Luísa Lucresia de Sales Ribeiro

# Myrtaceae distribution in the different vegetation types of the Espinhaço Mountain Range: floristic composition and environmental influence.

São Paulo

2022

Luísa Lucresia de Sales Ribeiro

# Distribuição de Myrtaceae em diferentes tipos vegetacionais da Cadeia do Espinhaço: composição florística e influência ambiental

# Myrtaceae distribution in the different vegetation types of the Espinhaço Mountain Range: floristic composition and environmental influence

Dissertação apresentada ao Instituto de Biociências da Universidade de São Paulo para obtenção do título de Mestre em Ciências, área de concentração em Botânica.

Orientador: Prof. Dr. Paulo Takeo Sano

São Paulo

2022

## Ficha Catalográfica

Lucresia de Sales Ribeiro, Luísa

Myrtaceae distribution in the different vegetation types of the Espinhaço Mountain Range: floristic composition and environmental influence

137 páginas

Dissertação (Mestrado) - Instituto de Biociências da Universidade de São Paulo. Departamento de Botânica.

1. Padrões florísticos 2. Banco de dados 3.Myrteae 4. Biogeografia ecológica I. Universidade de São Paulo. Instituto de Biociências. Departamento de Botânica

## Comissão Julgadora:

| | |
|---|---|
| Prof(a). Dr(a). | Prof(a). Dr(a). |

Prof. Dr. Paulo Takeo Sano

Orientador

À Jorge e Najla,

dedico.

“It (Successful research) depends to a large degree on
choosing an important problem and finding a way to solve it,
**even if imperfectly at first.**”

– Edward O. Wilson (em *Letters to a Young Scientist*)

# Agradecimentos

Gostaria de agradecer à Universidade de São Paulo e ao Instituto de Biociências da USP pela infraestrutura disponibilizada para minha formação acadêmica e desenvolvimento do presente trabalho.

Agradeço também à Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) pela concessão de bolsa (Processo 88887.360814/2019-00).

Agradeço ao meu orientador, Prof. Paulo Takeo Sano, por ter aceitado me orientar, pelas valiosas contribuições botânicas, pela paciência, confiança e pela sensibilidade em compreender meus tropeços e limitações.

Sou imensamente grata aos professores que contribuíram com minha formação durante o mestrado, em conversas informais, disciplinas ou bancas de qualificação: Profa. Adriana Martini (USP), Prof. Alexandre Adalardo (USP), Profa. Camila Castanho (Unifesp), Prof. Carolina Siniscalchi (MSU), Prof. Cristina Miyaki (USP), Prof. José Rubens Pirani (USP), Prof. Leonardo Borges (UFSCar), Prof. Leonardo Meireles (USP), Prof. Márcio Martins (USP), Prof. Maria Cristina Arias (USP), Prof. Matheus Fortes Santos (UFABC).

Agradeço aos professores, funcionários e amigos do Laboratório de Sistemática Vegetal da USP: Andressa Cabral, Annelise Frazão, Augusto Giaretta, Gisele Alves, Guilherme Antar, Jéssica Francisco, Jennifer Lopes, Prof. José Rubens Pirani, Luana Sauthier, Lucas Vilela, Profa. Lúcia Lohmann, Marcelo Kubo, Matheus Colli-Silva, Mirian Antonicelli, Raquel Pizzardo, Prof. Renato Mello-Silva, Renato Ramos, Roberta Figueiredo, Roberto Baptista, Sandra Reinales e Viviane Yuri Jono. Pelo acolhimento, pelas conversas enriquecedoras durante almoços e pausas de café e pela feliz (embora breve) convivência neste local especial.

Aos Mirtólogos, agradeço a presença solícita, a disponibilidade em mandar dados, discutir morfologia e a parceria em tentar desvendar juntos este grupo fascinante. Em especial: Augusto Giaretta, Duane F. Lima (e Caroline Harrison), Leidiana Santos, Thiago Fernandes e Thaís Vasconcelos. Gostaria de agradecer especialmente à Vanessa Staggemeier pela colaboração enriquecedora, essencial na construção do presente trabalho e na minha formação.

Agradeço também aos amigos do labFlora (Universidade Federal da Bahia), onde comecei minha formação acadêmica e onde sempre sinto que posso retornar

para discutir ciência, tomar um café e multiplicar risadas: a querida "pró" Nádia Roque, Daniel Morales, Fernanda Hurbath, Geovana Vieira, Lídia Campos, Maria Alves, Maria Líris Barbosa, Patrícia Steiner, Rodrigo Borges e Vivian Amorim. Agradeço especialmente à Aline Stadnik e Janine Melo, colaboradoras e grandes amigas, pelos ensinamentos taxonômicos valiosos e pela amizade sincera que nasceu de discussões botânicas e risadas em herbários.

Finalmente, agradeço à minha extensa rede de apoio extra-botânica, por me ensinarem tanto sobre o mundo, compreenderem minhas ausências e por serem calmaria em meio à muitas tempestades:

Os amigos: Adson Santana, Bruno Cajado, Erick Costa (Mai), Jaqueline Paraense, Leandro Leal, Lucas Rodrigues, Natália Ribeiro, Rodrigo Maia, Sara Dias, Thomas Wicks e Vitor Maronezzi.

Meu querido amigo e grande saudade Pedro Victor, cuja alegria e amor pela vida seguem me inspirando a ver o mundo com lentes mais coloridas.

Minha família Lucresia, e especialmente minha madrinha Vânia, companheira de cinema, de discussões profundas e meu primeiro e eterno lar em São Paulo.

Minha família Salles-Ribeiro e todos os meus (muitos) primos e tios. Em especial à família Coelho (meu tios Emanuel e Socorro e meu irmão Eduardo), a quem sempre posso recorrer como base de apoio e carinho.

Minhas avós Lygia, Linda e Ismaelita, que me ensinaram tanto sobre a vida e deixaram uma saudade inenarrável.

Gilnélia Pereira, que cuidou de mim durante grande parte da minha vida e a quem amo como mãe.

Finalmente, agradeço meus pais – Najla e Jorge, minha irmã Laís, meu cunhado Milton e meu sobrinho (que está a caminho!), as pessoas mais importantes da minha vida. Não existe sorte maior do que vir ao mundo com vocês para me guiar, inspirar, cuidar e amar.

# Summary

Resumo ........................................................................................................ 1

Abstract ...................................................................................................... 2

**Introduction**.............................................................................................. 3

  References.................................................................................................. 7

**Chapter One.** Myrtaceae composition throughout the Espinhaço Mountain Range: Distribution and similarity patterns across different geomorphological structures and vegetation types.............................................................................................. 13

  Abstract..................................................................................................... 14

  Introduction .............................................................................................. 14

  Materials and Methods .............................................................................. 16

  Results...................................................................................................... 19

  Discussion................................................................................................. 25

  References................................................................................................. 30

  Tables and Figures..................................................................................... 44

  Supplementary material ............................................................................. 71

**Chapter Two.** Environmental drivers of Myrtaceae beta-diversity turnover in different vegetation types of the Espinhaço Mountain Range, Brazil...................................... 102

  Abstract.................................................................................................... 103

  Introduction ............................................................................................. 103

  Materials and Methods ............................................................................. 105

  Results..................................................................................................... 108

  Discussion................................................................................................ 110

  References................................................................................................ 117

  Tables and Figures.................................................................................... 125

  Supplementary Material ............................................................................ 129

**General Conclusions** ................................................................................ 136

# Resumo

A Cadeia do Espinhaço (Espinhaço Mountain Range - EMR) é uma das regiões de maior diversidade florística da América do Sul, englobando um mosaico de fitofisionomias altamente diversas. Dentre os grupos de angiospermas que ocorrem nessas paisagens, Myrtaceae é destacada por sua diversidade e relevância ecológica. A família foi incluída em 13 inventários florísticos na EMR; contudo, esse número parece ser insuficiente para a compreensão de toda sua diversidade na área. Dessa forma, o objetivo desta dissertação foi revisar a composição, o esforço amostral e a distribuição de Myrtaceae em diferentes montanhas e vegetações da EMR e investigar os fatores ambientais que moldam esses padrões. Bancos de dados online, floras locais e descrições de espécies foram compilados, espécimes foram analisados em herbários e um banco de dados foi construído com 12.848 registros. Padrões florísticos foram investigados usando NMDS. Variáveis edáficas e climáticas associadas com a distribuição das espécies foram investigadas com GDM. Foram encontrados 17 gêneros e 281 espécies, das quais 42 spp. são endêmicas. Os gêneros mais diversos (*Eugenia* e *Myrcia*) também são os mais especiosos entre as Myrtaceae neotropicais, mas o endemismo foi desigual dentro dos clados. A maioria das espécies não é endêmica, estando distribuídas em domínios morfoclimáticos adjacentes – especialmente na Mata Atlântica, centro de diversidade de Myrteae e origem de grandes linhagens. A diversidade em diferentes subdivisões geomorfológicas foi correlacionada ao esforço amostral, ambos concentrados no Espinhaço Meridional, na Chapada Diamantina e no Quadrilátero Ferrífero. Florestas abrangeram o maior número de espécies e espécies exclusivas, embora o número de generalistas tenha crescido ao comparar o banco de dados com informações da literatura. Padrões de similaridade não recuperaram estruturas geomorfológicas ou subdivisões encontradas para outras famílias de angiospermas. Fatores edáficos relacionados à disponibilidade de nutrientes e capacidade de retenção de água do solo foram os preditores mais relevantes para a distribuição das espécies, alinhando-se com estudos que avaliam a distribuição de espécies em vegetações empobrecidas de nutrientes. Preditores climáticos e distância geográfica, embora citados anteriormente como expressivos para outras angiospermas em campos rupestres, não foram altamente significativos para Myrtaceae.

**Palavras-chave:** Banco de dados; Padrões florísticos; Myrteae; Biogeografia ecológica;

# Abstract

The Espinhaço Mountain Range (EMR) is one of the most floristically diverse regions in South America, encompassing a mosaic of highly diverse phytophysiognomies. Among angiosperm groups that occur in these landscapes, Myrtaceae has been consistently highlighted for its diversity and ecological relevance. Although the family has been previously included in 13 comprehensive inventories in the EMR, this number is still insufficient to comprehend Myrtaceae richness and species distribution in the area. Therefore, the aim of the present dissertation was to review Myrtaceae composition, sampling effort and distribution in different mountains and vegetation types of the Espinhaço Mountain Range and investigate environmental drivers that shape these patterns. Online databases, local floras and species descriptions were compiled, specimens were analyzed in herbaria and a comprehensive database was constructed with 12,848 records. Floristic patterns were investigated using NMDS. Climatic and edaphic variables associated with species turnover in the study area were investigated with a GDM. There were found 17 genera and 281 species, from which 42 spp. are endemic to the EMR. The most diverse genera (*Eugenia* and *Myrcia*) were also the most speciose among neotropical Myrtaceae, but species endemism was proportionally uneven within clades. Contrary to previous assessments, Myrtaceae species were mostly not endemic, being distributed in the adjacent morphoclimatic domains – especially the Atlantic Forest, a center of Myrteae diversity and origin of major lineages. Diversity in different geological subdivisions were correlated to sampling effort, both concentrated in the Southern Espinhaço, Chapada Diamantina and Iron Quadrangle. Forests encompassed the highest number of overall and exclusive species, although the number of habitats generalists grew comprehensively when comparing the database with data from literature. Similarity patterns did not recover geomorphological groups or subdivisions previously found for other angiosperm families. Edaphic predictors related to nutrient availability and soils water holding capacity were the most relevant drivers of Myrtaceae species turnover in different vegetation types within the EMR, aligning with previous studies assessing species distribution in nutrient impoverished phytophysiognomies. Climatic predictors and geographical distance, though previously cited as expressive for other angiosperms in campos rupestres, were not highly significant for Myrtaceae.

**Keywords:** Botanical database; Floristic patterns; Myrteae; Ecological biogeography;

# Introduction

Neotropical mountain formations have been highlighted for its enigmatic immense diversity since Humboldt expeditions in the XIX century, comprising large refugia for biodiversity in highly fragmented and vulnerable landscapes (Bitencourt *et al.* 2016; Martinelli 2007; Rahbek *et al.* 2019). Among mountain ecosystems worldwide, formations in east Brazil are underlined for its immense diversity despite small topographic complexity (Rahbek *et al.* 2019). The mountains in these regions were originally described as the Espinhaço Mountain Range (EMR) in 1822 by Wilhem von Eschwege (Derby 1906; Renger 2005). Since Eschwege, multiple studies have revaluated the EMR geology and circumscription: Derby (1906) reduced the EMR to the mountain ranges within the Minas series, therefore excluding areas known today as “Serra da Mantiqueira” and “Serra do Mar”, and Bruni *et al.* (1974) proposed the denomination of the Espinhaço Supergroup, dividing the EMR in two stratigraphic groups and therefore excluding the Iron Quadrangle of its circumscription.

The current delimitation of Espinhaço Mountain Range follows, simultaneously, Bruni *et al.* (1974) and Derby (1906). Some biodiversity assessments focus on the Espinhaço *sensu lato* (*sensu* Derby 1906), extending over 1270 km from Juazeiro (BA) to Ouro Branco (MG) (Derby 1906; Harley 1995; Harley & Simmons 1986), and others focus on Espinhaço *sensu stricto* (*sensu* Bruni *et al.* 1974), extending over 1200 km from Juazeiro (BA) to Barão de Cocais (MG) – as this is the southern limit to the Espinhaço supergroup distribution (Renger 2005). Internally, multiple geomorphological subdivisions have been adopted. One of the most comprehensive of them segments the mountain range in three main structures: Southern Espinhaço, in central-south Minas Gerais; Northern Espinhaço, in north of Minas Gerais and southwest of Bahia; and Chapada Diamantina, in central Bahia (Danderfer & Dardenne 2002; Saadi 1995). Nonetheless, these structures are composed by smaller geological or political subdivisions: The Southern Espinhaço can be divided in Serra do Cabral and Diamantina Plateau; the Northern Espinhaço is usually divided according in North/South according to the distribution of Brazilian Semiarid; and the Chapada Diamantina is composed of a central structure and the “Piemonte da Diamantina”, a portion in northeast deeply embedded within the Caatinga domain.

The mountain range encompasses a wide latitudinal variation, crossing three highly diverse and very ecologically distinct Brazilian Morphoclimatic domains: the Caatinga, the Cerrado and the Atlantic Forest. Variations in elevation and soil properties, in addition to these heterogeneous climatic influences, render a fragmented landscape with a mosaic of different phytophysiognomies that have been described in detail by a few comprehensive floras (*e.g.* Harley & Simmons 1986; Harley 1995; Pirani *et al.* 2003; Zappi *et al.* 2003). As the northern portion of the EMR is surrounded by the Caatinga Domain, lower elevations in this area are usually occupied by vegetation types intrinsically linked to leaf loss and desiccation, such as caatinga *sensu lato* (Andrade-Lima 1981). Intermediate elevations or lower elevations within the southmost portion of the EMR are usually covered by the wide continuum of cerrado *sensu lato* (campos limpos, campos sujos, campos cerrado, cerrado *sensu stricto* and cerradão), usually associated with marked seasonality and deep, aluminum-rich soils (Coutinho 1978). Mountaintops in the EMR are covered by shallow, rocky, and impoverished soils, with an overall predominance of highly diverse rocky outcrops like campos rupestres and cangas ferruginosas (ferruginous ironstones). Finally, throughout the mountain range, in areas with favorable edaphic conditions, there is the occasional occurrence of a wide array of forest vegetations that vary according to water availability: deciduous, semi-deciduous, nebular, riparian forests and "capões de mata" (disjunct evergreen and broadleaved tropical forests located on mountain slopes or swamps, according to Coelho 2014).

Although there are multiple studies assessing geological subdivisions in the EMR (*e.g.* Abreu, 1995; Chemale Jr. *et al.*, 2011; Dossin *et al.*, 1990; Martins-Neto, 1998), few investigations have emphasized biodiversity distribution in the region and proposed biogeographical subdivisions that accords to biota current distribution and the evolutionary history. Among them, few papers have investigated these patterns for specific taxonomical groups solely occurring in campos rupestres, like subdivisions proposed for *Minaria* – Apocynaceae (Ribeiro *et al.* 2014), Asclepiadoideae – Apocynaceae (Bitencourt *et al.* 2016), Asteraceae (Campos *et al.* 2019) and Microlicieae – Melastomataceae (Pacifico *et al.* 2021), and one comprehensive paper recognized biogeographical regions for campos rupestres using the distribution of endemic species (Colli-Silva *et al.* 2019). Nonetheless, these subdivisions are still incongruent, potentially indicating that distinct biological models present different distribution patterns. Since the EMR comprehends one of the most floristically diverse areas in South America, more investigations are needed to fully comprehend its diversity distribution (Giulietti *et al.* 1996; Harley 1995; Harley & Simmons 1986; Neves *et al.* 2018; Silveira *et al.* 2016).

