulose, 5-lobed, cream, glabrous; lobes 0.2–0.3 cm long, papillose; anthers with basal appendage calcarate, apical appendage acute, style branches acute, pilose. **Cypselas** cylindrical, glandular, 6-ribs; carpodium inconspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, pappus stramineous, deciduous.

Examined material: Brazil. Espírito Santo: Ibitirama, Santa Marta: Caparaó National Park, “Santa Marta” valley, Montane Ombrophilous Forest, 20°29'33"S, 41°44'50"W, 1.260 m, 29 June 2015 (fr.), E.A. Araújo *et al.* 174 (HUFU83610); *ibidem*, 1.110 m, 20°29'30"S,

41°44'22"W, 2014 (fr.), E.A. Araújo 492 (HUFU83609); *ibidem*, January 2013 (vg.); I.F. Campanharo 13 (VIES31765). Minas Gerais: Carangola: Araponga mountain, “Neblina” farm, 1.300 m, 09 August 1994 (fr.), L.S. Leoni 2628 (UEC117798).

Additional material: Brazil. Minas Gerais: Perdizes: “Galheiro” environmental station, 04 September 2003 (fl. fr.), S. Mendes & G.M. Araújo 940 (HUFU34034).

Distribution and Conservation: *Piptocarpha macropoda* was found at Montane Ombrophilous Forest around 1.100–1.300 meters asl. The species is restricted to Brazil occurring in Atlantic Forest and Brazilian savanna “Cerrado”. Regarding conservation status, *P. macropoda* is Least Concern (LC).

Taxonomic comments: *Piptocarpha macropoda* is recognized by tree habit, large leaves reaching ca. 20 cm long, elliptic, coriaceous, concolor, involucre 10-seriate, 12–16 flowers per capitulum, corolla lobes papillose and cypsela 6-ribbed.

3.9.4. *Piptocarpha notata* Baker, Fl. Bras. (Martius) 6(2): 129 (1873)

Vine; branches quadrangular, covered by lepidote-stellate, glabrescent, trichomes albescent to yellowish; leaf scars not evident. **Leaves** alternate, petiole 0.5–1.0 cm long; lamina 6.0–15.5x1.8–3.0 cm, narrowly elliptic or lanceolate, cartaceous, slightly discolor, grayish, base acute or obtuse, margin slightly serrate, apex acuminate or caudate, venation broquidodromous, abaxial surface covered by lepidote-stellate, glabrescent, trichomes whitish, adaxial surface covered by lepidote-stellate, very glabrescent, trichomes whitish. **Co-inflorescence** glomeriform; capitula grouped in glomerulus in leaf axils, sessile; involucre (buds ca. 0.5x0.3 cm), ovoid to cylindrical, ca. 4-seriate, greenish, sparse trichomes lepidote-stellate, glabrescent, whitish; involucral bracts imbricate, outer series ovate, apex obtuse, inner series elliptic to ovate, apex slightly acute, bracts deciduous; receptacle flat, glabrous. **Flowers** 3 per capitulum, bisexual; corolla (bud ca. 0.3 cm long), actinomorphic, tubulose, 5-lobed, white, glandular; lobes glandular, anthers with basal appendage calcarate, apical appendage acute; style branches acute, pilose. **Cypselas:** prismatic-obconic, apparently glabrous, ca. 10-ribs little evident; carpodium conspicuous; pappus 2-seriate, barbellate, stramineous, deciduous.

Examined material: Brazil. Espírito Santo: Ibitirama, Santa Marta: Caparaó National Park, “Santa Marta” valley, Montane Ombrophilous Forest, 1.260 m, 29 June 2015 (bd.), E.A. Araújo 173 (HUFU83608); *ibidem*, 2014 (fr.), Araújo, E.A. 485 (HUFU83607).

Distribution and Conservation: *Piptocarpha notata* was found at Montane Ombrophilous Forest around 1.300 meters asl. The species is restricted to Brazil, occurring in Atlantic Forest. Regarding conservation status, *Piptocarpha notata* is Least Concern (LC).

Taxonomic comments: *Piptocarpha notata* is easily recognized by climbing habit, quadrangular branches, lepidotes type stellate in branches, leaves and involucral bracts, leaves narrowly elliptic or lanceolate, apex acuminate or caudate, discolor, involucre ca. 4-seriate, 3-flowers per capitulum and glandular corolla.

3.9.5. *Piptocarpha reitziana* Cabrera, Arch. Jard. Bot. Rio de Janeiro 15: 73, tab. 5 (1957)

Vine; branches cylindrical, densely covered by lepidotes, glabrescent, trichomes whitish; leaf scars not evident. **Leaves:** alternate, petiole 0.6–1.0 cm long; lamina 5.6–9.5x1.0–3.0 cm, elliptic, cartaceous, discolor, base acute or slightly obtuse, margin entire or slightly serrate, apex acute or acuminate, venation brochidodromous, abaxial surface densely lanate-tomentose, persistent, trichomes stellate (5-armed), whitish, adaxial surface glabrous. **Co-inflorescence** glomeriform; capitula, grouped in glomerulus in leaf axils, sessile; involucre (bud ca. 0.2x0.3 cm), cylindrical, ca. 5-seriate, greenish to brownish, villous, glabrescent, trichomes simple, albescent; involucral bracts imbricate, outer bracts ovate, apex acute, inner bracts ovate, apex obtuse, bracts deciduous; receptacle flat, glabrous. **Flowers** 3 per capitulum, bisexual; corolla actinomorphic, tubulose, 5-lobed, cream. **Cypselas** prismatic, glandular, 6-ribs; carpodium inconspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, whitish, deciduous.

Examined material: Brazil. Espírito Santo: Divino São Lourenço, Patrimônio da Pena: “Águas Claras do Caparaó” lodging, Montane Ombrophilous Forest, 20°36'4"S, 41°46'44"W, 894 m, 25 December 2019 (bd.), J.P.F. Zorzanelli *et al.* 1957 (HUFU83617). Ibitirama, Santa Marta: nearly ICMBio lodging, 22 October 2012 (fr.), T.B. Flores *et al.* 1435 (UEC176340).

Distribution and Conservation: *Piptocarpha reitziana* was found at Montane Ombrophilous Forest around 900 meters asl. The species is restricted to Brazil occurring in Atlantic Forest. Regarding conservation status, *P. reitziana* is Least Concern (LC).

Taxonomic comments: *Piptocarpha reitziana* differs from others species by climbing habit, leaves elliptic with acute or acuminate apex, grayish, discolor, abaxial surface lanose-tomentose, involucre ca. 5-seriate, 3-flowers per capitulum and cypsela prismatic.

3.10. *Vernonanthura* H.Rob., Phytologia 73(2): 66 (1992)

Vernonanthura is recognized by habit arboreal or shrubby, trichomes predominantly villous, co-inflorescence strongly cyme-seriate or cyme not seriate arranging in thyrses and corymbs, inner involucral bracts generally deciduous, capitula generally pedunculate, 4–45 flowers per capitulum. The genus is one of most diverse in the park, being eight species found here.

3.10.1. Chave de identificação para as espécies do gênero *Vernonanthura*

1. Co-inflorescence of cyme-seriate (monocasium) arranging in racem; leaf-blade discolor; cypselas cylindrical or obovoid 2
- 1'. Co-inflorescence of cyme not seriate (dicasium) arranging in thyrses and/or corymb; leaf blade concolor; cypselas obconic 6
2. Shrubs; inner involucral bracts persistent; cypselas 5-ribbed; pappus barbellate *V. polyanthes*
- 2'. Trees; inner involucral bracts deciduous; cypselas 10-ribbed; pappus barbellate and paleaceous 3
3. Leaves membranaceous, eucamptodromous, strigose in abaxial surface *V. petiolaris*
- 3'. Leaves cartaceous or subcoriaceous, broquidodromous, villous in abaxial surface 4
4. Leaves glandular-dotted in abaxial surface; involucre 8–10 seriate; corolla glabrous *V. divaricata*
- 4'. Leaves not glandular-dotted in abaxial surface; involucre 5–8 seriate; corolla papillose or glandular 5
5. Leaves orbicular, apex retuse, villous in adaxial surfaces *V. aff. spathulata*
- 5'. Leaves elliptic or obovate, apex acute or acuminate, glabrous in adaxial surfaces *V. discolor*

6. Branches pubescent; leaves sessile, glandular-dotted; involucre 10–14 seriate, inner involucral bracts deciduous; corolla lobes glandular *V. montevidensis*
- 6'. Branches villous; leaves petiolate, not glandular-dotted; involucre 5–8 seriate, inner involucral bracts persistent; corolla lobes glabrous 7
7. Co-inflorescence thyriform; outer involucral bracts obovate or oblong, inner involucral bracts mucronate; cypselas 10-ribbed, glandular *V. hilairiana*
- 7'. Co-inflorescence thyrise-corymbiform; outer involucral bracts ovate, inner involucral bracts obtuse or retuse; cypselas 8-ribbed, strigose *V. phaeoneura*

3.10.2. *Vernonanthura discolor* (Less.) H.Rob., Phytologia 73(2): 70 (1992)

Tree, 8.0–9.0 m tall; branches densely tomentose or villous, glabrescent, trichomes simple, albescent; leaf scars not evident. **Leaves** alternate, petiolate, petiole 0.5–3.0 cm long; lamina 4.0–22.0x1.8–7.5 cm, elliptic or obovate, cartaceous, discolor, base acute, margin entire to slightly crenate, apex acute or acuminate, venation brochidodromous, abaxial surface densely villous, glabrescent, trichomes simple, whitish, adaxial surface glabrous. **Co-inflorescence** cyme-seriate racemiform; capitula, pedunculate, peduncle 0.2–0.8 cm long; involucre 0.5–0.8x0.3–0.4 cm, cylindrical, 6–8-seriate, greenish, densely villous, glandular-dotted, glabrescent, trichomes simple, albescent; involucral bracts imbricate, outer bracts ovate, apex slightly acute, inner bracts linear to elliptic, apex acute, outer bracts persistent, inner bracts deciduous; receptacle flat, glabrous. **Flowers** 8–10 per capitulum, bisexual; corolla ca. 0.6 cm long, actinomorphic, tubulose, 5-lobed, cream to albescent, papillose, trichomes apparently glandular; lobes ca. 0.2 cm long, villous; anthers with basal appendage sagittate, apical appendage acute; style branches acuminate, pilose. **Cypselas** cylindrical, setose, glandular, 10-ribs; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, whitish, apparently deciduous.