Among one of the most species-rich families in the mountain range and surrounding biomes (Bridgewater *et al.* 2004; Oliveira-Filho & Fontes 2000), Myrtaceae is an angiosperm family with pantropical distribution. Worldwide it is represented by ca. 130 genera and over 6000 species with diversity centers in southeast Asia, Australia and tropical America (Lucas *et al.* 2019; Wilson *et al.* 2001). The family is divided, according to molecular data, in subfamilies Psiloxyloideae – with two tribes, and Myrtoideae – with fifteen tribes (Wilson *et al.* 2005). In South America, Myrtaceae is almost exclusively represented by species of the Myrteae tribe, the richest of the Myrtoideae subfamily with ca. 49 genera and over 2500 species, including large genera *Eugenia* and *Myrcia*. Myrteae is morphologically characterized by its simple opposite leaves with oil glands, flowers with numerous stamens, inferior ovaries and indehiscent fleshy fruits (Lucas *et al.* 2007; Wilson *et al.* 2005). Myrteae morphological characters provide the group with a unique ecological relevance, maintaining strong interactions with pollinators and animal dispersers due to high quantity of pollen produced and year-round production of fleshy fruits – being of central relevance for the upkeep of frugivores in tropical environments (Gressler *et al.* 2006; Staggemeier *et al.* 2017).

Despite its great ecological and taxonomical relevance, studies including Myrtaceae are still insipient, mostly due to difficulty in taxon recognition. This can be mostly attributed to the homogeneous morphology and consequent taxonomical complexity of the group, that historically has been based on cryptic morphological characters such as embryo shape and the number of ovules and locules in the ovary (Landrum & Kawasaki 1997; McVaugh 1968). Consequently, floristic inventories including Myrtaceae frequently included extensive lists with imprecise identifications, reinforcing the existing knowledge gap (Soares-Silva 2000). Nevertheless, in the last 20 years there has been a significant breakthrough in Myrtaceae taxonomy, with multiple phylogenies and taxonomical revisions elucidating the relationships within subfamilies, tribes, genera, and sections within massive genera. This combined effort of taxonomists around the globe allowed future papers to reassess Myrtaceae distribution within complex landscapes based on more accurate and reliable taxonomical identifications. Therefore, though there is still major taxonomical progress to be made within Myrtaceae, we have reached a prime point where we can reevaluate what we already know about its species.

In the Espinhaço Mountain Range, the family is highlighted for its diversity in different phytophysiognomies, especially in areas of rocky outcrops and forests (Giulietti *et al.* 1987; Zappi *et al.* 2003). Myrtaceae have been included in 13 comprehensive floristic inventories in the area, with a total of 14 genera and 152 species (Lucresia *et al.* 2021). Still, these occurrences are limited to floristic surveys in restricted areas and there are major knowledge gaps concerning the overall distribution of these species in different vegetation types and areas that lack formal assessments. Though these investigations provided valuable insight onto species richness, it is relevant not only to assess the overall number of species, but also to understand the patterns and causes of current distribution to understand how diversity was shaped across time and space (Soininen 2010). Though biodiversity studies have historically focused on alpha-diversity, patterns of species distribution have been recognized as useful to understand and develop hypothesis about the underlying processes that drive diversity patterns, which is extremely valuable in a scenario of climate change and biodiversity crisis (Gaston 2000; Soininen *et al.* 2007).

Species distribution are a combination of multiple factors, such as biogeographical history, ecological interactions, and suitability to abiotic variables, which directly impact colonization, survival and dispersal of organisms and species (Cox & Moore 2005). Nonetheless, the proportion of variation driven by these factors varies. For flowering plants, previous investigations stressed the relevance of temperature and precipitation – as they affect vital processes related to plant growth and reproduction (Hedhly *et al.* 2009; Lawson & Rands 2019; Saiter *et al.* 2016; Toledo *et al.* 2011), but others pointed to a high overall relevance of edaphic factors – as these variables pose a bigger challenge to plant establishment and growth in environments with low nutrient or water availability (Bueno *et al.* 2018; Ulrich *et al.* 2014). Nevertheless, since beta diversity is related to organisms' physiology and evolutionary biogeographical processes, multiple studies are required to understand how different communities respond to similar constraints (Soininen *et al.* 2007).

Few studies have investigated environmental drivers of species beta diversity turnover in the Espinhaço Mountain Range. A few investigations have explored the relation between edaphic variations and community composition in campos rupestres, all of them in local scales (*e.g.* Carmo & Jacobi, 2016; Conceição & Pirani, 2005). Other studies have investigated large-scale patterns, all of which focused in campos rupestres, either with one taxonomic group or overall species composition (Campos *et al.* 2019; Neves *et al.* 2018; Pacifico *et al.* 2021). Since no previous study has investigated environmental influence in different vegetation types of the Espinhaço Mountain Range using the same biological model, and given Myrtaceae representativeness in different landscapes, the family is a prime model to compare environmental drivers of species turnover with other previously investigated biological models and across different vegetation types.

Therefore, the present work aims to (1) List Myrtaceae species for the Espinhaço Mountain Range and their distributions regarding vegetation preferences and geographical ranges; (2) Investigate if distinct geomorphological structures reflect distinct floristic patterns for Myrtaceae; (3) Identify areas with little collection effort that should be prioritized in future assessments; and (4) Identify which environmental predictors, if any, are relevant drivers of Myrtaceae species turnover in the study area. This dissertation comprises two manuscripts formatted according to their target journals. The first chapter is a comprehensive analysis of Myrtaceae distribution in the Espinhaço Mountain Range, including species occurrence within different geomorphological structures and vegetation types, similarity patterns across the study area and the recognition of the most relevant knowledge gaps for this angiosperm group. The second chapter assesses Myrtaceae biogeographical ecology in the EMR, investigating which climatic or pedological predictors are drivers of Myrtaceae turnover in different vegetation types of the study area – and comparing these results with other angiosperm groups.

## References

Abreu, P.A.A. (1995) O Supergrupo Espinhaço da Serra do Espinhaço Meridional (Minas Gerais): o Rifte, a Bacia e o Orógeno. *Geonomos* 3: 1–18. https://doi.org/10.18285/geonomos.v3i1.211

Andrade-Lima, D. de (1981) The Caatingas dominium. *Revista Brasileira de Botanica* 4: 149–153.

Bitencourt, C., Rapini, A., Santos Damascena, L. & De Marco Junior, P. (2016) The worrying future of the endemic flora of a tropical mountain range under climate change. *Flora: Morphology, Distribution, Functional Ecology of Plants* 218: 1–10. https://doi.org/10.1016/j.flora.2015.11.001

Bridgewater, S., Ratter, J.A. & Ribeiro, J.F. (2004) Biogeographic patterns, beta-diversity and dominance in the Cerrado biome of Brazil. *Biodiversity and Conservation* 13: 2295–2318. https://doi.org/10.2307/1931725

Bruni, M.A.L., Almeida, J.T. de & Bruni, D.C. (1974) Folha Rio São Francisco (SC. 23). *Carta Geológica do Brasil ao Milionésimo*. Departamento Nacional da Produção Mineral (DNPM), Brasília.

Bueno, M.L., Dexter, K.G., Pennington, R.T., Pontara, V., Neves, D.M., Ratter, J.A. &

Oliveira-Filho, A.T. (2018) The environmental triangle of the Cerrado Domain: Ecological factors driving shifts in tree species composition between forests and savannas. *Journal of Ecology* 106: 2109–2120. https://doi.org/10.1111/1365-2745.12969

Campos, L., Freire Moro, M., Funk, V.A. & Roque, N. (2019) Biogeographical review of Asteraceae in the Espinhaço Mountain Range, Brazil. *The Botanical Review* 85: 293–336. https://doi.org/10.1007/s12229-019-09216-9

Carmo, F.F. & Jacobi, C.M. (2016) Diversity and plant trait-soil relationships among rock outcrops in the Brazilian Atlantic rainforest. *Plant and Soil* 403: 7–20. https://doi.org/10.1007/s11104-015-2735-7

Chemale Jr., F., Dussin, I.A., Martins, M. & Santos, M.N. (2011) Nova abordagem tectono-estratigráfica do Supergrupo Espinhaço em sua porção meridional (MG). *Geonomos* 19: 173–41. https://doi.org/10.18285/geonomos.v19i2.52

Colli-Silva, M., Vasconcelos, T.N.C. & Pirani, J.R. (2019) Outstanding plant endemism levels strongly support the recognition of campo rupestre provinces in mountaintops of eastern South America. *Journal of Biogeography* 46: 1723–1733. https://doi.org/10.1111/jbi.13585

Conceição, A.A. & Pirani, J.R. (2005) Delimitação de habitats em campos rupestres na Chapada Diamantina, Bahia: substratos, composição florística e aspectos estruturais. *Boletim de Botânica da Universidade de São Paulo* 23: 85–111.

Coutinho, L.M. (1978) O conceito de cerrado. *Revista Brasileira de Biologia* 1: 17–23.

Cox, C.B. & Moore, P.D. (2005) *Biogeography: An Ecological and Evolutionary Approach*. 7th ed. C. B. Cox & P. D. Moore (eds.). Blackwell Publishing. 208 pp.

Danderfer, A. & Dardenne, M.A. (2002) Tectonoestratigrafia da Bacia Espinhaço na porção Centro-Norte do cráton do São Francisco: registro de uma evolução poliistórica descontínua. *Revista Brasileira de Geociências* 32: 449–460. https://doi.org/10.25249/0375-7536.2002324449460

Derby, O.A. (1906) The Serra do Espinhaço, Brazil. *The Journal of Geology* 14: 374–401.

Dossin, I.A., Dossin, T.M. & Chaves, M.L.S.C. (1990) Compartimentação estratigráfica do Supergrupo Espinhaço em Minas Gerais - Os Grupos Diamantina e Conselheiro Mata. *Revista Brasileira de Geociências* 20: 178–186. https://doi.org/10.25249/0375-7536.1990178186

Gaston, K.J. (2000) Global patterns in biodiversity. *Nature* 405: 220–227. https://doi.org/10.1038/35012228

Giulietti, A.M., Menezes, N.L., Pirani, J.R., Meguro, M. & Wanderley, M.G.L. (1987) Flora da Serra do Cipó, Minas Gerais: caracterização e lista das espécies. *Boletim de Botânica da Universidade de São Paulo* 9: 1–151.

Giulietti, A.M., Wanderley, M.G.L., Longhi-Wagner, H.M., Pirani, J.R. & Parra, L.R. (1996) Estudos em “sempre-vivas”: taxonomia com ênfase nas espécies de Minas Gerais, Brasil. *Acta Botanica Brasilica* 10: 329–377. https://doi.org/10.1590/s0102-33061996000200007

Gressler, E., Pizo, M.A. & Morellato, L.P.C. (2006) Polinização e dispersão de sementes em Myrtaceae do Brasil. *Revista Brasileira de Botanica* 29: 509–530. https://doi.org/10.1590/S0100-84042006000400002

Harley, R.M. (1995) Introduction. *In*: B. L. Stannard (ed.) *Flora of the Pico das Almas*. Kew, Royal Botanic Gardens, pp. 1–37.

Harley, R.M. & Simmons, N.A. (1986) *Florula of Mucugê, Chapada Diamantina, Bahia, Brazil: A descriptive check-list of a campo rupestre area*. 1st ed. Royal Botanical Gardens. 228 pp.

Hedhly, A., Hormaza, J.I. & Herrero, M. (2009) Global warming and sexual plant reproduction. *Trends in Plant Science* 14: 30–36. https://doi.org/10.1016/j.tplants.2008.11.001

Landrum, L.R. & Kawasaki, M.L. (1997) The genera of Myrtaceae in Brazil: An illustrated synoptic treatment and identification keys. *Brittonia* 49: 508–536. https://doi.org/10.2307/2807742

Lawson, D.A. & Rands, S.A. (2019) The effects of rainfall on plant–pollinator interactions. *Arthropod-Plant Interactions* 13: 561–569. https://doi.org/10.1007/s11829-019-09686-z

Lucas, E.J., Harris, S.A., Mazine, F.F., Belsham, S.R., Nic Lughadha, E.M., Telford, A., Gasson, P.E. & Chase, M.W. (2007) Suprageneric phylogenetics of Myrteae, the generically richest tribe in Myrtaceae (Myrtales). *Taxon* 56: 1105–1128. https://doi.org/10.2307/25065906

Lucas, E.J., Holst, B., Sobral, M., Mazine, F.F., Nic Lughadha, E.M., Barnes Proença, C.E., Ribeiro da Costa, I. & Vasconcelos, T.N.C. (2019) A new subtribal classification of Tribe Myrteae (Myrtaceae). *Systematic Botany* 44: 560–569.

https://doi.org/10.1600/036364419x15620113920608

Lucresia, L., Stadnik, A., Campos, L. & Roque, N. (2021) Myrtaceae floristic survey and vegetation distribution in a central portion of Chapada Diamantina, Brazil. *Phytotaxa* 498: 71–86. https://doi.org/10.11646/phytotaxa.498.2.1

Martinelli, G. (2007) Mountain biodiversity in Brazil. *Revista Brasileira de Botanica* 30: 587–597. https://doi.org/10.1590/S0100-84042007000400005

Martins-Neto, M.A. (1998) O Supergrupo Espinhaço em Minas Gerais: registro de uma bacia rifte-sag do Paleo/Mesoproterozóico. *Revista Brasileira de Geociências* 28: 151–168. https://doi.org/10.25249/0375-7536.1998151168

McVaugh, R. (1968) The genera of American Myrtaceae: an interim. *Taxon* 17: 354–418. https://doi.org/10.2307/1217393

Neves, D.M., Dexter, K.G., Pennington, R.T., Bueno, M.L., Miranda, P.L.S. & Oliveira-Filho, A.T. (2018) Lack of floristic identity in campos rupestres — A hyperdiverse mosaic of rocky montane savannas in South America. *Flora: Morphology, Distribution, Functional Ecology of Plants* 238: 24–31. https://doi.org/10.1016/j.flora.2017.03.011

Oliveira-Filho, A.T. & Fontes, M.A.L. (2000) Patterns of floristic differentiation among atlantic forests in southeastern Brazil and the influence of climate. *Biotropica* 32: 793–810. https://doi.org/10.1111/j.1744-7429.2000.tb00619.x

Pacifico, R., Almeda, F. & Fidanza, K. (2021) Modeling of Microlicieae (Melastomataceae) species composition provides insights into the evolution of campo rupestre vegetation on eastern Brazilian mountaintops. *Flora: Morphology, Distribution, Functional Ecology of Plants* 281. https://doi.org/10.1016/j.flora.2021.151850

Pirani, J.R., Mello-Silva, R. & Giulietti, A.M. (2003) Flora de Grão-Mogol, Minas Gerais, Brasil. *Boletim de Botânica da Universidade de São Paulo* 21: 1–24. https://doi.org/10.11606/issn.2316-9052.v21i1p1-24

Rahbek, C., Borregaard, M.K., Colwell, R.K., Dalsgaard, B., Holt, B.G., Morueta-Holme, N., Nogues-Bravo, D., Whittaker, R.J. & Fjeldså, J. (2019) Humboldt's enigma: What causes global patterns of mountain biodiversity? *Science* 365: 1108–1113. https://doi.org/10.1126/science.aax0149

Renger, F.E. (2005) O "Quadro Geognóstico Do Brasil" De Wilhelm Ludwig Von Eschwege: breves comentários à sua visão da geologia no Brasil. *Geonomos* 13:

91–95. https://doi.org/10.18285/geonomos.v13i1e2.139

Ribeiro, P.L., Rapini, A., Damascena, L.S. & Van den Berg, C. (2014) Plant diversification in the espinhaço range: Insights from the biogeography of *Minaria* (Apocynaceae). *Taxon* 63: 1253–1264. https://doi.org/10.12705/636.16

Saadi, A. (1995) A Geomorfologia da Serra do Espinhaço em Minas Gerais e de suas margens. *Geonomos* 3: 41–63. https://doi.org/10.18285/geonomos.v3i1.215

Saiter, F.Z., Brown, J.L., Thomas, W.W., Oliveira-Filho, A.T. & Carnaval, A.C. (2016) Environmental correlates of floristicregions and plant turnover in the Atlantic Forest hotspot.pdf. *Journal of Biogeography* 43: 2322–2331. https://doi.org/10.1111/jbi.12774

Silveira, F.A.O., Negreiros, D., Barbosa, N.P.U., Buisson, E., Carmo, F.F., Carstensen, D.W., Conceição, A.A., Cornelissen, T.G., Echternacht, L., Fernandes, G.W., Garcia, Q.S., Guerra, T.J., Jacobi, C.M., Lemos-Filho, J.P., Le Stradic, S., Morellato, L.P.C., Neves, F.S., Oliveira, R.S., Schaefer, C.E., Viana, P.L. & Lambers, H. (2016) Ecology and evolution of plant diversity in the endangered campo rupestre: a neglected conservation priority. *Plant and Soil* 403: 129–152. https://doi.org/10.1007/s11104-015-2637-8

Soininen, J. (2010) Species turnover along abiotic and biotic gradients: Patterns in space equal patterns in time? *BioScience* 60: 433–439. https://doi.org/10.1525/bio.2010.60.6.7

Soininen, J., Lennon, J.J. & Hillebrand, H. (2007) A multivariate analysis of beta diversity across organisms and environments. *Ecology* 88: 2830–2838. https://doi.org/10.1890/06-1730.1

Staggemeier, V.G., Cazetta, E. & Morellato, L.P.C. (2017) Hyperdominance in fruit production in the Brazilian Atlantic Rainforest: the functional role of plants in sustaining frugivores. *Biotropica* 49: 71–82. https://doi.org/10.1111/btp.12358

Toledo, M., Poorter, L., Peña-Claros, M., Alarcón, A., Balcázar, J., Leaño, C., Licona, J.C., Llanque, O., Vroomans, V., Zuidema, P. & Bongers, F. (2011) Climate is a stronger driver of tree and forest growth rates than soil and disturbance. *Journal of Ecology* 99: 254–264. https://doi.org/10.1111/j.1365-2745.2010.01741.x

Ulrich, W., Soliveres, S., Maestre, F.T., Gotelli, N.J., Quero, J.L., Delgado-Baquerizo, M., Bowker, M.A., Eldridge, D.J., Ochoa, V., Gozalo, B., Valencia, E., Berdugo, M., Escolar, C., García-Gómez, M., Escudero, A., Prina, A., Alfonso, G., Arredondo, T., Bran, D., Cabrera, O., Cea, A.P., Chaieb, M., Contreras, J., Derak, M., Espinosa, C.I., Florentino, A., Gaitán, J., Muro, V.G., Ghiloufi, W., Gómez-González, S., Gutiérrez, J.R., Hernández, R.M., Huber-Sannwald, E., Jankju, M., Mau, R.L., Hughes, F.M., Miriti, M., Monerris, J., Muchane, M., Naseri, K., Pucheta, E., Ramírez-Collantes, D.A., Raveh, E., Romão, R.L., Torres-Díaz, C., Val, J., Veiga, J.P., Wang, D., Yuan, X. & Zaady, E. (2014) Climate and soil attributes determine plant species turnover in global drylands. *Journal of Biogeography* 41: 2307–2319. https://doi.org/10.1111/jbi.12377

Wilson, P.G., O'Brien, M.M., Gadek, P.A. & Quinn, C.J. (2001) Myrtaceae revisited: A reassessment of infrafamilial groups. *American Journal of Botany* 88: 2013–2025. https://doi.org/10.2307/3558428

Wilson, P.G., O'Brien, M.M., Heslewood, M.M. & Quinn, C.J. (2005) Relationships within Myrtaceae *sensu lato* based on a matK phylogeny. *Plant Systematics and Evolution* 251: 3–19. https://doi.org/10.1007/s00606-004-0162-y

Zappi, D.C., Lucas, E., Stannard, B.L., Nic Lughadha, E., Pirani, J.R., Queiroz, L.P., Atkins, S., Hind, D.J.N., Giulietti, A.M., Harley, R.M. & Carvalho, A.M. (2003) Lista das plantas vasculares de Catolés, Chapada Diamantina, Bahia, Brasil. *Boletim de Botânica da Universidade de São Paulo* 21: 345–398.

## Chapter One.

# Myrtaceae composition throughout the Espinhaço Mountain Range: Distribution and similarity patterns across different geomorphological structures and vegetation types

*Target journal: The Botanical Review*

## Abstract

Myrtaceae is a highly diverse family among angiosperms, being highlighted for its species richness in different vegetation types within Brazil. The aim of the present work was to analyze Myrtaceae composition, distribution patterns and sampling effort in different mountains and vegetations types of the Espinhaço Mountain Range, one of the most floristically diverse regions in South America. Specimens were analyzed in herbaria and a comprehensive database was compiled with 12,848 records and their occurrences. Floristic patterns were investigated using NMDS. There were found 17 genera and 281 species, from which 42 spp. are endemic to the Espinhaço. Sampling effort was correlated with diversity, being concentrated in the Southern Espinhaço, Chapada Diamantina and Iron Quadrangle. Though the number of habitats generalists grew when comparing the database with literature, forests presented the highest number of overall and exclusive species. Floristic patterns did not recover subdivisions previously found for other angiosperm families and most non-endemic species also occurred in the Atlantic Forest – coinciding with overall diversity of Myrtaceae and the origin of major Myrteae lineages.

**Keywords:** Botanical database; Floristic patterns; Inventory; Myrteae;

## I. Introduction

Tropical mountain formations have been highlighted for its enigmatic immense diversity and biogeographical relevance since Alexander von Humboldt expeditions in the early of 19th century, presenting a large number of endemic species, important refugia for diversity and being situated in extremely vulnerable areas, facing habitat loss and climate change (Martinelli, 2007; Bitencourt *et al.*, 2016; Rahbek *et al.*, 2019). Despite its diversity and vulnerability, in Brazil there are still major knowledge gaps concerning mountains and its biological composition (Giulietti *et al.*, 1987). In this context, the Espinhaço Mountain Range (EMR) is located between two major Brazilian hotspots (The Atlantic Rainforest and the Cerrado) and it has been pointed as one of the most floristically diverse regions in South America and one of the most relevant for conservation purposes (Harley & Simmons, 1986; Rapini *et al.*, 2008; Silveira *et al.*, 2016; Neves *et al.*, 2018).

Due to its great latitudinal, altitudinal and pedogeomorphological variation, the EMR comprehends a complex landscape composed by a mosaic of campos rupestres, ferruginous cangas, caatinga *lato sensu*, cerrado *lato sensu* and a wide range of forests: seasonal, evergreen, riparian and nebular (Giulietti & Pirani, 1988; Carmo &

Jacobi, 2013; Moro *et al.*, 2014; G. W. Fernandes, 2016). This diversity of phytophysiognomies have been stressed as a huge challenge to describe and understand mountain biodiversity, as it is hard to comprehend how species are distributed within those gradients of different environments and how narrow species distribution is (Rahbek *et al.*, 2019). In this area, many floristic surveys have been carried out, all emphasizing the diversity and number of endemic species – especially in campos rupestres. In these studies, a few taxonomical groups are stressed for its diversity in different vegetation types, being Myrtaceae highlighted in several of them, especially in forests (Meguro *et al.*, 2007; M. F. Santos, Serafim, & Sano, 2012; Campos *et al.*, 2017).

Myrtaceae is a highly diverse family among angiosperms. In Brazil, it is represented by 29 genera (four endemic) and 1192 species (782 endemic) with greater diversity in the Atlantic Forest (Flora do Brasil 2020). Despite being consistently highlighted for its diversity and ecological relevance and going through great taxonomical progress in the last thirty years, there are still major gaps on the knowledge of Myrtaceae distribution due to difficulty towards taxon recognition (McVaugh, 1968; Landrum & Kawasaki, 1997; Fiorella Fernanda Mazine *et al.*, 2014, 2018; Fiorella F. Mazine *et al.*, 2016; Staggemeier, Cazetta, & Morellato, 2017; E. J. Lucas *et al.*, 2018; Amorim *et al.*, 2019; Vasconcelos, Prenner, & Lucas, 2019). Thirteen floristic surveys including Myrtaceae have been carried out in the Espinhaço Mountain Range (Kawasaki, 1989, 2004; Nic Lughadha, 1995; Zappi *et al.*, 2003; Hatschbach *et al.*, 2006; Morais & Lombardi, 2006; M. de O. Bünger, 2011; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Stadnik, Oliveira, & Roque, 2016, 2018; Lucresia *et al.*, 2021; P. S. N. dos Santos *et al.*, 2021). These surveys, although essential towards understanding Myrtaceae diversity, are unevenly distributed in the mountain range and mainly focused on the diversity within campos rupestres and forests, overlooking diversity in other vegetation types and biasing the distribution knowledge we have about this group so far.

Therefore, the aim of the present work is to analyze, through a comprehensive floristic survey, all information regarding Myrtaceae composition, distribution patterns and sampling effort in the Espinhaço Mountain Range and within its different geomorphological structures and vegetation types, as well as comprehend how the non-endemic species that occur in the EMR are distributed in the adjacent morphoclimatic domains of Brazil.

## II. Materials and Methods

### A. Delimitation of the study area

The study area was delimited by overlapping geodiversity and altitude data for the states of Bahia and Minas Gerais and then selecting aggregated pixels with mountainous reliefs and elevation equal or higher than 900m. This elevation threshold has been previously adopted by other authors (Echternacht *et al.*, 2011) as it allows a clearer delimitation of the main geological structures within the mountain range. Although the east, west and northern borders were easily detectable using this method, the south limit to the Espinhaço Mountain Range was hardly detectable due to its proximity to “Serra da Mantiqueira”, another mountain range in central-south Minas Gerais with different age and origin. Therefore, the south border was delimitated according to literature by selecting “Serra do Ouro Branco”, in the Ouro Branco municipality, as its south limit (Giulietti & Pirani, 1988; M. F. Santos & Sano, 2012; Coelho, 2014; Verdi *et al.*, 2015). After delineating the main structures of the Espinhaço Mountain Range, the municipalities that were touched by the resultant shapefile were selected as a part of the Espinhaço, totalizing 201 municipalities in the study area (Tab. S1). All procedures that involved geoprocessing or map construction were performed in QGIS software (version 3.6.2).

This delimitation comprehends mountains with distinct geological backgrounds, encompassing the broader definition of EMR – Espinhaço *sensu lato* (Fig. 1). The narrow definition, or Espinhaço *sensu stricto*, formally includes solely the structures from the Espinhaço Supergroup, those being: Chapada Diamantina (CD), Northern Espinhaço (or “Espinhaço Setentrional” – ES), Central Espinhaço (EC), Serra do Cabral (SC) and Southern Espinhaço (or “Espinhaço Meridional” – EM) (Saadi, 1995; Chaves, 1997). In this broader definition, we also include the Iron Quadrangle (QF), composed by different lithostratigraphic units, and the structure here referred as Adjacent Mountains (SA), usually less mentioned in previous works and included within areas of conflicting geological information (Abreu, 1995; Martins-Neto, 1998; K. Almeida *et al.*, 2011).

The EMR is one of the biggest mountain ranges in the country extension-wise, extending over approximately 1,000 km north-south, 50 to 100 km east-west and presenting elevations around 800 m above sea level (Giulietti & Pirani, 1988). Located within the latitudes 9° and 21°S, the mountain range encompasses four Köppen-Geiger climate zones: Aw (Tropical Savanna with dry winter), Bsh (Semi-arid), Cwa and Cwb (Mild temperature with dry winter), with overall dry winters and mild to hot summers

(Chen & Chen, 2013). Despite rain being heavily concentrated in the summer, there can be a second peak of humidity in the dry season due to low temperatures in the night and consequent formation of fogs (Harley & Simmons, 1986).

## B. Database and Species List

Myrtaceae records from the Espinhaço Mountain Range were obtained from SpeciesLink (http://splink.cria.org.br), Jardim Botânico do Rio de Janeiro (http://jabot.jbrj.gov.br) and species descriptions from the municipalities included in the EMR. To improve taxonomical accuracy, herbarium visits were carried out at ALCB, HUEFS, MBM, RB and SPF (acronyms according to Thiers 2020) and digitized images of exsicatae were seen on the online herbaria REFLORA (http://reflora.jbrj.gov.br/reflora/herbarioVirtual). Only records seen in the present work or identified by specialists were considered reliable. Duplicates were manually excluded and synonyms were transferred to valid names according to literature, Flora do Brasil 2020 (http://floradobrasil.jbrj.gov.br) and World Checklist (https://wcsp.science.kew.org). Genera and species that do not occur naturally, as *Backhousia* spp., *Corymbia* spp., *Eucalyptus* spp., *Melaleuca* spp., *Ugni* spp. and most *Syzygium* species (*S. aromaticum* (L.) Merr. & L.M.Perry , *S. cumini* (L.) Skeels and *S. malaccense* (L.) Merr. & L.M.Perry) were excluded from the list.

Vegetation of occurrence was attributed to the records according to the description provided by the collector and assembled from literature for the species compiled. In both cases, different phytophysiognomies were grouped in four main vegetation class: 1. campos rupestres (CR), which includes phytophysiognomies with a thin layer of soil and predominance of exposed rocks, as ferruginous cangas and campos rupestres *sensu stricto*; 2. cerrado *sensu lato* (CE), which includes phytophysiognomies with deeper aluminum-rich soils with the influence of fire, like cerrado *sensu stricto*, cerradão, campos limpos or campos sujos; 3. caatinga *sensu lato* (CAA), which includes phytophysiognomies with low water availability and a strong deciduity, as arboreal caatinga and caatinga *sensu stricto*; and 4. forests (FL), including perennial or semideciduous vegetations with canopy formation and deeper soils with leaf litter, as evergreen, semideciduous, nebular or riparian forests. Records described with dubious terms like “shrubland”, “transition vegetation”, “carrasco” or “mixed vegetation” were classified as conflicting data and were not assigned to a vegetation class. Morphoclimatic domains were delimited according to IBGE’s delimitation of “Brazilian Biomes” and the Atlantic Forest was divided in two portions:

North of the “Rio Doce” and South of “Rio Doce”, according to recent revisions that found significant differences in the composition of these two portions (Mori, Boom, & Prance, 1981; Fiaschi & Pirani, 2009; M. F. Santos *et al.*, 2017).

To understand species distribution outside of the Espinhaço Mountain Range, a second database was assembled using speciesLink records for Myrtaceae from Brazil. Due to the taxonomical complexity of Myrtaceae, only records identified by specialists were considered. The distribution data provided by herbarium records – in different morphoclimatic domains, within the EMR, and in the different vegetation types – were also compared with information provided by species description, distribution notes, taxonomical revisions and floristic surveys carried out by specialists (Tab. S2).

### C. Highlighting overlooked areas

To better comprehend the spatial bias of subsampling, records with accurate geographical coordinates were plotted in the study area with QGIS software (version 3.6.2) in grid cells of 0.25° per 0.25° and the number of species and specimens per cell were analyzed and correlated. With the same goal, rarefaction curves were performed for different geomorphological structures (CD, EC, EM, ES, SA, SC, QF) and vegetation categories (CAA, CE, CR, FL) through random ordination of records. Statistical analyses were performed in RStudio using the Vegan package (Oksanen *et al.*, 2018).

### D. Exploring floristic patterns

The study area was divided into grid cells of 0.25° per 0.25° (27.7 per 27.7km) in QGIS software (version 3.6.2). The original database was plotted in the study area and presence/absence matrixes were compiled for the species found within each grid cell for the complete unfragmented dataset (UD) and for the datasets segmented by vegetation categories, adding a total of five presence/absence matrixes (UD, CAA, CE, CR, FL). Grid cells with less than 10 species were removed to avoid false clustering due to lack of data and, since caatinga vegetations did not present over two grid cells after this cleaning process, further analyses were not performed for this vegetation class. To explore similarity patterns across the Espinhaço Mountain Range, a non-metric multidimensional scaling (NMDS) was performed using Sørensen index as a dissimilarity measure (Gotelli & Ellison, 2011). All statistical analysis were performed in RStudio using the Vegan package (Oksanen *et al.*, 2018).