Examined material: Brazil. Espírito Santo: Ibitirama, Santa Marta: Caparaó National Park, “Santa Marta” valley, Montane Ombrophilous Forest, 20°29'32"S, 41°45'20"W, 1,400 m, December 2015 (fr.), E.A. Araújo & A. Silva 555 (HUFU83605); *ibidem*, 20°29'33"S, 41°44'50"W, 1,260 m, undated (bd.), H.V. Pinto-Junior 85 (HUFU83622). Minas Gerais: Araponga mountain, “Neblina” farm, Montane Semideciduous Seasonal Forest, 20°43'S, 42°29'W, 1,300 m, 30 September 1994 (fl., fr.), L.S. Leoni 2651 (UEC117799). Alto Caparaó: Caparaó National Park, nearly “Vale Verde”, Montane Forest, 03 September 1996 (fl., fr.), V.C. Souza *et al.* 12215 (HUFU56923, RB572546, UEC112465).

Distribution and Conservation: *Vernonanthura discolor* was found at Montane Semideciduous Seasonal Forest and Montane Semideciduous Seasonal Forest, around 1.200–1.400 meters asl. The species is restricted to Brazil, occurring in Atlantic Forest and Brazilian savanna “Cerrado”. Regarding conservation status, *V. discolor* is Least Concern (LC).

Taxonomic comments: *Vernonanthura discolor* is easily recognized by tree habit, leaves petiolate, lamina elliptic or obovate with acute or acuminate apex, discolor, adaxial surface glabrous, 8-10 flowers per capitulum, corolla papillose, lobes villous and cypselas cylindrical.

3.10.3. *Vernonanthura divaricata* (Spreng.) H.Rob., Phytologia 78(5): 385 (191.895)

Fig. 2G

Tree, 5.0–8.0 m tall; branches densely villous-lanate, glabrescent, trichomes simple, albescent; leaf scars not evident. **Leaves** alternate or occasionally opposite, petiolate, petiole 1.0–3.5 cm long; lamina 4.5–19.0 × 2.2–8.0 cm, elliptic, cartaceous, slightly discolor, base acute or obtuse, margin irregular entire, apex acute, venation brochidodromous, abaxial surface densely villous, glandular-dotted, persistent, trichomes simple, albescent, adaxial surface strigose, glandular-dotted, glabrescent, trichomes simple, albescent. **Co-inflorescence** cyme-seriate racemiform; capitula, sessile or pedunculate, peduncle up to 0.2 cm long; involucre 0.3–0.5 × 0.3–0.4 cm, cylindrical, 8–10-seriate, greenish, densely villous-lanuginose or sericeous, glandular-dotted, persistent, trichomes simple, whitish; involucre bracts imbricate, outer bracts ovate, apex obtuse or slightly acute, inner bracts ovate, apex obtuse, outer bracts persistent, inner bracts deciduous; receptacle flat, glabrous. **Flowers** 10–15 per capitulum, bisexual; corolla ca. 0.6 cm long, actinomorphic, tubulose, 5-lobed, cream, glabrous; lobes 0.1–0.2 cm long, glabrous; anthers with basal appendage sagittate, apical appendage acute; style branches acuminate, pilose. **Cypselas** obovoid, setose, glandular, 10-ribbed; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, stramineous, apparently deciduous.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto: road between “Pedra Menina” and Caparaó National Park, 20 October 2012 (fl., fr.), T.B. Flores *et al.* 1364 (RB577438, UEC176982). Ibitirama, Pedra Roxa: “Águas de Gaya” reserve, 990 m, 06 November 2010 (fr.), D.R. Couto 1718 (HUFU83615); *ibidem*, 20°24'24"S, 41°43'15"W, 960 m, 16 September 2016 (bd.), D.R. Couto *et al.* 4027 (HUFU83614). Minas Gerais: Ibitirama,

Santa Marta: 20°29'32"S, 41°45'20"W, November 2015 (fr.), E.A. Araújo *et al.* 496 (HUFU).
 Alto Caparaó: road between Alto Caparaó and Caparaó, 20°28.741'S, 41°52.907'W, 20
 October 2012 (fl., fr.), T.B. Flores *et al.* 1305 (RB574042, UEC176994).

Distribution and Conservation: *Vernonanthura divaricata* was found at Montane Ombrophilous Forest and disturbed area, around 950–1.400 meters asl. The species is restricted to Brazil occurring in Atlantic Forest. About conservation status, *V. divaricata* is not evaluated.

Taxonomic comments: *Vernonanthura divaricata* differs from others species by tree habit, leaves, occasionally opposite, petiolate, lamina glandular-dotted, slightly discolor, 10–15 flowers per capitulum, corolla and lobes glabrous, cypselas obovoid.

6.10.4. *Vernonanthura hilairiana* (Gardner) A.J.Vega & Dematt., Bol. Soc. Argent. Bot. 46(3-4): 372 (2011)

Shrub or tree, 2.0–3.0 m tall; branches densely villous-lanate, glabrescent, trichomes simple, apparently multicellular, albescent to brownish; leaf scars not evident. **Leaves** alternate, petiolate, petiole 0.5–1.0 cm long; lamina 5.0–18.0 × 1.0–3.5 cm, narrowly elliptic or oblong, membranaceous or cartaceous, concolor, base acute, margin crenate, serrate or irregular entire, apex acute or acuminate, venation brochidodromous, abaxial surface villous, glabrescent, strigose, trichomes simple, multicellular, albescent to brownish, adaxial surface strigose, glabrescent, trichomes simple, multicellular, brownish. **Co-inflorescence** thyriform; capitula, sessile or briefly pedunculate, peduncle up to 0.2 cm long; involucre 0.5–0.8 × 0.6–0.8 cm, campanulate, 6–8-seriate, greenish, villous, glabrescent, trichomes simple, brownish; involucral bracts imbricate, outer bracts obovate or oblong, apex mucronate, inner bracts lanceolate or oblong, apex mucronate, bracts persistent, receptacle flat, glabrous. **Flowers** 20–25 per capitulum bisexual; corolla 0.5–0.7 cm long, actinomorphic, tubulose, 5-lobed, albescent, glabrous; lobes 0.1–0.2 cm long, glabrous; anthers with basal appendage sagittate, apical appendage acute; style branches acute, pilose. **Cypselas** obconic, strigose, glandular, 10-ribs; carpodium conspicuous; pappus 2-seriate, barbellate, stramineous, deciduous.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto: Caparaó National Park, Upper Montane Ombrophilous Forest, 20°29'06"S, 41°49'26"W, 16 March 2014 (bd.), M. Monge *et al.* 2534 (UEC194000). Iúna: Caparaó National Park, “Poço das Antas” waterfall,

20°22'26"S, 41°49'4"W, 1.216 m, 04 September 2021 (fr.), M.I.A. Horst *et al.* 222 (HUFU83505). Minas Gerais: Alto Caparaó: Caparaó National Park, “Vale Verde”, 1.300 m, July 1997 (fl., fr.), L.S. Leoni 3689 (RB741931, UEC117800); *ibidem*, “Macieira”, 20°28'42"S, 41°49'35"W, June 2014 (fl., fr.), J.P.F. Zorzanelli & H.M. Dias 1117 (VIES30504).

Distribution and Conservation: *Vernonanthura hilairiana* was found at Montane Ombrophilous Forest and Montane Semideciduous Seasonal Forest around 1.200–1.800 meters asl. The species is restricted to Brazil occurring in Atlantic Forest. Regarding conservation status, it is not evaluated.

Taxonomic comments: *Vernonanthura hilairiana* is recognized by shrubby or tree habit, leaves petiolate, lamina narrowly elliptic or oblong, concolor, margin usually serrate or crenate, inflorescence laxa, thyriform, 20–25 flowers per capitulum and cypselas obconic. The species is very similar to *V. phaeoneura* due to its branches densely villous, leaves elliptic and lengthy with the same dimensions, primary vein prominent, adaxial surface strigose and co-inflorescence thyriform. However, both species are differentiated by outer involucral bracts obovate or oblong, inner involucral bracts with mucronate apex, cypselas glandular 10-ribbed in *V. hilairiana*, and outer involucral bracts ovate, inner involucral bracts with obtuse or retuse apex, cypselas strigose 8-ribbed in *V. phaeoneura*. Despite of *V. hilairiana* and *V. phaeoneura* having a thyriform co-inflorescence, there are some difference in their arrangement. For example, in *V. phaeoneura*, there are more capitula than in *V. hilairiana*, the co-inflorescence is denser and arranged in corymbs.

3.10.5. *Vernonanthura montevidensis* (Spreng.) H.Rob., Phytologia 73(2): 72 (1992)

Fig. 2H

Shrub, 1.5–3.0 m tal, branches pubescent, glabrescent, glandular-dotted, trichomes simple, apparently multicellular, albescent; leaf scars not evident. **Leaves** alternate, sessile; lamina 2.0–5.0x0.6–2.3 cm, elliptic, cartaceous to subcoriaceous, concolor, obovate or linear, base acute, margin entire or slightly serrate, apex obtuse or acute, venation brochidodromous or eucamptodromous, abaxial and adaxial surfaces pubescent, glandular-dotted, glabrescent, trichomes simple, apparently multicellular, albescent to brownish. **Co-inflorescence** thyrse-corymbiform; capitula sessile or briefly pedunculate, peduncle up to 0.2 cm long; involucre 0.5–0.8x0.3–0.5 cm, cylindrical, 10–14-seriate, greenish to purplish, tomentose to villous-

setose, glandular-dotted or not, glabrescent, trichomes simple, apparently multicellular, brownish; involucre bracts imbricate, outer bracts ovate, apex obtuse, inner bracts oblong or elliptic, apex obtuse or slightly acute, outer bracts persistent, inner bracts deciduous; receptacle flat, glabrous. **Flowers** 8–10 per capitulum, bisexual; corolla 0.8–1.0 cm long, actinomorphic, tubulose, 5-lobed, purple or lilac, glabrous; lobes 0.3–0.4 cm long, glandular; anthers basal appendage sagittate, apical appendage acute; style branches acuminate, pilose. **Cypselas** obconic, setose, glandular, 8–10-ribs; carpodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, stramineous, deciduous.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto: Caparaó National Park, “Pico da Bandeira” trail, 20°28.839'S, 41°49.757'W, 20 October 2012 (fl., fr.), T.B. Flores *et al.* 1338 (RB574980, VIES35048); *ibidem*, “Macieira”, 20°29'00"S, 41°49'37"W, 16 March 2014 (fr.), M. Monge *et al.* 2574 (UEC194001); *ibidem*, humid area, 20°27'58"S, 41°49'01"W, 2.223 m, 16 March 2014 (fr.), M. Monge *et al.* 2600 (UEC200837); *ibidem*, 20°27'58"S, 41°49'01"W, 2.223 m, 16 March 2014 (fr.), M. Monge *et al.* 2608 (UEC194003); *ibidem*, nearly “Macieira”, High-altitude grassland, 13 August 2011 (fl., fr.), M. Monge *et al.* 987 (UEC169863); *ibidem*, “Macieira”, 20°28' 50"S, 41°49'47.4"W, 1.987 m, 19 October 2007 (fl., fr.), B.V. Tinti *et al.* 312 (HUFU73527). Pedra Menina: Caparaó National Park, “Macieira”, “Candeal”, 20°28'49"S, 41°49'45"W, 1.821 m, 12 October 2022 (fl., fr.), P. Renon 527 (HUFU83156); *ibidem*, 20°28'48"S, 41°49'46"W, 12 October 2022 (fl., fr.), P. Renon 528 (HUFU83157); *ibidem*, trail to “Macieira”, Montane Semideciduous Forest, 20°28'48"S, 41°49'46"W, 1.821 m, 12 October 2022 (fl., fr.), P. Renon 540 (HUFU83171). Minas Gerais: Caparaó National Park, “Lajão” peak, 14 November 1960 (fl., fr.) S.A. Ferreira 20 (RB110773); *ibidem*, High-altitude grassland, 19 November 1988 (fr.), Lkrieger *et al.* 23102 (UEC152884); *ibidem*, “Pico da Bandeira”, 16 November 1996 (fl., fr.), S.C.S. Silva 8 (HUFU15783). Alto Caparaó: Caparaó National Park, High-altitude grassland, 2.100 m, 29 September 1995 (fr.), L.S. Leoni 3082 (RB736116); *ibidem*, High-altitude grassland, 2.200 m, 16 November 1996 (fl., fr.), L.S. Leoni 4522 (HUFU81502); *ibidem*, “Aurélio” waterfall, 20°28'S, 41°50'W, 1.834 m, 01 December 2010 (fr.), T.M. Machado *et al.* 264 (RB543719); *ibidem*, 20.4333°S, 41.8683°W, 21 June 2013 (fr.), V.C. Manhães *et al.* 348 (UEC193971); *ibidem*, “Terreirão” trail, 20°25'60"S, 41°52'6"W, 29 August 2013 (fl., fr.) V.C. Manhães *et al.* 387 (HUFU83512); *ibidem*, path to “Pico da Bandeira”, 20°25'60"S, 41°52'6"W, 19 September 2013 (bd.), V.C. Manhães *et al.* 411 (HUFU83513); *ibidem*, 20.4333°S, 41.8683°W, 19 September 2013 (fr.), V.C. Manhães *et al.* 423 (UEC193988); *ibidem*,

“Tronqueira” trail, 20°26'00"S, 41°53'00"W, 21 September 2012 (fr.), M. Monge *et al.* 1277 (UEC197757); *ibidem*, High-altitude grassland, 20°24'44"S, 41°50'3"W, 2.066 m, 09 October 2022 (bd.), P. Renon 509 (HUFU83145); *ibidem*, 20°24'44"S, 41°50'3"W, 2.066 m, 09 October 2022 (fl., fr.), P. Renon 511 (HUFU83144). Espera Feliz: Caparaó National Park, trail “Macieira” to “Aurélio” waterfall, 1.841 m, 05 March 2010 (fr.), M.O. Bünger *et al.* 381 (BHCB136337).

Distribution and Conservation: *Vernonanthura montevidensis* was found at “Candeal” and High-altitude grassland around 1.800–2.220 meters asl. The species is distributed in Argentina, Bolivia, Brazil, Paraguay and Uruguay. In Brazil, *V. montevidensis* occurs in Atlantic Forest and Brazilian savanna “Cerrado”. Regarding conservation status, the species is not evaluated.

Taxonomic comments: *Vernonanthura montevidensis* is easily recognized by shrub habit, leaves sessile, lamina elliptic, obovate or linear, concolor, glandular-dotted, co-inflorescence thyse-corymbiform arranging in numerous corymbs, involucre 10–14 seriate, 8–10 flowers per capitulum, corolla glabrous, lobes glandular and cypselas obconic.

3.10.6. *Vernonanthura petiolaris* (A.DC.) H.Rob., Phytologia 73(2): 73 (1992)

Tree, 2.0–5.0 m tall; branches densely villous, glabrescent, trichomes simple, apparently multicellular, albescent; leaf scars not evident. **Leaves** alternate, petiolate, petiole 0.5–1.5 cm long; lamina 8.5–17.0x1.6–4.0 cm, narrowly elliptic or oblong, consistency membranaceous, slightly discolor, base acute, margin entire, apex acute, venation eucamptodromous, abaxial surface pubescent-strigose, glandular-dotted, glabrescent, trichomes simple, multicellular, albescent, adaxial surface strigose, glandular-dotted, glabrescent, trichomes simple, multicellular, albescent to yellowish. **Co-inflorescence** cyme-seriate racemiform; capitula sessile or briefly pedunculate, peduncle up to 0.3 cm long; involucre 0.6–0.8x0.5–0.7 cm, cylindrical to campanulate, 8–12-seriate, greenish, densely sericeous, glandular-dotted, persistent, trichomes simple, albescent; involucre bracts imbricate, outer bracts ovate, apex acute, inner bracts elliptic or linear, apex acute, outer bracts persistent, inner bracts apparently deciduous; receptacle flat, glabrous. **Flowers** 20–40 per capitulum, bisexual; corolla ca. 0.6 cm long, actinomorphic, tubulose, 5-lobed, cream to albescent, glandular; lobes ca. 0.2 cm long, glandular; anthers with basal appendage sagittate, apical appendage acuminate; style branches acuminate, pilose. **Cypselas** cylindrical, densely

sericeous, 10-ribs; carpopodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, whitish, persistent.

Examined material: Brazil. Espírito Santo: Dores do Rio Preto: road between “Pedra Menina” and “Dores do Rio Preto” municipalities, 21 October 2012 (fl., fr.), T.B. Flores *et al.* 1362 (UEC178064); road between “Pedra Menina” municipality and Caparaó National Park, 21 October 2012 (fl., fr.) T.B. Flores *et al.* 1363 (RB577435, UEC176981).

Distribution and Conservation: *Vernonanthura petiolaris* was found at disturbed area, the altitude was not mentioned. The species occurs in Argentina, Brazil and Paraguay. Regarding conservation status, *V. petiolaris* is Least Concern (LC).

Taxonomic comments: *Vernonanthura petiolaris* differs from others species by tree habit, leaves petiolate, lamina narrowly elliptic or oblong, membranaceous, glandular-dotted, discolor, margin entire, involucre 8–12-seriate, 20–30 flowers per capitulum, corolla and lobes glandular, cypselas cylindrical.

3.10.7. *Vernonanthura phaeoneura* (Toledo) H. Rob., Phytologia 73: 73 (1992)

Fig. 2I

Shrub or small tree, 1.0–4.0 m tall; branches densely villous, persistent, trichomes simple, multicellular, apparently glandular, brownish; leaf scars not evident. **Leaves** alternate, petiolate, petiole 0.5–1.5 cm long; lamina 4.0–17.0 × 1.0–3.0 cm, elliptic or lanceolate, membranaceous, concolor, base acute, margin serrate, apex acute or acuminate, venation brochidromous, abaxial surface densely villous, trichomes simple, multicellular, apparently glandular, brownish, adaxial surface strigose, trichomes simple, multicellular, apparently glandular, brownish. **Co-inflorescence** thyrses-corymbiform; capitula sessile or briefly pedunculate, peduncle up to 0.3 cm long; involucre 0.5–0.7 × 0.4–0.5 cm, cylindrical to campanulate, 5–6-seriate, greenish, villous, glabrescent, trichomes simple, brownish; involucral bracts imbricate, outer bracts ovate, apex obtuse or briefly mucronate, inner bracts oblong, apex obtuse or retuse, bracts persistent; receptacle flat, glabrous. **Flowers** 10–20 per capitulum, bisexual; corolla 0.6–0.7 cm long, actinomorphic, tubulose, 5-lobed, albescent, glabrous; lobes 0.1–0.2 cm long, glabrous; anthers with basal appendage sagittate, apical appendage acute; style branches acuminate, pilose. **Cypselas** obconic, strigose, 8-ribs;

carpopodium conspicuous; pappus 2-seriate, outer serie paleaceous, inner serie barbellate, stramineous, deciduous.