## III. Results

### A. EMR diversity and species list

There were found 12,848 Myrtaceae records after removal of duplicates, from which 8,462 had reliable taxonomical identification – those being distributed in 17 genera and 281 species (Table 1). The most diverse genus was *Myrcia*, with 110 species, followed by *Eugenia*, with 91 spp.; *Psidium*, with 23 spp.; *Campomanesia*, with 17 spp.; *Myrciaria*, with 10 spp.; *Myrceugenia* and *Plinia*, with 7 spp. each; *Siphoneugena*, with 6 spp.; and *Blepharocalyx*, with 2 species. Eight genera were represented by only one species: *Acca, Accara, Algrizea, Calycolpus, Myrcianthes, Neomitranthes, Pimenta* and *Syzygium*. Two hundred seventy-nine spp. are native, being *Psidium guajava* and *Syzygium jambos* the only naturalized ones, and 42 spp. are endemic, being 239 spp. also distributed outside of the EMR in the different morphoclimatic domains of Brazil. A few Myrtaceae representatives found in the EMR are presented in figures 2 and 3.

Although the number of species per genera was highly correlated with the overall diversity within different genus, species endemism was uneven within clades. Few small genera represented by few species in the EMR, like *Calycolpus* and *Blepharocalyx*, showed a high endemism for the study area, as well as monotypic endemic genus *Algrizea* and *Accara*. Besides those, *Myrcia* and *Eugenia* presented the highest number of endemics, as they also show the highest overall diversity within neotropical Myrtaceae. The endemism within the lineages of these massive genera (*sensu* Mazine *et al.* 2016; Lucas *et al.* 2018), were also uneven: In *Myrcia*, 50% of spp. within *M.* sect. *Reticulosae* (4/8 spp.) and 40% of species within *M.* sect. *Sypondiomyrcia* (4/10 spp.) were endemic of the study area, while *M*. sect. *Aguava* (8 spp.), *M*. sect. *Calyptranthes* (7 spp.), *M*. sect. *Eugeniopsis* (5 spp.) and *M*. sect. *Tomentosae* (2 spp.) did not present endemic species. A few of the sections of *Eugenia* (*E*. sect. *Excelsae*, *E*. sect. *Hexachlamys*, *E*. sect. *Schizocalomyrtus*, *E*. sect. *Speciosae*, *E*. sect. *Phyllocalyx*) also did not present endemics, although those patterns are harder to understand within this genus due to its taxonomical limitation, especially because most species within *Eugenia* belongs to the same section: *E*. sect. *Umbellatae* – and species relationship within this group are still poorly known. More studies within this clade will help to clarify those patterns in *Eugenia*.

Three taxa identified did not present a valid species name: *Eugenia* sp.1, *Eugenia* sp.2 and *Myrcia* sp., all of which have been already highlighted as new species by specialists and are still in process of being formally named. *Eugenia* sp.1, cited as *Eugenia* sp. nov. 3 by Faria Júnior (2014), was described as probably endemic from Serra do Cipó, and occurs solely in the municipality of Santana do Pirapama, in the Southern Espinhaço region - Minas Gerais, while *Eugenia* sp. 2, cited as *Eugenia* sp. nov 4. by Faria Júnior (2014), is described as probably endemic from Bahia, occurring in Chapada Diamantina and adjacent municipalities in the Caatinga domain. *Myrcia* sp., cited as a new species by Santos (2017), have been wrongly identified in herbaria as *Myrcia almasensis* due to their similar morphology and distribution, and appears to be endemic from central Chapada Diamantina, with specimens from the municipalities of Andaraí, Mucugê and Piatã.

Amongst the 278 species with valid names, 57 (20.5%) are new occurrences for the study area, including *Acca sellowiana* and *Myrcianthes pungens*, the first occurrences of their genera in the Espinhaço Mountain Range. It is also possible to highlight the occurrence of species that were so far known to be exclusive from other areas of Brazil: *Eugenia copacabanensis* and *Myrcia ramuliflora*, from coastal restinga vegetations; *Myrcia lituatinervia*, from the highlands of the Amazon rainforest; *Eugenia complicata, E. megaflora, E. velutifolia* and *Myrcia albotomentosa*, from savanna vegetations of central Brazil; *Eugenia tephrogyna* and *Myrcia tenuifolia*, from humid forests of northeast Brazil; and *Campomanesia phaea*, *Eugenia brunneopubescens, E. melanogyna, E. sprengelii, Myrcia ferruginosa, M. gestasiana, M. rubiginosa, Myrciaria disticha, Plinia edulis, P. pseudodichasiantha* and *Siphoneugena reitzii*, from humid forests of southeast of Brazil.

One hundred fifty-eight species (56.22%) presented under 10 records – being 56 (19.92%) represented by a single record. From those, 23 (41%) were mentioned at least once for the study area in previous floras or taxonomical revisions and 33 (59%) are new occurrences. Only five species (1.78%) presented over 200 records, those being: *Blepharocalyx salicifolius*, with 227 records, *Myrcia tomentosa*, with 233 records, *M. splendens*, with 471 records, *M. guianensis*, with 549 records and *Eugenia punicifolia*, with 691 records, all of which were described for the region, are widely distributed in different geomorphological structures and vegetation types within the study area and in the surrounding morphoclimatic domains, also being mentioned in the majority of previous works carried out in the EMR.

## B. Diversity within different geomorphological structures

The Southern Espinhaço presented the largest diversity, with 162 species, followed by Chapada Diamantina (155 spp.), the Iron Quadrangle (130 spp.), Central Espinhaço (92 spp.), Northern Espinhaço (69 spp.) and Serra do Cabral (62 spp.). The Adjacent mountains presented the lowest diversity by far, with only 36 species. There were found various patterns of species distribution within these different geomorphological structures, where most species with wider range occurred in multiple mountains (Fig. 4A), 9 spp. (3.2%) were widely distributed in all of them and 119 spp. (42.3%) occurred exclusively within one geomorphological structure: 41 in CD, 31 in EM, 28 in QF, 7 in EC, 5 in SC, 4 in ES and 3 in SA. When evaluating species that occurred solely in two of these structures it was possible to recognize floristic links, like the larger number of shared species in the Southern Espinhaço and Iron Quadrangle and the lack of exclusive species in adjacent structures like the Central and Northern Espinhaço (Fig. 4B).

From the 42 species that are endemic from the EMR (Table 1), 25 (59.5%) are exclusive from a single geomorphological structure: 12 from Chapada Diamantina, eight from the Southern Espinhaço, three from the Central Espinhaço and two from the Iron Quadrangle. From the 17 (40.5%) endemic species that are not restricted to a geomorphological unit, eight are exclusive from the state of Minas Gerais, occurring in different mountains within the state, two are exclusive from the state of Bahia and seven occur in both states – including species previously known only from CD, like *Eugenia anisomischa* and *Myrcia ascendens*.

Seventy-six records did not present sufficient information to be assigned to a geomorphological structure, all of which did not present valid geographical coordinates and either possessed location description as “Serra do Espinhaço”, which could be attributed to a large number of areas, or were collected in one of the municipalities that are not completely inserted within one geomorphological structures (*e.g.* Bocaiúva - MG, Itabira - MG, Oliveira dos Brejinhos - BA). Fifty-eight of these records were identified and, amongst those, one, collected in the municipality of Itabira (MG), was the only specimen attributed to *Myrcia ferruginosa*. Therefore, this species remains with its distribution within the EMR categorized as “non-identified” (Tab. 1).

When considering the total amount of records (including non-identified ones), the state of Minas Gerais presented the largest amount (8,296), especially in the Southern Espinhaço and Iron Quadrangle (3,438 and 3,370, respectively), despite the smaller size of these geomorphological structures (Fig. 1). On the other hand, most of Bahia’s records (4,552) were concentrated in Chapada Diamantina (4,009), the biggest geomorphological subdivision of the Espinhaço Mountain Range (Fig. 1). Nonetheless, despite the large number of records, the distribution of those were highly concentrated in a small area within CD, being the central portion far more collected than the northern or western portions of this geomorphological structure (Fig. 5).

Diversity in the study area was also unevenly distributed, with the number of total records and species being highly correlated (ρ = 0.89). Therefore, areas with the biggest number of records were also the same areas highlighted for its diversity (Fig. 5). The rarefaction curves of different geomorphological structures (Fig. 6A) showed that despite the large number of records in the Iron Quadrangle and Southern Espinhaço, these areas are still subsampled when compared to Chapada Diamantina. Central Espinhaço (EC), Northern Espinhaço (ES), Serra do Cabral (SC) and the Adjacent Mountains (SA) presented the smallest rarefaction curves, emphasizing their extreme subsampling and hindering our understanding of its diversity.

### C. Diversity within different vegetation types

Species distribution in different vegetation types varied according to the data source. According to literature, species occurrence would be more restricted and selective, with 149 species occurring exclusively in one vegetation type and only five being widely distributed (Fig. 7A). On the other hand, the database points to 93 species occurring exclusively in one vegetation type and 26 widely distributed (Fig. 7B). Although the number of species in each vegetation type varied according to the data source, in both databases forests presented the highest number of overall and exclusive species and caatinga *s.l.* presented the smallest diversity and number of exclusive species.

From the 47 species that, according to the dataset, occur in caatinga, four are exclusive of this vegetation type, including one endemic species of the EMR (*Eugenia zigzag*). From the 138 species encountered in cerrado, 18 were exclusive of this vegetation type, including three endemic species of the EMR (*Eugenia mucugensis, E. rotula, Myrcia revoluta*). From the 143 species occurring in campos rupestres, 20 were exclusive of this vegetation type, including eight endemic species of the EMR (*Calycolpus australis, Myrcia acutisepala, M. almasensis, M. ascendens, M. carassana, M. glauca, M. neosericea* and *M. venosissima*) and from the 178 species encountered in forests, 51 were exclusively found in this type of vegetation, including three endemic species of the EMR, all of which are found exclusively within the Minas Gerais state (*Eugenia grandissima, Myrcia megaphylla* and *Plinia espinhacensis*).

There were big gaps concerning the amount of records attributed to different vegetation types. From the total amount of records, including non-identified specimens, 6,716 (52.3%) did not present vegetation description or were described with conflicting terms, including 40 species that did not present any records with vegetation data (Tab.1). From the 6,132 records that presented valid vegetation descriptions, 198 (3.22%) were assigned to caatinga, 1,893 (30.87%) to cerrado, 1,971 (32.14%) to campos rupestres and 2,070 (33.75%) to forests. The rarefaction curves (Fig. 6B) emphasized the uneven diversity and sampling effort in these different types of vegetation. While forests presented higher number of species, the curve also indicated smaller sampling effort when compared to campo rupestre and cerrado. On the other hand, caatinga presented the smallest diversity and sampling effort, being hard to predict overall diversity due to its small rarefaction curve.

## D. Floristic Patterns

The amount of grid cells included in each NMDS varied due to different sampling efforts in the study area. A total of 61 grid cells were included in the unfragmented dataset (UD; Stress = 0.2194; Fig. 8A), from which 23 were exclusive to this data. Campo rupestre dataset included 16 grid cells (CR; Stress = 0.1565; Fig. 8B), cerrado included 25 grid cells (CE; Stress = 0.2269; Fig. 8C) and the dataset for species occurring in forests presented 20 grid cells (FL; Stress = 0.2196; Fig. 8D). Although most ordinations presented a stress value lightly above the threshold usually adopted in literature (0.2), their results indicate patterns for a considerable amount of variance. Therefore, as suggested by Dexter, Rollwagen-Bollens, & Bollens (2018), results were interpreted and the Shepard’s plot for every NMDS were provided in the supplementary material (Fig. S1).

From these analyses it is possible to highlight the overall differences in the positions of distinct geomorphological structures. Chapada Diamantina presented a cohesive pattern of floristic similarity across every ordination, with grid cells from its northern portion presenting a moderate dissimilarity from its central portion in UD and FL. Areas within Northern and Central Espinhaço were only included in CE and UD. The northern portion was clustered with Chapada Diamantina in the first and formed a cluster close to CD in the second. Central Espinhaço, on the other hand, presented little cohesion in UD and was represented in CE solely by one grid cell, positioned closer to areas from the Southern Espinhaço. Areas within Serra do Cabral were not grouped in the UD and were clustered with distinct geomorphological structures in different ordinations: to Chapada Diamantina in CR and to Southern Espinhaço in CE. The Southern Espinhaço presented an overall high beta diversity, with little cohesion between its grid cells in different ordinations. Adjacent mountains were only represented by one grid cell in one ordination (UD), not being clustered with any other geomorphological structure. Lastly, the Iron Quadrangle presented varying patterns of floristic similarity: in the UD it formed an overall cohesive group; in CR it was divided in two (one clustered with the EM and one highly dissimilar grid cell); in CE it was represented solely by one grid cell with a high floristic dissimilarity when compared to the rest of the EMR; and in FL it was represented by multiple grid cells – that were scattered along the ordination plot with EM grid cells.

## E. Species distribution in adjacent morphoclimatic domains

From the 239 non-endemic species found in the Espinhaço Mountain Range, only two are not distributed in the adjacent morphoclimatic domains, being *Eugenia dimorpha* cited for the prairies of South Brazil (Pampas) and *Myrcia lituatinervia* found solely in the Amazon highlands. The other 237 spp. occurred in at least one of the adjacent morphoclimatic domains, sometimes being also recorded in other non-adjacent areas, like the Amazon, or in disjunct portions of the adjacent domains, like costal restinga vegetation. Amongst these species, 28 occur in all the adjacent morphoclimatic domains and 134 are found exclusively in one of them: 10 in the Caatinga Domain, 23 in the Cerrado Domain and the majority, 101 species occur exclusively in the Atlantic Forest, being 11 found exclusively in the northern portion, 55 exclusively in the southern portion and 35 widely distributed within this morphoclimatic domain (Tab. S2).

There was found a recurrent pattern of distribution when evaluating species occurrence outside of the mountain range, whereas most of non-endemic species that occur in different geomorphological structures also occur in the Atlantic Forest. Therefore, while the geomorphological structures found within the Cerrado domain (EM, ES) and the Caatinga Domain (CD) presented a larger number of species from these areas, their non-endemic species are also mostly from the overall Atlantic Forest and specifically, from its southern portion. When fragmenting species distribution by its occurrence in different vegetation types, the vast majority of species (CAA: 68.2%; CE: 72.8%; CR: 78.4%; FL: 86.6%) were either widely distributed in adjacent morphoclimatic domains or found within the south Atlantic Forest, coinciding with the overall pattern. Nonetheless, when evaluating species found exclusively in a specific vegetation type, other patterns were revealed. From the non-endemic species recorded exclusively in caatinga vegetations within the EMR (Fig. 9A), two also occur in the Caatinga Domain and one is found exclusively in the south Atlantic Forest (*Eugenia verticillata*). From the non-endemic species recorded solely in cerrado in the EMR (Fig. 9B), 9 (60%) occur in the Cerrado Morphoclimatic Domain, but there are also species widely distributed and found exclusively in the Caatinga Domain (*Eugenia bahiana*) and in the Atlantic Forest (*Eugenia prasina, E. sprengelii* and *Myrcia hirtiflora*). Non-endemic species recorded exclusively in campos rupestres (Fig. 9C) occurred either in the Cerrado domain, north or south of the Atlantic Forest, or in a combination of these domains. From the species found solely in forests of EMR (Fig. 9D), a more diverse pattern was found, being most species exclusively found in the Atlantic Forest (32; 66.6%), with a few species widely distributed or found exclusively in the Cerrado (*Eugenia lagoensis*) or Caatinga domain (*Eugenia* sp.2).

## IV. Discussion

### A. Overall diversity and species list

The Espinhaço Mountain Range presented a huge diversity, encompassing more Myrtaceae species than many Brazilian morphoclimatic domains, as the Cerrado or Amazon rainforest, for example (Flora do Brasil, 2020). Despite the large number of studies carried out in the area, the amount of new occurrences (57 spp.; 20.3%) reinforces the existence of knowledge gaps. These species are mostly represented by one or few records and their distribution in the study area appears to be either small or subsampled. This could occur both due to the spatial aggregation of previous floras and sampling effort, but also due to taxon recognition difficulties within Myrtaceae, represented by the large amount of non-identified herbaria records (4,369, 34%) even after the herbarium visits carried out in the present work.