Examined material: Brazil. Espírito Santo: Divino São Lourenço, Patrimônio da Penha: Caparaó, 24 June 2007 (fl., fr.), T. Chimalli s.n. (HUFU83506); *ibidem*, Montane Ombrophilous Forest, 20°36'4"S, 41°46'44"W, 894 m, 25 May 2019 (bd.), J.P.F. Zorzanelli *et al.* 1952 (HUFU83616). Dores do Rio Preto: Caparaó National Park, Upper Montane Ombrophilous Forest, 20°29'06"S, 41°49'26"W, 1.797 m, 16 March 2014 (bd.), M. Monge *et al.* 2534 (UEC194000). Ibitirama, Santa Marta: Caparaó National Park, "Santa Marta" valley, Montane Ombrophilous Forest, 20°29'29"S, 41°44'43"W, 05 May 2015 (bd.), E.A. Araújo 493 (HUFU83606). Minas Gerais: Alto Caparaó: Caparaó National Park, transitional vegetation, 12 May 2019 (fl., fr.), G.D. Colletta *et al.* 242 (HUFU59614, RB746760). Espera Feliz: Caparaó National Park, 20°28'48"S, 41°49'57"W, 05 March 2010 (fl., fr.), M.O. Bünger 355 (BHCB136312).

Distribution and Conservation: *Vernonanthura phaeoneura* was found at Upper Montane Ombrophilous Forest and transitional vegetation ("Candéal") between Montane Forest and High-altitude grassland, around 800–1.850 meters asl. The species is restricted to Brazil occurring in Atlantic Forest. It is not evaluated regarding conservation status.

Taxonomic comments: *Vernonanthura phaeoneura* is recognized by shrubby or tree habit, leaves petiolate, lamina elliptic or lanceolate, membranaceous, concolor, margin serrate, co-inflorescence corymbiform, involucre 5–6-seriate, involucral bracts with obtuse or retuse apex, 10–20 flowers per capitulum, corolla and lobes glabrous, cypselas obconic.

3.10.8. *Vernonanthura polyanthes* (Spreng.) A.J.Vega & Dematt., Phytotaxa 8: 47 (2010)

Shrub, ca. 2.0 m tall; branches densely tomentose or villous, glabrescent, trichomes simple, multicellular, albescent or brownish; leaf scars not evident. **Leaves** alternate, petiolate, petiole 0.5–1.0 cm long; lamina 5.0–12.0x0.5–2.5 cm, elliptic, cartaceous to subcoriaceous, slightly discolor, base acute, margin irregular entire, apex acute, venation broquidodromous, abaxial surface densely villous, glandular-dotted, glabrescent, trichomes simple, multicellular, brownish, adaxial surface strigose, glabrescent, trichomes simple, multicellular, brownish. **Co-inflorescence** cyme-seriate racemiform; capitula sessile or pedunculate, peduncle up to 0.5 cm long; involucre 0.3–0.6x0.3–0.6 cm, campanulate, 5–6-

seriate, greenish, villous, glabrescent, trichomes simple, albescent to yellowish; involucre bracts imbricate, outer bracts ovate, apex acute, inner bracts ovate to elliptic, apex acute, bracts persistent; receptacle flat, glabrous. **Flowers** 20–30 per capitulum, bisexual; corolla 0.5–0.6 cm long, actinomorphic, tubulose, 5-lobed, lilac to albescent, glabrous; lobes ca. 0.1 cm long, glabrous; anthers with basal appendage sagittate, apical appendage acute; style branches acute or acuminate, pilose. **Cypselas** cylindrical, strigose, densely glandular, 5-ribs; carpodium conspicuous; pappus 2-seriate, barbellate, stramineous, deciduous.

Examined material: Brazil. Minas Gerais: Alto Caparaó: Caparaó National Park, “Tronqueira”, Montane Semideciduous Seasonal Forest, 20.2600°S, 41.5260°W, 18 September 2012 (fr.) M. Monge *et al.* 1192 (UEC201169); *ibidem*, between “Vale Verde” and lodging, Montane Forest, 01 September 1996 (fl., fr.), V.C. Souza *et al.* 12101 (HUFU26950, RB736054).

Distribution and Conservation: *Vernonanthura polyanthes* was found at Montane Semideciduous Seasonal Forest, the altitude was not mentioned. The species is distributed in Brazil and Bolivia. In Brazil occurs in Atlantic Forest and Brazilian savanna “Cerrado”. Regarding conservation status, *V. polyanthes* is not evaluated.

Taxonomic comments: *Vernonanthura polyanthes* is easily recognized by shrubby habit, leaves petiolate, lamina elliptic, cartaceous or subcoriaceous, slightly discolor, glandular-dotted in abaxial surfaces, involucre 5–6-seriate, corolla and lobes glabrous, cypselas cylindrical, 5-ribbed, densely glandular.

3.10.9. *Vernonanthura* aff. *spatulata* M.Monge & Semir, Rodriguésia 69(2): 605 (2018)

Tree, ca. 14.0 m tall; branches densely villous, persistent, trichomes simple, whitish; leaf scars not evident. **Leaves** alternate, petiolate, petiole 2.0–2.5 cm long; lamina 5.5–12.5x2.6–5.0 cm, elliptic to obovate or orbicular, cartaceous to subcoriaceous, discolor, base acute, margin irregular entire, apex acute with little mucron or retuse, venation brochidodromous, abaxial surface densely villous, persistent, trichomes simple, whitish, adaxial surface villous, glabrescent, trichomes simple, whitish. **Co-inflorescence** cyme-seriate racemiform; capitula pedunculate, peduncle up to 0.3 cm long; involucre 0.3–0.5x0.2–0.3 cm, cylindrical to campanulate, 5–6-seriate, greenish to brownish, villous, glabrescent, trichomes simple, albescent; involucre bracts imbricate, outer bracts ovate, apex slightly

acute, inner bracts elliptic to ovate, apex acute, deciduity of bracts indefinite; receptacle flat, glabrous. **Flowers** ca. 10 per capitulum, bisexual; corolla (bud ca. 0.2x<0.1 cm long), actinomorphic, tubulose, 5-lobed, color unknown, glandular; lobes glandular. **Cypselas** imature; pappus 2-seriate, barbellate, stramineous, apparently deciduous.

Examined material: Brazil. Espírito Santo: Ibitirama, Santa Marta: Caparaó National Park, “Santa Marta” valley, Montane Ombrophilous Forest, 20°29'29"S, 41°44'46"W, 1.200 m, 29 June 2015 (bd.), E.A. Araújo 161 (HUFU83604).

Distribution and Conservation: *Vernonanthura* aff *spathulata* was found at Montane Ombrophilous Forest around 1.200 meters asl.

Taxonomic comments: *Vernonanthura* aff *spathulata* is easily distinguished by tree habit, leaves petiolate, lamina elliptic, obovate or orbicular, cartaceous or subcoriaceous, apex acute with little mucron or retuse, involucre 5–6-seriate, ca. 10 flowers per capitulum, corolla and lobes glandular.

4. Discussion

Floristic inventory

Vernonieae has a diverse flora in the Caparaó National Park, with a large percentual of Brazilian species (63%) exhibiting a narrow distribution. Floristic surveys in mountain habitats of Atlantic Forest reveal that Vernonieae is among the most diverse tribe into Asteraceae in that environments (Rizzini 1954; Barroso 1957; Borges *et al.*, 2010; Lombardi *et al.*, 2012; Meireles *et al.*, 2014). The Brazilian flora has a large number of endemic species, principally to Asteraceae (third richest family in country) (BFG 2021), the privileged region of Brazil encompassing two extensive hotspots areas, as Atlantic Forest, added several mountain ranges and climatic conditions can explain the high endemism (Myers *et al.* 2000).

The genera *Lepidaploa* and *Vernonanthura* were the richest in the park, both are large genera in Vernonieae (Robinson 1999; Flora e Funga do Brasil 2023) and generally are among the most diverse in mountains of brazilian southeastern (Rizzini 1954; Barroso 1957; Meireles *et al.*, 2014; Moreira *et al.*, 2020).

Forest environment, such as Montane Semidecidual Seasonal Forest and Montane Ombrophilous Forest, holds a major diversity of Vernonieae in the Caparaó National Park.

The biggest genera in tribe, *Lepidaploa*, *Vernonanthura* and *Piptocarpha* occurred preferably in Montane Forest, excluding only *Lepidaploa* aff *argyroticha*, *L. estevesiana* and *Vernonanthura montevidensis*.

The new record of *Hololepis pedunculata* and notable enlargement in species' list to the park display the relevance of floristic inventories to cognize the biodiversity and understand patterns in species morphology and their distribution.

Distribution data and conservation status

The incongruity of records between websites can be reflex of the failures in network among online databases. The data consensus in websites is important to find gaps and equivocal records to be corrected, consequently increasing the reliability of informations.

Records difficult to validate by absence of images or invalid records provoked by wrong identifications may be reduced if there is an effort by herbaria to upload all specimens from collections accompanied of photographs. Thereby, more researchers can have access of the material become easier validate or reject records.

A gap about status conservation on online databases was observed, approximately 61% of species found here were not evaluated. Seeing the deforestation advances and increase of biodiversity loss over the years (Brooks *et al.*, 2002; Jantz *et al.*, 2015; Leão *et al.*, 2014; Lughadha *et al.*, 2020), it is important that more species would be categorized, mainly species with restrict distribution. Also is essential that species ever evaluated would be periodically reviewed.

Systematic treatment

The taxonomic studies are fundamental to upgrade the identifications of collections, principally for large groups as Asteraceae. Beyond provide an accurate identification for the specimens during the research, systematic treatments result in informations and tools becoming easier future identifications among researchers.

In this way, studies approaching taxonomy and collections may extend the knowledge about species, decreasing equivocal data emerged from wrongs identifications, such as distribution, phenology, conservation status.

Vernonieae is very diverse and has several similar genera and species. The tribe can be easily recognized through three structures, leaves, style branches and pappus, however, to differ genera and mainly species require to understand better the morphologic patterns of taxa,

being necessary to consult descriptions, images and identification key in systematic studies like that.

5. Conclusion

A large percentual of Brazilian species in Vernoniaeae is found in the Caparaó National Park. The park protects populations of restricted species to Brazil, Atlantic Forest, Brazilian southeast, High-altitude grassland and populations of endemic species (*Critoniopsis bradeana*) showing the importance of preserving natural areas to conserve the biodiversity, mainly in hotspots regions.

Floristic inventories binded with taxonomy are the fastier way to cognize the species, understading their morphological patterns and distribution. Also, both studies are significant to investigate a local flora discovering the occurrence of rare species, species never cited in literature for determined area and new records such as *Hololepis pedunculata* here.

Asteraceae is poorly studied in Atlantic Forest and in their mountain environments. There is a scarcity of floristic surveys for the family, principally to Vernoniaeae. The scarcity is even higher for systematic treatments. The present research is a great contribution to studies investigating Asteraceae, particularly Vernoniaeae, in mountains habitats of Atlantic Forest.

6. Reference

Araújo EA, Kunz SH, Dias HM, Zorzanelli JPF, Callegaro RM (2021) Vascular plant checklist in an area of extreme biological importance: filling gaps in the Caparaó National Park-ES, Brazil. *Biota Neotropica* 21: e20201024. <https://doi.org/10.1590/1676-0611-bn-2020-1024>

Alkmim FF, Marshak S, Pedrosa-Soares AC, Peres GG, Cruz SCP, Whittington A (2006) Kinematic evolution of the Araçuaí-West Congo orogen in Brazil and Africa: Nutcracker tectonics during the Neoproterozoic assembly of Gondwana. *Precambrian Research* 149: 43-64. <https://doi.org/10.1016/j.precamres.2006.06.007>

Barroso GM (1957) Flora do Itatiaia I – Compositae. *Rodriguésia* 32: 171–241. <https://doi.org/10.1590/2175-78601980325309>

Baker JG (1873) Compositae I Vernoniaceae. In: Martius CFP & Eichler AG (eds.) *Flora*

brasiliensis. Fleicher, Liepizig. Vol. 6, pars 2, pp. 1-180.

Beck HE, Zimmermann NE, McVicar TR, Vergopolan N, Bergl A & Wood EF (2018) Present and future Köppen-Geiger climate classification maps at 1-km resolution. Scientific Data 5: 180214. <https://doi.org/10.1038/sdata.2018.214>

BFG (2021) Brazilian Flora 2020: Leveraging the power of a collaborative scientific network. Taxon 71: 178-198.

Bhat JA, Kumar M, Pala NA, Shah S, Dayal S, Gunathilake C & Negi AK (2018) Influence of altitude on the distribution pattern of flora in a protected area of Western Himalaya. Acta Ecologica Sinica 40: 30-43. <https://doi.org/10.1016/j.chnaes.2018.10.006>

Bibliothèque Nationale de France (BnF). Available at: <<https://www.bnf.fr/fr>>. Access on 05 October 2022.

Biodiversity Heritage Library (BHL). Available at: <<https://www.biodiversitylibrary.org/>>. Access on 05 October 2022.

Borges RAX, Saavedra MM, Nakajima JN, Forzza RC (2010) The Asteraceae flora of the Serra do Ibitipoca: analyses of its diversity and distribution compared with selected areas in Brazilian mountain ranges. Systematics and Biodiversity 8: 471–479. <https://doi.org/10.1080/14772000.2010.517573>

Brooks TM, Mittermeier RA, Mittermeier CG, Fonseca GAB, Rylands AB, Konstant WR, Flick P, Pilgrim J, Oldfield S, Magin G & Hilton-Taylor C (2002) Habitat Loss and Extinction in the Hotspots of Biodiversity. Conservation Biology 16: 909-923. <https://doi.org/10.1046/j.1523-1739.2002.00530.x>

Chaves DA, Ribeiro-Silva S, Proença CEB, Oliveira WL, Bringel JBA & Medeiros MB (2019) Geographic space, relief, and soils predict plant community patterns of Asteraceae in rupestrian grasslands, Brazil. Biotropica 51: 1-10. <https://doi.org/10.1111/btp.12636>

Cheek M, Lughadha EN, Kirk P, Lindon H, Carretero J, Looney B, Douglas B, Haelewaters D, Gaya E, Llewellyn T, Ainsworth AM, Gafforov Y, Hyde K, Crous P, Hughes M, Walker BE, Forzza RC, Wong KM & Niskanen T (2020) New scientific discoveries: Plants and fungi. *Plants People Planet* 2: 371-388. <https://doi.org/10.1002/ppp3.10148>

CNCFlora. Centro Nacional de Conservação da Flora. Available at:
<<http://cncflora.jbrj.gov.br/>>. Access on 05 October 2022.

Colli-Silva M, Reginato M, Cabral A, Forzza RC, Pirani JR & Vasconcelos TNC (2020) Evaluating shortfalls and spatial accuracy of biodiversity documentation in the Atlantic Forest, the most diverse and threatened Brazilian phytogeographic domain. *Taxon* 69: 1-11. <https://doi.org/10.1002/tax.12239>

Cruz LVV, Pivari MOD, Neto LM, Salimena FRG (2020). Montane seasonal wetlands: an inventory of its associated flora in Parque Estadual do Ibitipoca, southeast Brazil. *Rodriguésia* 71: e02502018. <https://doi.org/10.1590/2175-7860202071097>

Ellis B, Daly DC, Hickey LJ, Johnson KR, Mitchell JD, Wilf P & Wing SL (2009) *Manual of leaf architecture*. The New York Botanical Garden Press, New York. Pp. 1-191. <https://doi.org/10.1079/9781845935849.0000>

Esteves R, Loeuille B, Nakajima JN, Marques D, Soares P, Esteves-Gonçalves V, Mendonça C & Dematteis M. (2017) Tribo Vernonieae Cass. In: Roque N, Teles AM, Nakajima JN (eds.) *A família Asteraceae no Brasil: classificação e diversidade*. Salvador: EDUFBA. Pp 101-118. <https://doi.org/10.7476/9788523219994.0016>

Flora e Funga do Brasil. Jardim Botânico do Rio de Janeiro. Available at:
<<http://floradobrasil.jbrj.gov.br/>>. Access on 03 May 2023.

Funk VA, Susanna A, Stuessy TF & Robinson H (2009) Classification of Compositae. In: Funk VA, Susanna A, Stuessy TF & Bayer RJ (eds.) *Systematics, Evolution, and Biogeography of Compositae*. IAPT, Vienna. Pp. 171-189.

Galindo-Leal C & Câmara IG (2005) Mata Atlântica: biodiversidade, ameaças e perspectivas. São Paulo: Fundação SOS Mata Atlântica. Pp 1-472.

GBIF. Global Biodiversity Information Facility. Available at: < <https://www.gbif.org/>>. Access on 05 October 2022.

Ghafari S, Ghorbani A, Moameri M, Mostafazadeh R, Bidarlord M & Kakehmami A (2020) Floristic Diversity and Distribution Patterns Along an Elevational Gradient in the Northern Part of the Ardabil Province Rangelands, Iran. Mountain Research and Development 40: 37-47. <https://doi.org/10.1659/MRD-JOURNAL-D-18-00089.1>

Heilbron M, Pedrosa-Soares AC, Neto MCC, Silva LC, Trouw RAJ & Janasi VA (2004). Província Mantiqueira. In: Mantesso-Neto V, Bartorelli A, Carneiro CDR, Brito-Neves BB (eds.) Geologia do Continente Sul-Americano: Evolução da Obra de Fernando Flávio Marques de Almeida. BECA, São Paulo. Pp. 203-234.

Hickey LJ (1973) Classification of the architecture of dicotyledonous leaves. American Journal of Botany 60: 17-33. <https://doi.org/10.1002/j.1537-2197.1973.tb10192.x>

IBDF. Instituto Brasileiro de Desenvolvimento Florestal (1981) Plano de Manejo Parque Nacional do Caparaó. Brasília: Fundação Brasileira para a Conservação da Natureza. Pp 1-135.

ICMBio. Instituto Chico Mendes de Conservação da Biodiversidade (2015) Plano de Manejo para o Parque Nacional do Caparaó. MMA, Brasília. Pp. 1-517.

ICMBio. Instituto Chico Mendes de Conservação da Biodiversidade. Parque Nacional do Caparaó. Available at: <<https://www.icmbio.gov.br/>>. Access on 03 May 2023.

IPNI. International Plant Names Index. Available at: < <https://ipni.org/>>. Access on 05 October 2022.

IUCN Red List. The IUCN Red List of Threatened Species. Available at: <<https://www.iucnredlist.org/>>. Access on 05 October 2022.

Jantz SM, Barker B, Brooks TM, Chini LP, Huang Q, Moore RM, Noel J & Hurtt GC (2015) Future habitat loss and extinctions driven by land-use change in biodiversity hotspots under four scenarios of climate-change mitigation. *Conservation biology* 29: 1122–1131.
<https://doi.org/10.1111/cobi.12549>

JSTOR. Global Plants. Available at: < <https://plants.jstor.org/>>. Access on 05 October 2022.