Although we cannot predict species abundance solely based in herbarium data (Garcillán & Ezcurra, 2011), the large amount of species represented by a singleton can indicate that there are a lot of rare or micro endemic species with few or small populations in the EMR or that these species might be common in subsampled areas – which reinforces the need for a larger conservation and sampling efforts. According to Garcillan & Ezcurra (2011), herbarium collections are usually biased by overcollection of rare species and under collecting abundant and common species, which potentially corroborates that the five species with a larger number of specimens are both habitat generalists, occurring in a wide range of areas, as well as abundant species in the study area.

### B. Myrtaceae diversity within different geomorphological structures

The adjacent mountains (SA) presented the biggest knowledge gap and represents today the most subsampled area of the Espinhaço Mountain range. Despite being included in the Southern and most diverse portion of the mountain range, this geomorphological structure is completely inserted within the Atlantic Forest and frequently not included in the studies carried out in the EMR. Nonetheless, previous studies (Campos *et al.*, 2019) pointed out a different knowledge gap in the region, one that is, although not the biggest, a very concerning gap for the development of future work in the area: The Central (EC) and Northern Espinhaço (ES). These structures, although included in a few studies (Pirani, Mello-Silva, & Giulietti, 2003; Stadnik, Oliveira, & Roque, 2018), still configurates a challenge in our understanding of the EMR due to its central location, limiting our comprehension of species distribution and biogeographical barriers in the study area.

The spatial distribution of sampling effort is known to be influenced by multiple factors. The most documented of these factors is the proximity to access routes, whereas localities with difficult roads or bad infrastructure may pose a logistic and financial challenge to biologists (Sousa-Baena, Garcia, & Peterson, 2014; U. Oliveira *et al.*, 2016). In areas of high nature-based touristic activity, such as the Espinhaço Mountain Range, tourism may be strongly associated with the accessibility bias – as touristic visits in protected areas is strongly correlated with proximity to access routes and urban centers (Chung, Dietz, & Liu, 2018). This pattern is corroborated in the EMR, with sampling effort being concentrated in municipalities with high touristic activity and significant infrastructure, like Diamantina, Ouro Preto, Santana do Riacho, Belo Horizonte, Morro do Chapéu, Mucugê, Abaíra and Palmeiras (Tab. S1). Other component that appears to be relevant for collection effort is the presence of previous floras, as Ouro Preto, Grão Mogol, Rio de Contas and Mucugê have previously been included in inventories, which intensifies sampling effort locally.

Geographical proximity to herbaria and research centers might also bias sampling effort, as suggested by Yang, Ma, & Kreft (2013). In Brazil this effect may be particularly relevant since there is a strong economic disparity between different geopolitical regions, whereas the northern portion of the EMR is inserted in northeast Brazil while the southern portion of the EMR is inserted within Southeast Brazil – an area with far more infrastructure and research investment – factors that have been suggested to influence sampling bias (U. Oliveira *et al.*, 2016). An illustration of that disparity in research investment is illustrated by the harsh difference in the number of active herbaria in each geopolitical region, with northeast presenting a total of 27 herbaria distributed in nine states and the southeast encompassing 42 herbaria distributed in four states (Sociedade Botânica do Brasil, 2022). Other factors may also play an important role in sampling effort, such as physical or ecological characteristics - whereas localities with difficult reliefs or tall vegetations could impose a different challenge to botanists. Nonetheless, it is important to investigate the reasons why sampling effort is strongly concentrated and actively pursue a more homogenous sampling. An unbiased understanding of species distribution is fundamental to improve predictions in future ecological or biogeographical analysis, so far known to be biased by funding, sampling effort and botanist expertise (Ahrends, Burgess, *et al.*, 2011; Ahrends, Rahbek, *et al.*, 2011; Sousa-Baena, Garcia, & Peterson, 2014).

Despite the strong correlation between number of records and species diversity, the rarefaction curves indicates a bigger, and yet subsampled, diversity south of the EMR, where there is also a large concentration of records. This possibly indicates that the higher diversity in these areas is a valid pattern and not an effect of larger sampling. This increase in diversity may be explained both by the environmental preferences of the family, as the southern portion of the EMR is situated in a more humid region with abundance of forests – vegetation in which Myrtaceae is highlighted for its diversity and abundance (Mori *et al.*, 1983; M. F. Santos, Serafim, & Sano, 2012), but it is also a corroborated pattern found for other Angiosperm families, which seems to point out to a bigger overall diversity south of the Espinhaço (Bitencourt & Rapini, 2013; Nascimento, 2017; Colli-Silva, Vasconcelos, & Pirani, 2019). On the other hand, the rarefaction curve for CD may be strongly biased: since the vast majority of records are concentrated within a small portion of this structure (Fig. 3), there is a strong possibility that the curve represents the diversity of a small well-sampled central area. The other portions of this geomorphological structure, already highlighted as knowledge gaps for Asteraceae (Campos *et al.*, 2019), are the Western and Northern portions of CD, cited as “Irecê region” and “Piemonte da Diamantina”. Those areas present relevant climatic differences to the central portion and therefore, a more homogeneous sampling effort is required to evaluate Myrtaceae diversity within the entire Chapada Diamantina.

## C. Myrtaceae diversity within different vegetation types

Concerning Myrtaceae diversity within different vegetation types, the biggest diversity within forests reinforced a pattern found in other studies (Mori *et al.*, 1983; M. F. Santos, Serafim, & Sano, 2012), but the amount of habitat generalist grew comprehensively when contrasting species distribution data provided by literature with the information in the database (Fig. 7). This could occur both due to historic subsampling – and be a symptom of the pre-existent knowledge gap – or could be a strong bias in our attribution of vegetation in the database, considering that collector's description may be biased, and the definition of each vegetation type may vary from one collector to the other. Nonetheless, the shifts in vegetation compositions were focused mainly on forests, where literature and the database found a similar number of exclusive species in cerrados, caatingas and campos rupestres (Fig. 7). This could also indicate a biased view of Myrtaceae distribution, with a large number of widely distributed species being described as occurring exclusively in forests.

## D. Floristic patterns

Floristic patterns found for Myrtaceae did not reflect exactly what has been recovered for other taxonomical groups or the known geological or biogeographical regions of the Espinhaço Mountain Range. In the few studies encompassing Chapada Diamantina, only one spatial structure was recognized: a division of the two main mountains of CD – dividing the structure in east and west (Ribeiro *et al.*, 2014). Despite the lack of usable grid cells in the western portion, Myrtaceae similarity patterns for forests seems to emphasize another spatial structure in Chapada Diamantina: a division in north (or "Piemonte da Diamantina") and central CD. In an opposite case, the Southern Espinhaço and the Minas Gerais portion of the EMR as a whole have been formally divided using different group models and methods (Rapini, Mello-Silva, & Kawasaki, 2002; Echternacht *et al.*, 2011; Ribeiro *et al.*, 2014; Campos *et al.*, 2019; Colli-Silva, Vasconcelos, & Pirani, 2019), and Myrtaceae data has not recovered those subdivisions or similarity patterns. While Chapada Diamantina and the Southern Espinhaço presented interesting patterns, the lack of usable grid cells rendered a knowledge gap in the central portion of the EMR, encompassing the Central and the Northern Espinhaço. While more studies are needed to clarify floristic patterns in this area, the analysis with Myrtaceae species from cerrado reinforced the same pattern found in other studies of the EMR, where these structures are more correlated to other disjunct portions than to each other. The lack of these floristic links is also reinforced when evaluating the number of species shared by those two areas (Fig. 2).

### E. Species distribution in adjacent morphoclimatic domains

Most of the Myrtaceae species found in the EMR also occur in the Atlantic Forest (172; 61.2%). This morphoclimatic domain holds over half of the Myrtaceae species within Brazil and coincides with the origin of *Myrcia sensu lato*, *Eugenia sensu lato* and Pliniiniae, major lineages within the family (M. D. O. Bünger *et al.*, 2016; Amorim *et al.*, 2019; Flora do Brasil, 2020; Stadnik, 2020). Since Myrtaceae diversity is heavily concentrated in this morphoclimatic domain, dividing the Atlantic Forest in north/south allowed a better comprehension of species distribution, where the biggest amount of species from this domain occurred exclusively in its southern portion (88 spp.), despite the geographical proximity between the EMR and the northern portion of the Atlantic Forest. Although the dissimilarity between the north and south portions of this morphoclimatic domain have been discussed by recent papers (Mori, Boom, & Prance, 1981; Fiaschi & Pirani, 2009; M. F. Santos *et al.*, 2017), the link between its south portion and the EMR, has not. This pattern can be exclusive for Myrtaceae, given that the family possesses overall bigger diversity in the southern portion of the AF (Flora do Brasil, 2020), or be a pattern found for other botanical families as well.

Other known distribution patterns for the Espinhaço Mountain Range were also found for Myrtaceae: high floristic similarity between the EMR and neighboring areas (Neves *et al.*, 2018; Campos *et al.*, 2019), and the restinga – campo rupestre disjunction. The latter, well documented for many taxonomic groups (Alves, Cardin, & Kropf, 2007), is here reinforced by a new occurrence (*e.g. Myrcia ramuliflora*). In addition, the occurrence of *Eugenia copacabanensis* and *E. luschnathiana* may suggest another disjunction pattern with “restingas” and forests of the EMR, whereas these species, considered endemic of coastal Brazilian vegetation, are here documented with this distribution pattern.

Overall, the main pattern for Myrtaceae distribution was the lack of habitat specificity, where species occurred both in open shrubby formations, like campo rupestres and cerrados as well as in closed more humid vegetations like forests. Although this comprehensive review shed some light into Myrtaceae distribution based on current herbarium data, the data emphasize the need to improve sampling effort in different areas of the Espinhaço Mountain Range to fully understand species composition and distribution within this area.

## V. References

Abreu, P.A.A. 1995. O Supergrupo Espinhaço da Serra do Espinhaço Meridional (Minas Gerais): o rifte, a bacia e o orógeno. Geonomos 3: 1–18. Available online: https://doi.org/10.18285/geonomos.v3i1.211

Ahrends, A., N.D. Burgess, R.E. Gereau, R. Marchant, M.T. Bulling, J.C. Lovett, P.J. Platts, V. Wilkins Kindemba, N. Owen, E. Fanning, & C. Rahbek. 2011. Funding begets biodiversity. Diversity and Distributions 17: 191–200. Available online: https://doi.org/10.1111/j.1472-4642.2010.00737.x

Ahrends, A., C. Rahbek, M.T. Bulling, N.D. Burgess, P.J. Platts, J.C. Lovett, V.W. Kindemba, N. Owen, A.N. Sallu, A.R. Marshall, B.E. Mhoro, E. Fanning, & R. Marchant. 2011. Conservation and the botanist effect. Biological Conservation 144: 131–140. Available online: http://dx.doi.org/10.1016/j.biocon.2010.08.008

Almeida, K., J. Matschullat, J. Mello, I. Meneses, & Z. Viole. 2011. Physical aspects of the Iron Quadrangle. Pp. 81–90. *In*: J. Bundschuh & P. Bhattacharya (eds.). Arsenic: Natural and Anthropogenic (1st ed., Vol. 4). CRC Press LLC: Boca Raton, FL,.

Almeida, R.B.P., G.M. Antar, T.N.C. Vasconcelos, L.L. Santos, & B.S. Amorim. 2020. *Myrcia lucasae* (Myrtaceae), a new species from the campo rupestre of Chapada Diamantina, Brazil. Phytotaxa 435: 227–234. Available online: https://doi.org/10.11646/phytotaxa.435.3.2 ISSN

Alves, R.J.V., L. Cardin, & M.S. Kropf. 2007. Angiosperm disjunction “Campos rupestres - Restingas”: a re-evaluation. Acta Botanica Brasilica 21: 675–685. Available online: https://doi.org/10.1590/S0102-33062007000300014

Amorim, B.S. 2017. Filogenia e estudos taxonômicos do clado *Gomidesia* (Myrtaceae, *Myrcia s.l.*) na Floresta Atlântica do Brasil. Universidade Federal de Pernambuco, Recife, Brazil.

Amorim, B.S., & M. Alves. 2012. Myrtaceae from lowland Atlantic forest areas in the state of Pernambuco, northeastern Brazil. Phytotaxa 40: 33–54. Available online: https://doi.org/10.11646/phytotaxa.40.1.6

Amorim, B.S., E. Lucas, & M. Alves. 2014. *Myrcia lughadhai* sp. nov. (*Myrcia s.l.*, Myrtaceae), a new endemic species from the Brazilian highlands. Kew Bulletin 69: 1–6. Available online: https://doi.org/10.1007/s12225-014-9535-8

Amorim, B.S., J.R. Maciel, & M. Alves. 2015. New geographical records of *Myrcia s.l.* (Myrteae, Myrtaceae) from South America, with a focus on Brazilian taxa. Check List 11: 8–10. Available online: https://doi.org/10.15560/11.2.1592

Amorim, B.S., T.N.C. Vasconcelos, G. Souza, M. Alves, A. Antonelli, & E. Lucas. 2019. Advanced understanding of phylogenetic relationships, morphological evolution and biogeographic history of the mega-diverse plant genus *Myrcia* and its relatives. Molecular Phylogenetics and Evolution 138: 65–88. Available online: https://doi.org/10.1016/j.ympev.2019.05.014

Barroso, G.M., & A.L. Peixoto. 1992. Espécies novas ou pouco conhecidas do gênero *Marlierea* (Myrtaceae) no sudeste brasileiro. Boletim do Museu de Biologia Mello Leitão (Nova Série) 1: 83–96.

Bitencourt, C., & A. Rapini. 2013. Centres of Endemism in the Espinhaço Range: identifying cradles and museums of Asclepiadoideae (Apocynaceae). Systematics and Biodiversity 11: 525–536. Available online: https://doi.org/10.1080/14772000.2013.865681

Bitencourt, C., A. Rapini, L. Santos Damascena, & P. De Marco Junior. 2016. The worrying future of the endemic flora of a tropical mountain range under climate change. Flora: Morphology, Distribution, Functional Ecology of Plants 218: 1–10. Available online: http://dx.doi.org/10.1016/j.flora.2015.11.001

Bünger, M. de O. 2011. Myrtaceae na Cadeia do Espinhaço. Universidade Federal de Minas Gerais, Belo Horizonte, Brasil.

Bünger, M. de O., F.F. Mazine, E.J. Lucas, & J.R. Stehmann. 2016. Circumscription and synopsis of *Eugenia* section *Speciosae* Bünger & Mazine (Myrtaceae). PhytoKeys 61: 73–80. Available online: https://doi.org/10.3897/phytokeys.61.7904

Bünger, M. de O., V.R. Scalon, M. Sobral, & J.R. Stehmann. 2012. Myrtaceae no Parque Estadual do Itacolomi, Minas Gerais, Brasil. Rodriguésia 63: 857–881. Available online: https://doi.org/10.1590/S2175-78602012000400009

Bünger, M. de O., M. Sobral, & J.R. Stehmann. 2013. Two new Atlantic forest Myrtaceae from Brazil. Phytotaxa 147: 55–60. Available online: https://doi.org/10.11646/phytotaxa.147.2.3

Bünger, M.D.O., F.F. Mazine, F. Forest, M.L. Bueno, J.R. Stehmann, & E.J. Lucas. 2016. The evolutionary history of *Eugenia* sect. *Phyllocalyx* (Myrtaceae) corroborates historically stable areas in the southern Atlantic forests. Annals of

Botany 118: 1209–1223. Available online: https://doi.org/10.1093/aob/mcw209

Campos, L., M. Freire Moro, V.A. Funk, & N. Roque. 2019. Biogeographical review of Asteraceae in the Espinhaço Mountain Range, Brazil. The Botanical Review 85: 293–336. Available online: https://doi.org/10.1007/s12229-019-09216-9

Campos, L., M.L.S. Guedes, P. Acevedo-Rodríguez, & N. Roque. 2017. Contributions to the floristic and vegetation knowledge of Espinhaço Septentrional, Bahia, Brazil. Brazilian Journal of Botany 40: 427–437. Available online: https://doi.org/10.1007/s40415-016-0347-y

Carmo, F.F. do, & C.M. Jacobi. 2013. A vegetação de canga no Quadrilátero Ferrífero, Minas Gerais: caracterização e contexto fitogeográfico. Rodriguesia 64: 527–541. Available online: https://doi.org/10.1590/s2175-78602013000300005

Chaves, M.L. de S.C. 1997. Geologia e mineralogia do diamante da Serra do Espinhaço em Minas Gerais. Universidade de São Paulo, São Paulo, Brazil.