Leão TCC, Fonseca CR, Peres CA & Tabarelli M (2014) Predicting Extinction Risk of Brazilian Atlantic Forest Angiosperms. *Conservation Biology* 00: 1-11.
<https://doi.org/10.1111/cobi.12286>

Leitão F, Leitão SG, Fonseca-Kruel VS, Silva IM & Martins K (2014) Medicinal plants traded in the open-air markets in the State of Rio de Janeiro, Brazil: an overview on their botanical diversity and toxicological potential. *Revista Brasileira de Farmacognosia* 24: 225-247. <https://doi.org/10.1016/j.bjp.2014.04.005>

Lombardi JA, Carvalho CS, Biral L, Saka MN & Hieda SM (2012) Vascular flora of Serra do Japi Biological Reserve, Jundiaí, southeastern Brazil. *Rodriguésia* 63: 333-340.
<https://doi.org/10.1590/S2175-78602012000200008>

Lughadha EN *et al.* (2020) Extinction risk and threats to plants and fungi. *Plants People Planet* 2: 389-408. <https://doi.org/10.1002/ppp3.10146>

MapBiomias. Estatísticas. Available at: < <https://mapbiomas.org/>>. Access on 03 May 2023.

Marques D, Farco GE, Nakajima JN & Massimiliano D (2018) The genus *Lepidaploa* (Vernonieae: Asteraceae) in southern South America. *Phytotaxa* 362: 115-142.
<https://doi.org/10.11646/phytotaxa.362.2.1>

Martinelli G., Valente ASM, Maurenza D, Kutschenko DC, Judice DM, Silva DS, Fernandez EP, Martins EM, Barros FSM, Sfair JC, Filho LAFS, Abreu MB, Moraes MA, Monteiro NP,

Pietro PV, Fernandes RA, Hering RLO, Messina T & Penedo RSA (2013) Avaliações de risco de extinção de espécies da flora brasileira. In: Martinelli, G., Moraes, M. A. (eds.) Livro vermelho da flora do Brasil. Rio de Janeiro: Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Pp 60-78.

Meireles LD, Kinoshita L & Shepherd GJ (2014) Composição florística da vegetação altimontana do distrito de Monte Verde (Camanducaia, MG), Serra da Mantiqueira Meridional, Sudeste do Brasil. *Rodriguésia* 65: 831-859. <https://doi.org/10.1590/2175-7860201465403>

Mittermeier RA, Gill PR, Hoffman M, Pilgrim J, Brooks T, Mittermeier CG, Lamoreux J, Fonseca GAB (2004). Hotspots revisited: earth's biologically richest and most endangered terrestrial ecoregions. CEMEX, Mexico. Pp. 392.

Mittermeier RA, Turner WR, Larsen FW, Brooks TM & Gascon C (2011) Global Biodiversity Conservation: The Critical Role of Hotspots. In: Zachos FE & Habel JC (eds.) Biodiversity Hotspots: Distribution and protection of conservation priority areas. 2011th Ed. Springer, New York. Pp. 3-22. https://doi.org/10.1007/978-3-642-20992-5_1

Mindat. The Köppen Climate Classification. Available at:
<<https://www.mindat.org/climate.php>>. Access on 03 May 2023.

Monge M., Marques D, Leoni LS & Nakajima N (2023) A new species of *Lepidaploa* (Cass.) Cass. (Vernoniaeae, Asteraceae) from Mantiqueira range, southeastern Brazil. *Brittonia* 75: 215–224. <https://doi.org/10.1007/s12228-023-09741-3>

Moreira MM *et al* (2020) A list of land plants of Parque Nacional do Caparaó, Brazil, highlights the presence of sampling gaps within this protected area. *Biodiversity Data Journal* 8: 1-26. <https://doi.org/10.3897/BDJ.8.e59664>

Myers N, Mittermeier RA, Mittermeier CG, Fonseca GAB & Kent J. (2000) Biodiversity hotspots for conservation priorities. *Nature* 403: 853-858. <https://doi.org/10.1038/35002501>

Pádua JAR, Brandão MM & Carvalho D (2016) Spatial genetic structure in natural populations of the overexploited tree *Eremanthus erythropappus* (DC.) macleish (Asteraceae). *Biochemical Systematics and Ecology* 66: 307-311. <https://doi.org/10.1016/j.bse.2016.04.015>

Paglia AP, Fonseca GAB & Silva JMC (2008) A Fauna Brasileira Ameaçada de Extinção: síntese taxonômica e geográfica. In: Machado ABM, Drummond GM & Paglia AP (eds.) Livro Vermelho da Fauna Brasileira Ameaçada de Extinção. Belo Horizonte: Fundação Biodiversitas. Pp 63-70.

Pedrosa-Soares AC, Noce CM, Wiedemann CM & Pinto CP (2001) The Araçuaí-West-Congo Orogen in Brazil: an overview of a confined orogen formed during Gondwanaland assembly. *Precambrian Research* 110: 307-323. [https://doi.org/10.1016/S0301-9268\(01\)00174-7](https://doi.org/10.1016/S0301-9268(01)00174-7)

Pedrosa-Soares AC, Noce CM, Alkmim FF, Silva LC, Babinski M, Cordani U, Castañeda C (2007) Orógeno Araçuaí: síntese do conhecimento 30 anos após Almeida 1977. *Geonomos* 15: 1-16.

Plants of the World Online. Royal Botanic Gardens, Kew. Available at: <https://powo.science.kew.org/>. Access on 05 October 2022.

Portella RO, Cordeiro EMG, Marques APS, Ming LC, Zucchi MI, Lima MP, Martins ER, Hantao LW, Sawaya ACHF, Semir J, Pinheiro JB & Marques MOM (2021) Evidence of altitudinal gradient modifying genomic and chemical diversity in populations of *Lychnophora pinaster* Mart. *Phytochemistry* 192: 112898. <https://doi.org/10.1016/j.phytochem.2021.112898>

QGIS Development Team (2020) QGIS Geographical Information System. Open Source Geospatial Foundation Project. Available at: <http://qgis.osgeo.org/>. Access on 05 October 2022.

R Development Core Team (2021) R A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. Available at: <http://www.R-project.org/>. Access on 05 October 2022.

Radford AE (1986) *Fundamentals of Plant Systematics*. Harper & Row Publishers, New York. Pp. 1-498.

Ribeiro MC, Metzger JP, Martensen AC, Ponzoni FJ & Hirota MM (2009) The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation* 142: 1141-1153.

<https://doi.org/10.1016/j.biocon.2009.02.021>

Reis GH, Mansanares ME, Domingos DQ, Meireles LD, Berg E (2015) Asteraceae dos Campos Rupestres das Serras da Bocaina e de Carrancas, Minas Gerais, Brasil. *Rodriguésia*, 66: 829-845. <https://doi.org/10.1590/2175-7860201566311>

Rizzini CT (1954) *Flora Organensis*. *Arquivos do Jardim Botânico do Rio de Janeiro* 13: 118–243.

Robinson H (1987) Studies in the *Lepidaploa* complex (Vernonieae: Asteraceae). III: two new genera, *Cyrtocymura* and *Eirmocephala*. *Proceedings of the Biological Society of Washington* 100: 844-855.

Robinson H (1988) Studies in the *Lepidaploa* complex (Vernonieae: Asteraceae). IV: the new genus *Lessingianthus*. *Proceedings of the Biological Society of Washington* 101: 929-951.

Robinson H (1990) Studies in the *Lepidaploa* complex (Vernonieae: Asteraceae). VII: the genus *Lepidaploa*. *Proceedings of the Biological Society of Washington* 103: 464-498.

Robinson H (1999) Generic and subtribal classification of American Vernonieae. *Smithsonian Contributions to Botany* 89: 1-116. <https://doi.org/10.5479/si.0081024X.89>

Robinson H (2007) Vernonieae. In: Kubitski EdK, Kadereit JW & Jeffrey C (eds.) *The families and genera of vascular plants: flowering plants, Eudicots: Asterales*. Vol. 8. Springer-Verlag, Berlin, Heideberg. Pp. 149-174.

Rotta E, Carvalho LC & Zonta BM (2008) *Manual de prática de coleta e herborização de material botânico*. Embrapa Florestas, Colombo. Pp. 1-31.

Salimena FRG, Matozinhos CN, Abreu NL, Ribeiro JHC, Souza FS & Neto LM (2013) Flora fanerogâmica da Serra Negra, Minas Gerais, Brasil. *Rodriguésia* 64: 311-320.

<https://doi.org/10.1590/S2175-78602013000200008>

Santiago DS, Oliveira Filho AT, Neto LM, Carvalho FA, Salimena FRG (2018) Floristic composition and phytogeography of an Araucaria Forest in the Serra da Mantiqueira, Minas Gerais, Brazil. *Rodriguésia* 69: 1909-1925. <https://doi.org/10.1590/2175-7860201869426>

Santos KA, Klein EJ, Gazim ZC, Gonçalves JE, Cardozo-Filho L, Corazza ML, & Silva EA (2016) Wood and industrial residue of candeia (*Eremanthus erythropappus*): Supercritical CO₂ oil extraction, composition, antioxidant activity and mathematical modeling. *The Journal of Supercritical Fluids* 114: 1-8. <https://doi.org/10.1016/j.supflu.2016.02.015>

Silva RG, Santos AR, Pelúzio JBE, Fiedler NC, Juvanhol RS, Souza KB & Branco ERF (2021) Vegetation trends in a protected area of the Brazilian Atlantic forest. *Ecological Engineering* 162: 106180. <https://doi.org/10.1016/j.ecoleng.2021.106180>

Smith GL (1982) Taxonomic considerations of *Piptocarpha* (Compositae: Vernonieae) and new taxa in Brazil. *Brittonia* 34: 201-218. <https://doi.org/10.2307/2806378>

Smith GL & Coile NC (2007) *Piptocarpha* (Compositae: Vernonieae). *Flora Neotropica Monograph* 99: 1-94.

SpeciesLink. CRIA - Centro de Referência em Informação Ambiental. Available at: <<https://specieslink.net/>>. Access on 05 October 2022.

Soares G & Loeuille B (2021) Notes in Brazilian Vernonieae (Asteraceae): two new combinations and a range expansion. *Phytotaxa* 522 (2): 139–149.