Chen, D., & H.W. Chen. 2013. Using the Köppen classification to quantify climate variation and change: An example for 1901-2010. Environmental Development 6: 69–79. Available online: https://doi.org/10.1016/j.envdev.2013.03.007

Chung, M.G., T. Dietz, & J. Liu. 2018. Global relationships between biodiversity and nature-based tourism in protected areas. Ecosystem Services 34: 11–23. Available online: https://doi.org/10.1016/j.ecoser.2018.09.004

Coelho, M.S. 2014. Os capões de mata da Cadeia do Espinhaço: padrões e processos ecológicos. Universidade Federal de Minas Gerais, Belo Horizonte, Brazil.

Colli-Silva, M., T.N.C. Vasconcelos, & J.R. Pirani. 2019. Outstanding plant endemism levels strongly support the recognition of campo rupestre provinces in mountaintops of eastern South America. Journal of Biogeography 46: 1723–1733. Available online: https://doi.org/10.1111/jbi.13585

Dexter, E., G. Rollwagen-Bollens, & S.M. Bollens. 2018. The trouble with stress: A flexible method for the evaluation of nonmetric multidimensional scaling. Limnology and Oceanography: Methods 16: 434–443.

Echternacht, L., M. Trovó, C.T. Oliveira, & J.R. Pirani. 2011. Areas of endemism in the Espinhaço Range in Minas Gerais, Brazil. Flora: Morphology, Distribution, Functional Ecology of Plants 206: 782–791. Available online: http://dx.doi.org/10.1016/j.flora.2011.04.003

Faria Júnior, J.E.Q. de. 2010. O gênero *Eugenia* L. (Myrtaceae) nos estados de Goiás e Tocantins, Brasil. Universidade de Brasília, Brasília, Brazil.

Faria Júnior, J.E.Q. de. 2014. Revisão taxonômica e filogenia de *Eugenia* sect. *Pilothecium* (Kiaersk.) D.Legrand (Myrtaceae). Universidade de Brasília, Brasília, Brazil.

Fernandes, G.W. 2016. The megadiverse rupestrian grassland. Pp. 1–14. *In*: G.W. Fernandes (ed.). Ecology and Conservation of Mountaintop Grasslands in Brazil (1st ed.). Springer International Publishing: Cham, Switzerland,.

Fernandes, T., D.F. Lima, & J.M.A. Braga. 2020. Two new species of *Myrcia* sect. *Reticulosae* (Myrtaceae) from the campo rupestre of Minas Gerais, Brazil. Brittonia 72: 393–401. Available online: https://doi.org/10.1007/s12228-020-09630-z

Fiaschi, P., & J.R. Pirani. 2009. Review of plant biogeographic studies in Brazil. Journal of Systematics and Evolution.

Flora do Brasil. 2020. Jardim Botânico do Rio de Janeiro. Available online: http://floradobrasil.jbrj.gov.br/

Garcillán, P.P., & E. Ezcurra. 2011. Sampling procedures and species estimation: Testing the effectiveness of herbarium data against vegetation sampling in an oceanic island. Journal of Vegetation Science 22: 273–280. Available online: https://doi.org/10.1111/j.1654-1103.2010.01247.x

Giaretta, A. 2018. Sistemática de *Eugenia* L. (Myrtaceae, Myrteae): Evolução da flor e da inflorescência e implicações taxonômicas. Universidade de São Paulo, São Paulo, Brazil.

Giaretta, A., E. Lucas, & P.T. Sano. 2021. Taxonomic monograph of *Eugenia* sect. *Schizocalomyrtus* (Myrtaceae: Myrteae), a group within *Eugenia* with unusual flowers. Phytotaxa 524: 135–177.

Giaretta, A., & A.L. Peixoto. 2015. Myrtaceae da restinga no norte do Espírito Santo, Brasil. Boletim do Museu de Biologia Mello Leitão 37: 45–126.

Giulietti, A.M., N.L. de Menezes, J.R. Pirani, M. Meguro, & M. das G.L. Wanderley. 1987. Flora da Serra do Cipó, Minas Gerais: caracterização e lista das espécies. Boletim de Botânica da Universidade de São Paulo.

Giulietti, A.M., & J.R. Pirani. 1988. Patterns of geographic distribution of some plant species from the Espinhaço Range, Minas Gerais and Bahia, Brazil. Pp. 39–69. *In*: P.E. Vanzolini & W.R. Heyer (eds.). Proceedings of a workshop on neotropical distribution patterns. Academia Brasileira de Ciências: Rio de Janeiro,.

Gotelli, N.J., & A.M. Ellison. 2011. Princípios de estatística em ecologia (1st ed.). Porto Alegre: Artmed.

Harley, R.M., & N.A. Simmons. 1986. Florula of Mucugê, Chapada Diamantina, Bahia, Brazil: a descriptive check-list of a campo rupestre area. 228 pp. (1st ed.). Royal Botanical Gardens.

Hatschbach, G., E.A.E. Guarçoni, M.A. Sartori, & O. dos S. Ribas. 2006. Aspectos fisionômicos da vegetação da Serra do Cabral (Minas Gerais - Brasil). Boletim do Museu Botânico Municipal 67: 1–33.

Holst, B., L.R. Landrum, & F. Grifo. 2003. Myrtaceae. Pp. 1–99. *In*: R. Schmid, J.A. Steyermark, P.E. Berry, B.K. Holst, & K. Yatskievych (eds.). Flora of the Venezuelan Guayana (Vol. 7). Misouri Botaical Garden: St. Louis, Missouri,.

Kawasaki, M.L. 1989. Flora da Serra do Cipó, Minas Gerais: Myrtaceae. Boletim de Botânica 11: 121–170. Available online: https://doi.org/10.11606/issn.2316-9052.v11i0p121-170

Kawasaki, M.L. 2000. A new species of *Campomanesia* (Myrtaceae) from Brazil. Brittonia 52: 188–190. Available online: https://doi.org/10.11646/phytotaxa.149.1.3

Kawasaki, M.L. 2004. Flora de Grão-Mogol, Minas Gerais: Myrtaceae. Boletim de Botânica da Universidade de São Paulo 22: 323–337. Available online: https://doi.org/10.11606/issn.2316-9052.v22i2p323-337

Landrum, L.R. 1981. Flora Neotropica: A monograph of the genus *Myrceugenia* (Myrtaceae). 1–135 pp. The New York Botanical Garden (Vol. 29).

Landrum, L.R. 1986. Flora Neotropica: *Campomanesia, Pimenta, Blepharocalyx, Legrandia, Acca, Myrrhinium, and Luma* (Myrtaceae). 1–178 pp. The New York Botanical Garden.

Landrum, L.R. 1990. *Accara*: A new genus of Myrtaceae, Myrtinae from Brazil. Systematic Botany 15: 221–225. Available online: https://doi.org/10.2307/2419176

Landrum, L.R. 2010. A revision of *Calycolpus* (Myrtaceae). Systematic Botany 35: 368–389. Available online: https://doi.org/10.1600/036364410791638342

Landrum, L.R. 2017. The genus *Psidium* (Myrtaceae) in the state of Bahia, Brazil.

Canotia 13: 1–101.

Landrum, L.R., & M.L. Kawasaki. 1997. The genera of Myrtaceae in Brazil: An illustrated synoptic treatment and identification keys. Brittonia 49: 508–536. Available online: https://doi.org/10.2307/2807742

Lima, D.F. 2017. Estudos filogenéticos e taxonômicos em *Myrcia* DC. *sensu lato* (Myrtaceae), com ênfase no clado *guianensis*. Universidade de Campinas, Campinas, Brazil.

Lima, D.F., M.K. Caddah, & R. Goldenberg. 2015. A família Myrtaceae na Ilha do Mel, Paranaguá, Estado do Paraná, Brasil. Hoehnea 42: 497–519. Available online: https://doi.org/10.1590/2236-8906-68/2014

Lima, D.F., R. Goldenberg, & M. Sobral. 2011. O gênero *Campomanesia* (Myrtaceae) no estado do Paraná, Brasil. Rodriguésia 62: 683–693. Available online: https://doi.org/10.1590/2175-7860201162313

Lourenço, A.R. de L. 2015. *Calyptranthes* SW. no domínio da Mata Atlântica Brasileira – Taxonomia e filogenia. Universidade Federal de Pernambuco, Recife, Brazil.

Lourenço, A.R. de L., & M.R. de V. Barbosa. 2012. Myrtaceae em restingas no limite norte de distribuição da Mata Atlântica, Brasil. Rodriguésia 63: 373–393. Available online: https://doi.org/10.1590/S2175-78602012000200011

Lucas, E., C.E. Wilson, D.F. Lima, M. Sobral, & K. Matsumoto. 2016. A conspectus of *Myrcia* sect. *Aulomyrcia* (Myrtaceae). Annals of the Missouri Botanical Garden 101: 648–698. Available online: https://doi.org/10.3417/2014015

Lucas, E.J., B.S. Amorim, D.F. Lima, A.R. Lima-Lourenço, E.M. Nic Lughadha, C.E.B. Proença, P.O. Rosa, A.S. Rosário, L.L. Santos, M.F. Santos, M.C. Souza, V.G. Staggemeier, T.N.C. Vasconcelos, & M. Sobral. 2018. A new infra-generic classification of the species-rich Neotropical genus *Myrcia s.l.* Kew Bulletin 73. Available online: https://doi.org/10.1007/s12225-017-9730-5

Lucresia, L., A. Stadnik, L. Campos, & N. Roque. 2021. Myrtaceae floristic survey and vegetation distribution in a central portion of Chapada Diamantina, Brazil. Phytotaxa 498: 71–86. Available online: https://doi.org/10.11646/phytotaxa.498.2.1

Martinelli, G. 2007. Mountain biodiversity in Brazil. Revista Brasileira de Botanica 30: 587–597. Available online: https://doi.org/10.1590/S0100-84042007000400005

Martins-Neto, M.A. 1998. O Supergrupo Espinhaço em Minas Gerais: registro de uma bacia rifte-sag do Paleo/Mesoproterozóico. Revista Brasileira de Geociências 28: 151–168. Available online: https://doi.org/10.25249/0375-7536.1998151168

Mazine, Fiorella F. 2006. Estudos taxonômicos em *Eugenia* L. (Myrtaceae), com ênfase em *Eugenia* sect. *Racemosae* O. Berg. Universidade de São Paulo, São Paulo, Brazil.

Mazine, Fiorella F., M. de O. Bünger, J.E.Q. de Faria, E. Lucas, & V.C. Souza. 2016. Sections in *Eugenia* (Myrteae, Myrtaceae): Nomenclatural notes and a key. Phytotaxa 289: 225–236. Available online: https://doi.org/10.11646/phytotaxa.289.3.2

Mazine, Fiorella Fernanda, J.E.Q. de Faria Júnior, A. Giaretta, T.N.C. Vasconcelos, F. Forest, & E. Lucas. 2018. Phylogeny and biogeography of the hyper-diverse genus *Eugenia* (Myrtaceae: Myrteae), with emphasis on *E*. sect. *Umbellatae*, the most unmanageable clade. Taxon 67: 752–769. Available online: https://doi.org/10.12705/674.5

Mazine, Fiorella Fernanda, G.Z. Sant'ana, M. Sobral, & K.S. Valdemarin. 2019. *Eugenia velutifolia* (Myrteae, Myrtaceae), a new species from the cerrado of São Paulo, Brazil. Phytotaxa 392: 232–238. Available online: https://doi.org/10.11646/phytotaxa.392.3.6

Mazine, Fiorella Fernanda, & V.C. Souza. 2008a. A new species of *Eugenia* (Myrtaceae) from north-eastern Brazil. Brazilian Journal of Linnean Society 158: 775–777. Available online: https://doi.org/10.1111/j.1095-8339.2008.00921.x

Mazine, Fiorella Fernanda, & V.C. Souza. 2008b. Myrtaceae dos campos de altitude do Parque Nacional do Caparaó - Espírito Santo/Minas Gerais, Brasil. Rodriguésia 59: 57–74. Available online: https://doi.org/10.1590/2175-7860200859102

Mazine, Fiorella Fernanda, & V.C. Souza. 2009. New Species of *Eugenia* sect. *Racemosae* (Myrtaceae) from the Atlantic Forest, Eastern Brazil. Novon: A Journal for Botanical Nomenclature 19: 80–84. Available online: https://doi.org/10.3417/2007034

Mazine, Fiorella Fernanda, V.C. Souza, M. Sobral, F. Forest, & E. Lucas. 2014. A preliminary phylogenetic analysis of *Eugenia* (Myrtaceae: Myrteae), with a focus on Neotropical species. Kew Bulletin 69: 1–14. Available online:

https://doi.org/10.1007/s12225-014-9497-x

McVaugh, R. 1968. The genera of American Myrtaceae: An interim. Taxon 17: 354–418. Available online: https://doi.org/10.2307/1217393

Meguro, M., J.R. Pirani, R. de Mello-Silva, & I. Cordeiro. 2007. Composição florística e estrutura das florestas estacionais decíduas sobre calcário a oeste da Cadeia do Espinhaço, Minas Gerais, Brasil. Boletim Botanico da Universidade de São Paulo 25: 147–171. Available online: https://doi.org/10.11606/issn.2316-9052.v25i2p147-171

Morais, P.O., & J.A. Lombardi. 2006. A família Myrtaceae na reserva particular do patrimônio natural da Serra do Caraça, Catas Altas, Minas Gerais, Brasil. Lundiana 7: 3–32.

Mori, S.A., B.M. Boom, A.M. de Carvalino, & T.S. dos Santos. 1983. Ecological importance of Myrtaceae in an Eastern Brazilian Wet Forest. Biotropica 15: 68. Available online: https://doi.org/10.2307/2388002

Mori, S.A., B.M. Boom, & G.T. Prance. 1981. Distribution patterns and conservation of Eastern Brazilian Coastal Forest tree species. Brittonia 33: 233. Available online: https://doi.org/10.2307/2806330

Moro, M.F., E. Nic Lughadha, D.L. Filer, F.S. de Araújo, & F.R. Martins. 2014. A catalogue of the vascular plants of the Caatinga Phytogeographical Domain: A synthesis of floristic and phytosociological surveys. Phytotaxa 160: 1–30. Available online: https://doi.org/10.11646/phytotaxa.160.1.1

Nascimento, L.C. 2017. Asteraceae dos campos rupestres da Cadeia do Espinhaço: distribuição espacial e a influência do ambiente. Universidade Estadual de Feira de Santana, Feira de Santana, Brazil.

Neves, D.M., K.G. Dexter, R.T. Pennington, M.L. Bueno, P.L.S. de Miranda, & A.T. Oliveira-Filho. 2018. Lack of floristic identity in campos rupestres — A hyperdiverse mosaic of rocky montane savannas in South America. Flora: Morphology, Distribution, Functional Ecology of Plants 238: 24–31. Available online: https://doi.org/10.1016/j.flora.2017.03.011

Nic Lughadha, E. 1994. Notes on the Myrtaceae of the Pico das Almas, Bahia, Brazil. Kew Bulletin 49: 321–329. Available online: https://doi.org/10.2307/4110268

Nic Lughadha, E. 1995. Myrtaceae. Pp. 492–517. *In*: B.L. Stannard (ed.). Flora of the Pico das Almas (1st ed.). Royal Botanical Gardens.:

Nic Lughadha, E., E.J. Lucas, M. Sobral, & E.M. Woodgyer. 2012. A new species and a replacement name in *Myrcia* (*Gomidesia*; Myrtaceae) from north-eastern Brazil. Kew Bulletin 67: 19–24. Available online: https://doi.org/10.1007/s12225-012-9332-1

Oksanen, J., F.G. Blanchet, M. Friendly, R. Kindt, P. Legendre, D. Mcglinn, P.R. Minchin, R.B. O'Hara, G.L. Simpson, P. Solymos, M.H.H. Stevens, E. Szoecs, & H. Wagner. 2018. Vegan: Community Ecology Package.