<https://doi.org/10.11646/phytotaxa.522.2.6>

Souza CD & Felfili JM (2006) Uso de plantas medicinais na região de Alto Paraíso de Goiás, GO, Brasil. *Acta Botanica Brasilica* 20: 135-142. <https://doi.org/10.1590/S0102-33062006000100013>

Susanna A, Baldwin BG, Bayer RJ, Bonifacino JM, Garcia-Jacas N, Keeley SC, Mandel JR, Ortiz S, Robinson H & Stuessy TF (2020). The classification of the Compositae: A tribute to Vicki Ann Funk (1947–2019). *Taxon* 69: 807-814. <https://doi.org/10.1002/tax.12235>

Thiers B. 2023. Index herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's virtual herbarium. Published at <http://sweetgum.nybg.org/science/ih/> [accessed 03 May 2023].

Tropicos. Missouri Botanical Garden. Available at: < <https://www.tropicos.org/home>>. Access on 05 October 2022.

Vargem DS, Braz VS, Lemes EO, Peixoto JC (2022) Plantas medicinais do cerrado: estudos etnobotânicos e etnofarmacológico. *Research, Society and Development* 11: e595111033149. <https://doi.org/10.33448/rsd-v11i10.33149>

Zidorn C (2010) Altitudinal variation of secondary metabolites in flowering heads of the Asteraceae: trends and causes. *Phytochemistry Review* 9:197–203. <https://doi.org/10.1007/s11101-009-9143-7>

7. FIGURES

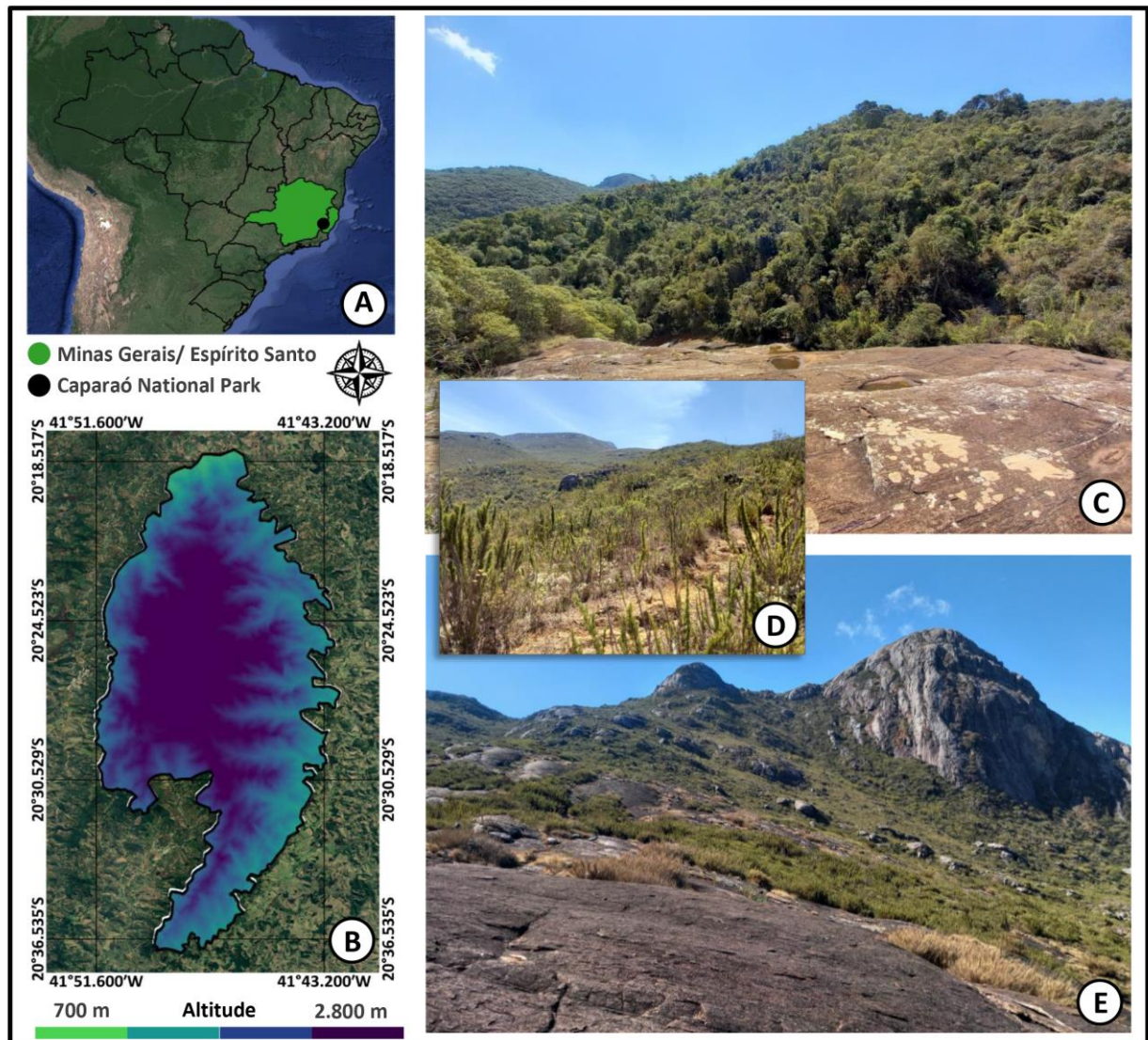


Figure 1 – Study area and phytophysionomies of Atlantic Forest at the park. **A:** Caparaó National Park location. **B:** Conservation unit boundaries, coordinates and altitude; green color represent of 700–1000 m asl; light blue 1.000–1.500 m; dark blue 1.500–2.000 m and purple 2.000–2.800 m. **C:** Montane Ombrophilous Forest. **D-E:** High-altitude grassland; *Chusquea* sp. grassland and rock outcrops. Coordinates follows EPSG: 4674 – SIRGAS 2000 on QGIS Development Team. (Photos: P. Renon).

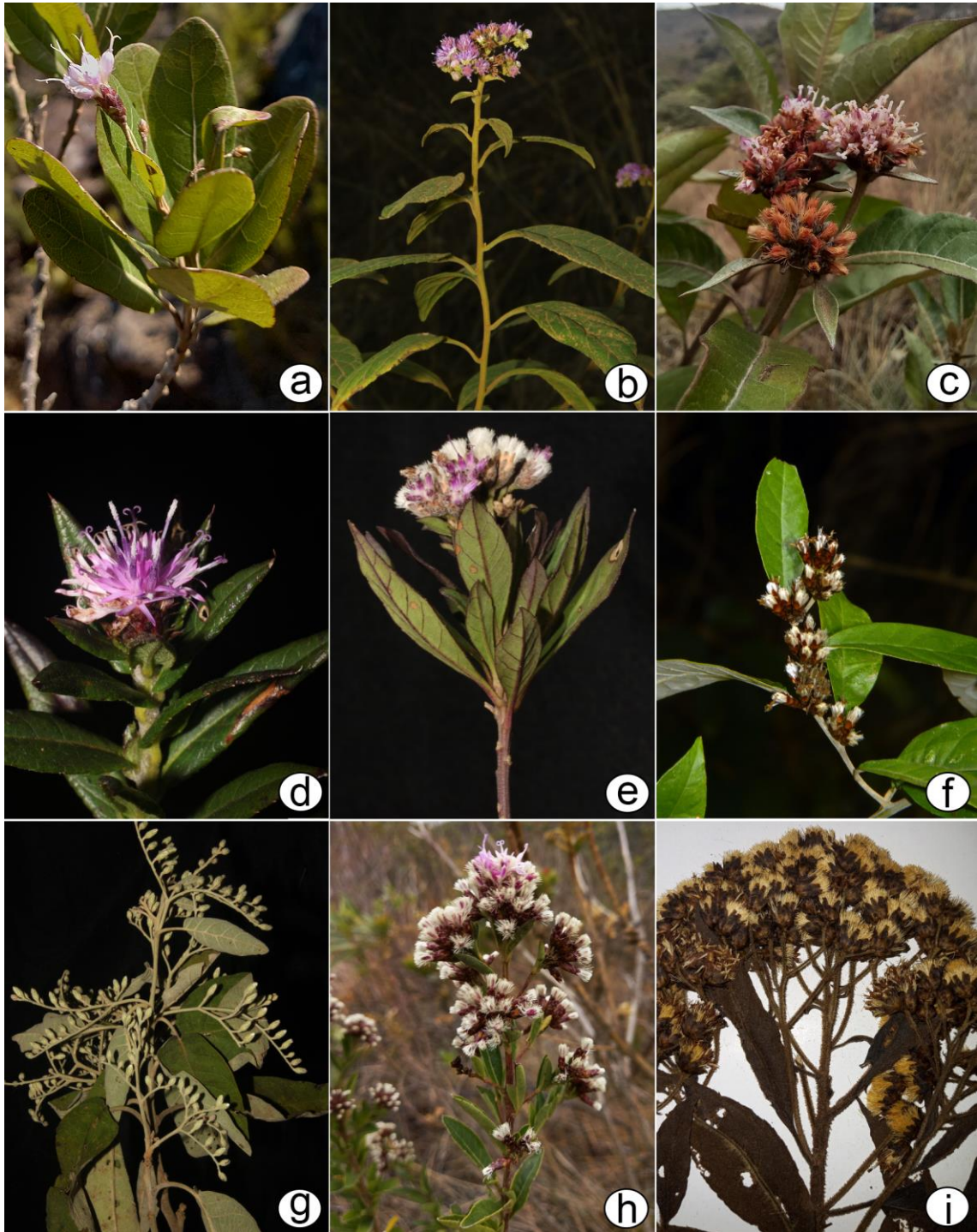


Figure 2 - Vernoniaceae in the Caparaó National Park. **A:** *Critoniopsis bradeana* (G.M.Barroso) G.Souares & Loeuille. **B:** *Cyrtocymura scorpioides* (Lam.) H.Rob., **C:** *Eremanthus erythropappus* (DC.) MacLeish. **D:** *Lepidaploa estevesiana* M.Monge, Leoni & Nakajima. **E:** *Lepidaploa macahensis* (Glaz. ex G.M.Barroso) H.Rob. **F:** *Piptocarpha macropoda* (DC.) Baker. **G:** *Vernonanthura divaricata* (Spreng.) H.Rob.. **H:** *Vernonanthura montevidensis* (Spreng.) H.Rob. **I:** *Vernonanthura phaeoneura* (Toledo) H.Rob. (Photos: A, C, H, J: P. Renon; B, D, E, F, G: M. Monge).