Oliveira, M.I.U. de, L.S. Funch, & L.R. Landrum. 2012. Flora da Bahia: *Campomanesia* (Myrtaceae). Sitientibus série Ciências Biológicas 12: 91–107. Available online: https://doi.org/10.13102/scb115

Oliveira, M.I.U. de, L.R. Landrum, R.P. de Oliveira, & L.S. Funch. 2013. A new species of *Campomanesia* (Myrtaceae) from Bahia, Brazil, and its relationships with the *C. xanthocarpa* complex. Phytotaxa 149: 19–26. Available online: https://doi.org/10.11646/phytotaxa.149.1.3

Oliveira, U., A.P. Paglia, A.D. Brescovit, C.J.B. de Carvalho, D.P. Silva, D.T. Rezende, F.S.F. Leite, J.A.N. Batista, J.P.P.P. Barbosa, J.R. Stehmann, J.S. Ascher, M.F. de Vasconcelos, P. De Marco, P. Löwenberg-Neto, P.G. Dias, V.G. Ferro, & A.J. Santos. 2016. The strong influence of collection bias on biodiversity knowledge shortfalls of Brazilian terrestrial biodiversity. Diversity and Distributions 22: 1232–1244. Available online: https://doi.org/10.1111/ddi.12489

Pirani, J.R., R. de Mello-Silva, & A.M. Giulietti. 2003. Flora de Grão-Mogol, Minas Gerais, Brasil. Boletim de Botânica da Universidade de São Paulo 21: 1–24. Available online: https://doi.org/10.11606/issn.2316-9052.v21i1p1-24

Proença, C. 1990. A Revision of *Siphoneugena* Berg. Edinburgh Journal of Botany 47: 239–271. Available online: https://doi.org/10.1017/S0960428600003401

Proença, C.E.B., M.I.U. Oliveira, M. Sobral, & M.F. Landim. 2014. Novelties in Myrtaceae: Contributions to the flora of the state of Sergipe, Brazil. Phytotaxa 173: 217–225. Available online: https://doi.org/10.11646/phytotaxa.173.3.4

Proença, C.E.B., E.M. Nic Lughadha, E.J. Lucas, & E.M. Woodgyer. 2006. *Algrizea* (Myrteae, Myrtaceae): A new genus from the highlands of Brazil. Systematic Botany 31: 320–326. Available online: https://doi.org/10.1600/036364406777585874

Rahbek, C., M.K. Borregaard, R.K. Colwell, B. Dalsgaard, B.G. Holt, N. Morueta-

Holme, D. Nogues-Bravo, R.J. Whittaker, & J. Fjeldså. 2019. Humboldt’s enigma: What causes global patterns of mountain biodiversity? Science 365: 1108–1113. Available online: https://doi.org/10.1126/science.aax0149

Rapini, A., R. de Mello-Silva, & M.L. Kawasaki. 2002. Richness and endemism in Asclepiadoideae (Apocynaceae) from the Espinhaço Range of Minas Gerais, Brazil - a conservationist view. Biodiversity and Conservation 11: 1733–1746. Available online: https://doi.org/10.1023/A:1020346616185

Rapini, A., P.L. Ribeiro, S. Lambert, & J.R. Pirani. 2008. A flora dos campos rupestres da Cadeia do Espinhaço. Megadiversidade 4: 16–24.

Ribeiro, P.L., A. Rapini, L.S. Damascena, & C. Van Den Berg. 2014. Plant diversification in the Espinhaço Range: Insights from the biogeography of *Minaria* (Apocynaceae). Taxon 63: 1253–1264. Available online: https://doi.org/10.12705/636.16

Romagnolo, M.B., & M.C. de Souza. 2004. Os gêneros *Calycorectes* O. Berg, *Hexachlamys* O. Berg, *Myrcianthes* O. Berg, *Myrciaria* O. Berg e *Plinia* L. (Myrtaceae) na planície alagável do alto rio Paraná, Brasil. Acta Botanica Brasilica 18: 613–627. Available online: https://doi.org/10.1590/S0102-33062004000300019

Rosa, P.O. 2009. O gênero *Myrcia* DC. (Myrtaceae) nos campos rupestres de Minas Gerais. Universidade Federal de Uberlândia. Uri: https://doi.org/10.1590/S2175-78602012000300011

Rosa, P.O. 2015. Subtribo Myrciinae DC. e *Myrceugenia* O.Berg: Tratamento taxonômico, flora e adequações nomenclaturais da coleção de Glaziou para os estados Goiás e Tocantins. Universidade de Brasília, Brasília, Brazil.

Rosa, P.O., & R. Romero. 2012. O gênero *Myrcia* (Myrtaceae) nos campos rupestres de Minas Gerais, Brasil. Rodriguésia 63: 613–633. Available online: https://doi.org/10.1590/S2175-78602012000300011

Saadi, A. 1995. A geomorfologia da Serra do Espinhaço em Minas Gerais e de suas margens. Geonomos 3: 41–63. Available online: https://doi.org/10.18285/geonomos.v3i1.215

Santana, K.C. De. 2018. Estudos taxonômicos em *Eugenia* L. sect. *Eugenia* (Myrtaceae, Myrteae). Universidade Estadual de Feira de Santana, Feira de Santana, Brazil.

Santana, K.C. De, M.I.U. de Oliveira, F.F. Mazine, & L.S. Funch. 2017. Flora da Bahia: *Eugenia* sect. *Eugenia* (Myrtaceae). Sitientibus série Ciências Biológicas 17. Available online: https://doi.org/10.13102/scb2624

Santos, L.L. dos. 2017. Taxonomia e filogenia de *Myrcia* sect. *Myrcia* (*Myrcia s.l.,* Myrtaceae). Universidade Federal Rural de Pernambuco, Recife, Brazil.

Santos, L.L. dos, M.F. Sales, & M. Sobral. 2016. A new Brazilian species of *Myrcia* (Myrtaceae) and a new synonym for *Psidium amplexicaule*. Phytotaxa 257: 122–132.

Santos, P.S.N. dos, M.I.U. de Oliveira, A.P.L. do Couto-Santos, & L.S. Funch. 2021. Diversity of Myrtaceae in and surroundings the Chapada Diamantina National Park, Brazil. Rodriguesia 72: 14. Available online: http://dx.doi.org/10.1590/2175-7860202172098

Santos, M.F., E. Lucas, & P.T. Sano. 2015. Five new South American species of *Myrcia s.l.* (Myrtaceae). Phytotaxa 234: 159–171. Available online: https://doi.org/10.11646/phytotaxa.234.2.6

Santos, M.F., E. Lucas, P.T. Sano, S. Buerki, V.G. Staggemeier, & F. Forest. 2017. Biogeographical patterns of *Myrcia s.l.* (Myrtaceae) and their correlation with geological and climatic history in the Neotropics. Molecular Phylogenetics and Evolution 108: 34–48. Available online: https://doi.org/10.1016/j.ympev.2017.01.012

Santos, M.F., E.J. Lucas, M. Sobral, & P.T. Sano. 2015. New species of *Myrcia s.l.* (Myrtaceae) from campo rupestre, Atlantic Forest and Amazon Forest. Phytotaxa 222: 100–110. Available online: https://doi.org/10.11646/phytotaxa.222.2.2

Santos, M.F., & P.T. Sano. 2012. Flora fanerogâmica da Serra do Ouro Branco, Minas Gerais: Myrtaceae. Rodriguésia 63: 1065–1083. Available online: https://doi.org/10.1590/S2175-78602012000400019

Santos, M.F., H. Serafim, & P.T. Sano. 2012. Composição e estrutura arbórea em floresta estacional semidecidual no Espinhaço Meridional (Serra do Cipó, MG). Rodriguésia 63: 985–997. Available online: https://doi.org/10.1590/S2175-78602012000400015

Silva, A.T. da, & F.F. Mazine. 2016. A família Myrtaceae na Floresta Nacional de Ipanema, Iperó, São Paulo, Brasil. Rodriguesia 67: 203–223. Available online: https://doi.org/10.1590/2175-7860201667110

Silveira, F.A.O., D. Negreiros, N.P.U. Barbosa, E. Buisson, F.F. do Carmo, D.W. Carstensen, A.A. Conceição, T.G. Cornelissen, L. Echternacht, G.W. Fernandes, Q.S. Garcia, T.J. Guerra, C.M. Jacobi, J.P. Lemos-Filho, S. Le Stradic, L.P.C. Morellato, F.S. Neves, R.S. Oliveira, C.E. Schaefer, P.L. Viana, & H. Lambers. 2016. Ecology and evolution of plant diversity in the endangered campo rupestre: a neglected conservation priority. Plant and Soil 403: 129–152. Available online: http://dx.doi.org/10.1007/s11104-015-2637-8

Sobral, M. 1993. Sinopse de *Myrciaria* (Myrtaceae). Napaea 9: 13–41.

Sobral, M. 2005. *Plinia nana* (Myrtaceae), a new species from Minas Gerais. Missouri Botanical Garden Press 15: 586–589.

Sobral, M. 2007. A evolução do conhecimento taxonômico das Angiospermas no Brasil (1990-2006) e um estudo de caso: A família Myrtaceae no município de Santa Teresa, Espírito Santo. Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais.

Sobral, M. 2010a. Three new montane forest Myrtaceae from Espírito Santo, Brazil. Novon: A Journal for Botanical Nomenclature 20: 338–344. Available online: http://dx.doi.org/10.3417/2004070

Sobral, M. 2010b. Ten new Myrtaceae from eastern and northeastern Brazil. Journal of the Botanical Research Institute of Texas 4: 133–158.

Sobral, M., & K. Antunes. 2018. *Myrcia auxotelica*, a new southeastern Brazilian myrtaceae. Phytotaxa 379: 297–300. Available online: http://dx.doi.org/10.11646/phytotaxa.379.4.4

Sobral, M., C.P. Caliari, E. Gressler, F.F. Mazine, M. Magenta, & P.L. Viana. 2016. Seven new southeastern Brazilian species of *Myrcia* (Myrtaceae). Phytotaxa 247: 27–44. Available online: http://dx.doi.org/10.11646/phytotaxa.247.1.2

Sobral, M., J.E.Q. de Faria Júnior, & K. Coutinho. 2018. Five new Brazilian species of *Eugenia* (Myrtaceae). Phytotaxa 347: 59–70. Available online: http://dx.doi.org/10.11646/phytotaxa.347.1.3

Sobral, M., J.E.Q. de Faria Júnior, M.U. Ibrahim, E.J. Lucas, D. Rigueira, A. Stadnik, & D. Villaroel. 2015. Thirteen new Myrtaceae from Bahia, Brazil. Phytotaxa 224: 201–231. Available online: http://dx.doi.org/10.11646/phytotaxa.224.3.1

Sobral, M., C.R. Grippa, M.C. Souza, O.T. Aguiar, R. Bertoncello, & T.B. Guimarães. 2012. Fourteen new species and two taxonomic notes on Brazilian Myrtaceae.

Phytotaxa 50: 19–50. Available online: http://dx.doi.org/10.11646/phytotaxa.50.1.3

Sobral, M., & D.F. Lima. 2021. Three new Brazilian Myrtaceae. Phytotaxa 483: 277–284. Available online: https://doi.org/10.11646/phytotaxa.483.3.7

Sobral, M., & J.R. Stehmann. 2009. An analysis of new angiosperm species discoveries in Brazil (1990-2006). Taxon 58: 227–232.

Sociedade Botânica do Brasil. 2022. Catálogo da Rede Brasileira de Herbários.

Sousa-Baena, M.S., L.C. Garcia, & A.T. Peterson. 2014. Completeness of digital accessible knowledge of the plants of Brazil and priorities for survey and inventory. Diversity and Distributions 20: 369–381. Available online: https://doi.org/10.1111/ddi.12136

Souza, M. da C. 2005. Myrtaceae Juss. da restinga da Marambaia RJ-Brasil. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil.

Souza, M. da C. 2009. Estudos taxonômicos em Myrtaceae no Brasil: Revisão de Neomitranthes Kausel ex D.Legrand e contribuição ao conhecimento da diversidade e conservação de *Plinia* L. no Domínio Atlântico. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil.

Stadnik, A. 2020. Estudos sistemáticos na subtribo Pliniinae E. Lucas & T. Vasc. (Myrtaceae). Universidade Estadual de Feira de Santana, Feira de Santana, Brazil.

Stadnik, A., M.I.U. de Oliveira, & Roque. 2018. Myrtaceae na Serra Geral de Licínio de Almeida, Bahia, Brasil. Rodriguésia 69: 515–552. Available online: https://doi.org/10.1590/2175-7860201869220

Stadnik, A., M.I.U. de Oliveira, & N. Roque. 2016. Levantamento florístico de Myrtaceae no município de Jacobina, Chapada Diamantina, Estado da Bahia, Brasil. Hoehnea 43: 87–97. Available online: https://doi.org/10.1590/2236-8906-46/2015

Staggemeier, V.G., E. Cazetta, & L.P.C. Morellato. 2017. Hyperdominance in fruit production in the Brazilian Atlantic rain forest: the functional role of plants in sustaining frugivores. Biotropica 49: 71–82. Available online: https://doi.org/10.1111/btp.12358

Thiers, B. 2020. Index Herbariorum. New York Botanical Garden’s Virtual Herbarium.

Tuler, A.C., T.T. Carrijo, M.F.S. Ferreria, & A.L. Peixoto. 2017. Flora of Espírito Santo:

*Psidium* (Myrtaceae). Rodriguésia 68: 1791–1805. Available online: https://doi.org/10.1590/2175-7860201768515

Valdemarin, K.S. 2018. Estudo taxonômico das espécies de *Eugenia* L . (Myrtaceae) da Reserva Natural Vale – Linhares, ES. Universidade de São Paulo, Piracicaba, Brazil.

Vasconcelos, T.N.C., G. Prenner, & E.J. Lucas. 2019. A systematic overview of the floral diversity in Myrteae (Myrtaceae). Systematic Botany 44: 570–591. Available online: https://doi.org/10.1600/036364419x15620113920617

Verdi, M., N. Pougy, E. Martins, & G. Martinelli. 2015. A Serra do Espinhaço Meridional. Pp. 19–31. *In*: Plano de ação nacional para a conservação da flora ameaçada de extinção da Serra do Espinhaço Meridional.

Villarroel, D., & C.E.B. Proença. 2013. A new species and new records of Myrtaceae from the Noel Kempff Mercado National Park region of Bolivia. Kew Bulletin 68: 261–267. Available online: https://doi.org/10.1007/s12225-013-9449-x

Wagner, M. de A., & P. Fiaschi. 2020. Myrtaceae from the Atlantic forest subtropical highlands of São Joaquim National Park (Santa Catarina, Brazil). Rodriguésia 71. Available online: https://doi.org/10.1590/2175-7860202071006

Yang, W., K. Ma, & H. Kreft. 2013. Geographical sampling bias in a large distributional database and its effects on species richness-environment models. Journal of Biogeography 40: 1415–1426.

Zappi, D.C., E. Lucas, B.L. Stannard, E. Nic Lughadha, J.R. Pirani, L.P. de Queiroz, S. Atkins, D.J.N. Hind, A.M. Giulietti, R.M. Harley, & A.M. de Carvalho. 2003. Lista das Plantas Vasculares de Catolés, Chapada Diamantina, Bahia, Brasil. Boletim de Botânica da Universidade de São Paulo.