General Conclusion

The Basal Clades and the Vernonieae tribe are well represented in the Caparaó National Park. A large percentual of Brazilian species with a narrower distribution is found to the both groups, with two species being endemic to the Caparaó, highlighting the importance of preserving natural areas, particularly the hotspots, to ensure the species conservation.

There is a scarcity of studies investigating the Asteraceae flora in the Atlantic Forest, especially in mountainous environments. Therefore, this dissertation makes a significant contribution to the study of Asteraceae in the mountain habitats of Atlantic Forest, enhancing our knowledge about its biodiversity and improving the species recognition.

Floristic inventories and systematic treatments play an important role in science, contributing with morphology, phenology and biogeography data, documenting new records, and evidencing shortfalls in our understanding about the biodiversity.

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References of General Introduction

Araújo EA, Kunz SH, Dias HM, Carrijo TT & Zorzanelli JPF (2018) Inventários florísticos na região do Caparaó Capixaba revelam novos registros para a flora do Espírito Santo. *Rodriguésia* 69: 1.953-1.963. <https://doi.org/10.1590/2175-7860201869429>

Barroso GM (1957) Flora do Itatiaia I – Compositae. *Rodriguésia* 32: 171–241. <https://doi.org/10.1590/2175-78601980325309>

Borges RAX, Saavedra MM, Nakajima JN, Forzza RC (2010) The Asteraceae flora of the Serra do Ibitipoca: analyses of its diversity and distribution compared with selected areas in Brazilian mountain ranges. *Systematics and Biodiversity* 8: 471–479. <https://doi.org/10.1080/14772000.2010.517573>

Cheek M, Lughadha EN, Kirk P, Lindon H, Carretero J, Looney B, Douglas B, Haelewaters D, Gaya E, Llewellyn T, Ainsworth AM, Gafforov Y, Hyde K, Crous P, Hughes M, Walker BE, Forzza RC, Wong KM & Niskanen T (2020) New scientific discoveries: Plants and fungi. *Plants People Planet* 2: 371-388. <https://doi.org/10.1002/ppp3.10148>

Flora e Funga do Brasil. Jardim Botânico do Rio de Janeiro. Available at:
<<http://floradobrasil.jbrj.gov.br/>>. Access on 03 May 2023.

Funk VA (2006) Floras: a model for biodiversity studies or a thing of the past? *Taxon* 55: 581-588. <https://doi.org/10.2307/25065635>

Funk VA, Susanna A, Stuessy TF & Robinson H (2009) Classification of Compositae. In: Funk VA, Susanna A, Stuessy TF & Bayer RJ (eds.) *Systematics, Evolution, and Biogeography of Compositae*. IAPT, Vienna. Pp. 171-189.

Humphreys AM, Govaerts R, Ficinski SZ, Lughadha EN & Vorontsova MS (2019) Global dataset shows geography and life form predict modern plant extinction and rediscovery. *Nature, Ecology & Evolution* 3: 1043–1047. <https://doi.org/10.1038/s41559-019-0906-2>

Jeffrey C (2007) Introduction with key to tribes. In: Kadereit JW and Jeffrey C (eds.) *The families and genera of vascular plants. VIII. Flowering plants, Eudicots, Asterales*. Springer, Heidelberg. Pp. 61.

Joppa LN, Roberts DL, Myers N & Pimm SL (2011^a). Biodiversity hotspots house most undiscovered plant species. *PNAS* 108: 3.171-13.176. <https://doi.org/10.1073/pnas.1109389108>

Joppa LN, Roberts DL & Pimm SL (2011^b) How many species of flowering plants are there? *Proceeding of the Royal Society B* 278: 554-559. <https://doi.org/10.1098/rspb.2010.1004>

Keeley SC, Cantley JT, Gallaher TJ (2021) The “evil tribe” spreads across the land: A dated molecular phylogeny provides insight into dispersal, expansion, and biogeographic relationships within one of the largest tribes of the sunflower family (Vernonieae: Compositae). *American Journal of Botany* 108: 1-15. <https://doi.org/10.1002/ajb2.1614>

Lagomarsino LP, Frost LA (2020) The central role of taxonomy in the study of neotropical biodiversity. *Annals of the Missouri Botanical Garden* 105: 405-421. <https://doi.org/10.3417/2020601>

Lopes ITFV, Marques D, Nakajima JN (2021) The Eupatorieae tribe (Asteraceae) in Caparaó National Park, Espírito Santo/ Minas Gerais, Brazil. *Rodriguésia* 72: 1-30.

<https://doi.org/10.1590/2175-7860202172113>

Lughadha EN *et al.* (2020) Extinction risk and threats to plants and fungi. *Plants People Planet* 2: 389-408. <https://doi.org/10.1002/ppp3.10146>

Lughadha EN, Govaerts R, Belyaeva I, Black N, Lindon H, Allkin R, Magill RE & Nicolson N (2016) Counting counts: revised estimates of numbers of accepted species of flowering plants, seed plants, vascular plants and land plants with a review of other recent estimates. *Phytotaxa* 272: 082-088. <https://doi.org/10.11646/phytotaxa.272.1.5>

Mandel J, Barker MS, Bayer RJ, Dikow RB, Gao TG, Jones KE, Keeley S, Kilian N, Ma H, Siniscalchi CM, Susanna A, Thaphal R, Watson L & Funk VA (2017) The Compositae Tree of Life in the age of phylogenomics. *Journal of Systematics and Evolution* 55: 405–410.

<https://doi.org/10.1111/jse.12265>

Mandel JR, Dikow RB, Siniscalchi CM, Thapa R, Watson LE & Funk VA (2019) A fully resolved backbone phylogeny reveals numerous dispersals and explosive diversifications throughout the history of Asteraceae. *PNAS* 116: 14083-14088.

<https://doi.org/10.1073/pnas.1903871116>

MapBiomias. Estatísticas. Available at: < <https://mapbiomas.org/>>. Access on 03 May 2023.

Meireles LD, Kinoshita L & Shepherd GJ (2014) Composição florística da vegetação altimontana do distrito de Monte Verde (Camanducaia, MG), Serra da Mantiqueira Meridional, Sudeste do Brasil. *Rodriguésia* 65: 831-859. <https://doi.org/10.1590/2175-7860201465403>

Mittermeier RA, Gill PR, Hoffman M, Pilgrim J, Brooks T, Mittermeier CG, Lamoreux J, Fonseca GAB (2004). Hotspots revisited: earth's biologically richest and most endangered terrestrial ecoregions. CEMEX, Mexico. Pp. 392.

Mittermeier RA, Turner WR, Larsen FW, Brooks TM & Gascon C (2011) Global Biodiversity Conservation: The Critical Role of Hotspots. In: Zachos FE & Habel JC (eds.) Biodiversity Hotspots: Distribution and protection of conservation priority areas. 2011th Ed. Springer, New York. Pp. 3-22. https://doi.org/10.1007/978-3-642-20992-5_1

Moreira MM *et al.* (2020) A list of land plants of Parque Nacional do Caparaó, Brazil, highlights the presence of sampling gaps within this protected area. Biodiversity Data Journal 8: 1-26. <https://doi.org/10.3897/BDJ.8.e59664>

Monge, M. As tribos Barnadesieae e Mutisieae S. L. (Asteraceae) no estado de São Paulo, Brasil. 199 f. Dissertação (mestrado) – Universidade Estadual de Campinas, Instituto de Biologia, Campinas, 2011.

Monge, M.; Semir, J. Asteraceae Brecht. & J. Presl. na Serra do Japi. *In*: Vasconcellos-Neto, J., Polli, P.R. & Pentead-Dias, A.M. (Eds.) Novos Olhares, Novos Saberes sobre a Serra do Japi. Curitiba: CRV, 2012.

Myers N, Mittermeier RA, Mittermeier CG, Fonseca GAB & Kent J. (2000) Biodiversity hotspots for conservation priorities. Nature 403: 853-858. <https://doi.org/10.1038/35002501>

Pimm SL & Joppa LN (2015) How Many Plant Species are where, where are they, and at what rate are they going extinct? Annals of the Missouri Botanical Garden 100: 170-176. <https://doi.org/10.3417/2012018>

Rezende CL, Scarano FR, Assad ED, Joly CA, Metzger JP, Strassburg BBN, Tabarelli M, Fonseca GA, Mittermeier RA (2018) From hotspot to hopespot: An opportunity for the Brazilian Atlantic Forest. Perspectives in Ecology and Conservation 16: 208-2014. <https://doi.org/10.1016/j.pecon.2018.10.002>

Roque N, Teles AM & Nakajima JN (2017) A família Asteraceae no Brasil: classificação e diversidade. EDUFBA, Salvador. Pp. 260. <https://doi.org/10.7476/9788523219994>

Susanna A, Baldwin BG, Bayer RJ, Bonifacino JM, Garcia-Jacas N, Keeley SC, Mandel JR, Ortiz S, Robinson H & Stuessy TF (2020). The classification of the Compositae: A tribute to Vicki Ann Funk (1947–2019). *Taxon* 69: 807-814. <https://doi.org/10.1002/tax.12235>