## VI. Tables and Figures

Table 1. Myrtaceae species, their distribution within different geomorphological subdivisions and vegetations types of the Espinhaço Mountain Range, level of endemism and total number of records. States listed: Bahia (BA) and Minas Gerais (MG); Geomorphological structures: Chapada Diamantina (CD), Northern Espinhaço (ES), Central Espinhaço (EC), Serra do Cabral (SC), Southern Espinhaço (EM), Adjacent Mountains (SA) and Iron Quadrangle (QF); Vegetation classes: Caatinga *sensu lato* (CAA), cerrado *sensu lato* (CE), campo rupestre (CR) and forests (FL). NI stands for not identified, used when there is no available information to assess their distribution. Regarding endemism level, species are categorized as not endemic of the EMR (WD) or their type of endemism is detailed: where species can either be exclusive to the whole area (EMR), different geomorphological structures within a single state (BA or MG), or have even smaller distribution, being exclusive to a single geomorphological structure – in this case, both the state and the structure are highlighted.

| **Species** | **Voucher** | **State** | **Geomorphological structure** | | | | | | | | **Vegetation type** | **Endemism level** | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **CD** | **ES** | **EC** | **SC** | **EM** | **SA** | **QF** | **NI** | | | |
| *Acca* O.Berg | | | | | | | | | | | | | |
| *Acca sellowiana* (O.Berg) Burret | Oliveira, J.E.615 | MG | | | | | | | 🟧 | | NI | WD | 1 |
| *Accara* Landrum | | | | | | | | | | | | | |
| *Accara elegans* (DC.) Landrum | Faria, J.E.Q.981 | MG | | | | | 🟦 | | 🟧 | | CE, CR, FL | MG | 63 |
| *Algrizea* Proença & NicLugh. | | | | | | | | | | | | | |
| *Algrizea macrochlamys* (DC.) Proença & NicLugh. | Stadnik, A. 528 | BA | 🟥 | 🟩 | | | | | | | WD | BA | 55 |
| *Blepharocalyx* O.Berg | | | | | | | | | | | | | |
| *Blepharocalyx myriophyllus* (Casar.) | Borges, L.M.200 | MG | | | 🟩 | 🟦 | 🟦 | | 🟧 | | CE, CR, FL | MG | 23 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Morais & Sobral | | | | | ■ | ■ | ■ | | ■ | | | |
| *Blepharocalyx salicifolius* (Kunth) O.Berg | Ganev, W.2203 | BA, MG | ■ | ■ | ■ | ■ | ■ | | ■ | WD | WD | 227 |
| *Calycolpus* O.Berg | | | | | | | | | | | | |
| *Calycolpus australis* Landrum | Hensold, N.2836 | MG | | | | | ■ | | | CR | MG (EM) | 15 |
| *Campomanesia* Ruiz et Pav. | | | | | | | | | | | | |
| *Campomanesia adamantium* (Cambess.) O.Berg | Kawasaki, M.L.8181 | MG | | | ■ | ■ | ■ | ■ | ■ | CE, CR, FL | WD | 181 |
| *Campomanesia aromatica* (Aubl.) Griseb. | Carvalho, R.A.23 | BA, MG | ■ | ■ | | | ■ | | | CAA, FL | WD | 7 |
| *Campomanesia costata* M.Ibrahim & Landrum | Ibrahim, M.187 | BA, MG | ■ | | | | | | | CE, CR, FL | BA (CD) | 7 |
| *Campomanesia dichotoma* (O.Berg) Mattos | Cardoso, D.2735 | MG | | | | | | | ■ | CR | WD | 1 |
| *Campomanesia eugenioides* (Cambess.) D.Legrand ex Landrum | Barreto, V.226 | BA, MG | ■ | | ■ | | | | | CE | WD | 10 |
| *Campomanesia grandiflora* (Aubl.) Sagot | Faria, J.E.Q.937 | BA, MG | | ■ | | | ■ | | | FL | WD | 4 |
| *Campomanesia guaviroba* (DC.) Bertoni | Stadnik, A. 286 | BA, MG | ■ | ■ | | ■ | ■ | ■ | | FL | WD | 8 |
| *Campomanesia guazumifolia* (Cambess.) O. Berg | Santos, A.P.M.471 | MG | | | | ■ | ■ | | ■ | CR, FL | WD | 7 |
| *Campomanesia laurifolia* Gardner | Santos, M.F.195 | MG | | | | | ■ | ■ | | FL | WD | 2 |
| *Campomanesia lineatifolia* Ruiz & Pav. | Barbosa, J. sn | MG | | | | | | | ■ | FL | WD | 1 |
| *Campomanesia phaea* (O.Berg) Landrum | Rodrigues, M.J. | MG | | | | | | | ■ | NI | WD | 1 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | sn | | | | | | | | 🟧 | | | |
| *Campomanesia pubescens* (Mart. ex DC.) O. Berg | Cardoso, D.2738 | MG | | | 🟩 | 🟦 | 🟦 | | 🟧 | CE, CR, FL | WD | 163 |
| *Campomanesia rufa* (O.Berg) Nied. | Vidal, C.V.1023 | MG | | | | | 🟦 | | 🟧 | CE, CR, FL | WD | 19 |
| *Campomanesia sessiliflora* (O.Berg) Mattos | Lucresia, L.21 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | 🟧 | CE, CR, FL | WD | 66 |
| *Campomanesia simulans* M.L.Kawas. | Vasconcelos, T.N.C.472 | MG | | | | | 🟦 | | 🟧 | FL | WD | 3 |
| *Campomanesia velutina* (Cambess.) O.Berg | Ganev, W.1380 | BA, MG | 🟥 | 🟩 | 🟩 | | | | 🟧 | CAA, CE, FL | WD | 9 |
| *Campomanesia xanthocarpa* (Mart.) O.Berg | Santos, M.F.188 | MG | | | | | 🟦 | | 🟧 | NI | WD | 4 |
| *Eugenia* L. | | | | | | | | | | | | |
| *Eugenia acutata* Miq. | Rodrigues, F.M.388 | MG | | | | | 🟦 | | 🟧 | CE, FL | WD | 6 |
| *Eugenia angustissima* O.Berg | Roque, N.3330 | BA, MG | 🟥 | 🟩 | | 🟦 | 🟦 | | | CAA, CE, CR | WD | 8 |
| *Eugenia anisomischa* Sobral & K.Cout. | Giulietti, A.M.1628 | BA, MG | 🟥 | | | | 🟦 | | | CE, FL | EMR | 8 |
| *Eugenia anomala* D.Legrand | Hatschbach, G.G.67254 | MG | | | | 🟦 | | | | CR | WD | 2 |
| *Eugenia arvensis* Vell. | Pereira, A.1901 | BA | 🟥 | | | | | | | CR, FL | WD | 11 |
| *Eugenia astringens* Cambess. | Stadnik, A. 40 | BA | 🟥 | | | | | | | CR | WD | 1 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Eugenia aurata* O.Berg | Borges, L.M.312 | MG | | | 🟩 | | 🟦 | | 🟧 | ⬜ | CE, CR, FL | WD | 9 |
| *Eugenia azuruensis* O.Berg | Faria, J.E.Q.2642 | BA | 🟥 | | | | | | | | CE, CR | BA (CD) | 18 |
| *Eugenia bahiana* Mattos | Hatschbach, G.G.49658 | MG | | | | | 🟦 | | | | CE | WD | 3 |
| *Eugenia beaurepairiana* (Kiaersk.) D.Legrand | Funch, R.601 | BA | 🟥 | | | | | | | | FL | WD | 5 |
| *Eugenia bimarginata* DC. | Ganev, W.1107 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | ⬛ | 🟧 | ⬜ | CE, CR, FL | WD | 114 |
| *Eugenia blanda* Sobral | Silva, T.R.S.13340 | MG | | | 🟩 | | | | | | CE, CR | MG (EC) | 5 |
| *Eugenia brasiliensis* Lam. | Faria, J.E.Q.2068 | MG | | | | | 🟦 | | 🟧 | | FL | WD | 17 |
| *Eugenia brejoensis* Mazine | Gasson, P.6206 | BA | 🟥 | | | | | | | | NI | WD | 1 |
| *Eugenia brunneopubescens* Mazine | Forzza, R.C.4841 | MG | | | | | 🟦 | | | | CR | WD | 1 |
| *Eugenia candolleana* DC. | Giulietti, A.M.2816 | BA, MG | 🟥 | | | | 🟦 | | | | CAA, CE, FL | WD | 18 |
| *Eugenia capparidifolia* DC. | Faria, J.E.Q.5339 | MG | | | 🟩 | 🟦 | 🟦 | ⬛ | | ⬜ | CE, CR, FL | MG | 39 |
| *Eugenia cerasiflora* Miq. | Lucresia, L.15 | BA, MG | 🟥 | | | | | | 🟧 | | CE, CR, FL | WD | 37 |
| *Eugenia complicata* O.Berg | Kawasaki, M.L.8190 | MG | | | | 🟦 | | | | | CE | WD | 5 |
| *Eugenia copacabanensis* Kiaersk. | Ganev, W.2490 | BA | 🟥 | | | | | | | | FL | WD | 1 |
| *Eugenia costatifructa* Mazine | Guedes, M.L.3842 | BA | 🟥 | | | | | | | | CE, CR, FL | WD | 11 |
| *Eugenia crassa* Sobral | Pirani, J.R.3954 | MG | | | | | | ⬛ | | | NI | WD | 1 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Eugenia dictyophleba* O.Berg | Sano, P.T. sn | MG | | | 🟩 | | | | | | NI | WD | 2 |
| *Eugenia dimorpha* O.Berg | Faria, J.E.Q.6375 | MG | | | | | 🟦 | | | | NI | WD | 1 |
| *Eugenia duarteana* Cambess. | Melo, E.3171 | BA | 🟥 | | | | | | | | CAA | WD | 2 |
| *Eugenia dysenterica* DC. | Guedes, M.L.16651 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | | ⬜ | WD | WD | 58 |
| *Eugenia ellipsoidea* Kiaersk. | Ganev, W.591 | BA, MG | 🟥 | 🟩 | | 🟦 | 🟦 | | | | CE, CR, FL | WD | 44 |
| *Eugenia espinhacensis* Bünger & Sobral | Mota, R.C.86 | MG | | | | | 🟦 | | 🟧 | | CE, FL | MG | 6 |
| *Eugenia expansa* Spring ex. Mart. | Verdi, M.6539 | MG | | | | | 🟦 | | | | FL | WD | 1 |
| *Eugenia flavescens* DC. | Oliveira, I.25 | BA, MG | 🟥 | 🟩 | | | 🟦 | | 🟧 | | FL | WD | 10 |
| *Eugenia florida* DC. | Guedes, M.L.7460 | BA, MG | 🟥 | 🟩 | 🟩 | | 🟦 | 🟦 | 🟧 | | CAA, CE, FL | WD | 34 |
| *Eugenia francavilleana* O.Berg | Faria, J.E.Q.6358 | BA, MG | 🟥 | | 🟩 | 🟦 | 🟦 | 🟦 | 🟧 | | CE, CR, FL | WD | 16 |
| *Eugenia gracillima* Kiaersk. | Stadnik, A. 110 | BA | | 🟩 | | | | | | | FL | WD | 2 |
| *Eugenia grandissima* Sobral, Mazine & E.A.D. Melo | Sobral, M.15783 | MG | | | | | 🟦 | 🟦 | | | FL | MG | 3 |
| *Eugenia hiemalis* Cambess. | Hensold, N.3131 | BA, MG | 🟥 | | 🟩 | 🟦 | 🟦 | 🟦 | 🟧 | | CE, CR, FL | WD | 27 |
| *Eugenia hilariana* DC. | Prado, J.12020 | MG | | | 🟩 | | 🟦 | | | | CE, CR | WD | 9 |
| *Eugenia hirta* O.Berg | Melo, E.9962 | BA | 🟥 | | | | | | | | FL | WD | 5 |
| *Eugenia indistincta* Sobral & Stadnik | França, F.3043 | BA | 🟥 | | | | | | | | CAA | WD | 2 |
| *Eugenia involucrata* DC. | Fiaschi, P.6 | BA, MG | 🟥 | | | 🟦 | 🟦 | 🟦 | 🟧 | | CE, CR, FL | WD | 52 |
| *Eugenia itajurensis* Cambess. | Faria, J.E.Q.4250 | MG | | | | | 🟦 | | | | CE, FL | WD | 9 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Eugenia itapemirimensis* Cambess. | Stadnik, A. 180 | BA | | 🟩 | | | | | | | FL | WD | 1 |
| *Eugenia klotzschiana* O.Berg | Sevilha, A.C.4898 | MG | | | 🟩 | | | | 🟧 | | CE, CR | WD | 2 |
| *Eugenia lagoensis* Kiaersk. | Fraga, C.N.2436 | MG | | | | | 🟦 | | | | FL | WD | 15 |
| *Eugenia langsdorffii* O.Berg | Hatschbach, G.G.73526 | MG | | | | 🟦 | | | | | CE | WD | 1 |
| *Eugenia laruotteana* Cambess. | Faria, J.E.Q.6629 | MG | | | 🟩 | | 🟦 | | | | CE, FL | WD | 7 |
| *Eugenia laxa* DC. | Martius, K.F.P. sn | BA | 🟥 | | | | | | | | NI | BA (CD) | 1 |
| *Eugenia ligustrina* (Sw.) Willd. | Guedes, M.L.14478 | BA, MG | 🟥 | 🟩 | | | 🟦 | | 🟧 | | CR, FL | WD | 22 |
| *Eugenia longipedunculata* Nied. | Faria, J.E.Q.6567 | MG | | | | | 🟦 | | 🟧 | | CE, CR, FL | WD | 7 |
| *Eugenia luschnathiana* (O. Berg) Klotzsch ex B.D. Jacks. | Faria, J.E.Q.3140 | MG | | | | | 🟦 | | | | FL | WD | 1 |
| *Eugenia macrosperma* DC. | Rapini, A.457 | MG | | | 🟩 | 🟦 | | | 🟧 | | FL | WD | 3 |
| *Eugenia mansoi* O.Berg | Faria, J.E.Q.5525 | BA, MG | 🟥 | 🟩 | | | 🟦 | | | | CE | WD | 9 |
| *Eugenia maritima* DC. | Guedes, M.L.712 | BA | 🟥 | | | | | | | | CE, CR, FL | WD | 19 |
| *Eugenia megaflora* Govaerts | Santos, E.C.17 | BA | | 🟩 | | | | | | | NI | WD | 1 |
| *Eugenia melanogyna* (D.Legrand) Sobral | Furlan, A.2987 | MG | | | | | 🟦 | | | | NI | WD | 1 |
| *Eugenia modesta* DC. | Landrum, L.R.4276 | BA, MG | 🟥 | | 🟩 | | 🟦 | 🟦 | 🟧 | ⬜ | WD | WD | 80 |
| *Eugenia moonioides* O.Berg | Faria, J.E.Q.6646 | MG | | | | | 🟦 | | | | FL | WD | 1 |
| *Eugenia mosenii* Kausel (Sobral) | Dias, S. sn | MG | | | | | | | 🟧 | | FL | WD | 1 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Eugenia mucugensis* Sobral | Bovini, M.G.2503 | BA | 🟥 |  |  |  |  |  |  |  | CE | BA (CD) | 2 |
| *Eugenia myrcianthes* Nied. | Sujuki, HT sn | MG |  |  |  |  |  |  | 🟧 |  | FL | WD | 1 |
| *Eugenia nutans* O.Berg | Harley, R.M.18724 | BA, MG | 🟥 |  |  |  | 🟦 |  | 🟧 |  | CR, FL | WD | 25 |
| *Eugenia pantagensis* O.Berg | Souza, V.C.25561 | BA, MG | 🟥 |  | 🟩 | 🟦 |  |  |  |  | CE, FL | WD | 4 |
| *Eugenia parvula* Glaz. | Glaziou, A.F.M.19388 | MG |  |  |  |  | 🟦 |  |  |  | NI | MG (EM) | 1 |
| *Eugenia piloensis* Cambess. | Faria, J.E.Q.547 | MG |  |  |  |  | 🟦 |  |  |  | FL | WD | 1 |
| *Eugenia pistaciifolia* DC. | Guedes, M.L.15181 | BA, MG | 🟥 | 🟩 | 🟩 |  |  |  |  | ⬜ | WD | WD | 84 |
| *Eugenia pitanga* (O.Berg) Kiaersk. | Rapini, A.400 | MG |  |  |  |  | 🟦 |  |  |  | NI | WD | 1 |
| *Eugenia pohliana* DC. | Ganev, W.1063 | BA | 🟥 |  |  |  |  |  |  |  | CAA, CE, CR | WD | 25 |
| *Eugenia prasina* O.Berg | Hatschbach, G.G.77575 | MG |  |  |  | 🟦 |  |  |  |  | CE | WD | 2 |
| *Eugenia punicifolia* (Kunth) DC. | Ganev, W.526 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | 🟦 | 🟧 | ⬜ | WD | WD | 691 |
| *Eugenia pyriformis* Cambess. | Schwacke, C.A.W.11088 | MG |  |  |  |  | 🟦 |  | 🟧 |  | NI | WD | 7 |
| *Eugenia rosea* DC. | Saar, E.5831 | BA | 🟥 |  |  |  |  |  |  |  | CAA, CE | WD | 8 |
| *Eugenia rotula* Sobral | Faria, J.E.Q.4190 | BA | 🟥 |  |  |  |  |  |  |  | CE | BA (CD) | 2 |
| *Eugenia sellowiana* DC. | Sevilha, A.C.4844 | MG |  |  | 🟩 |  |  |  |  |  | CE | WD | 2 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Eugenia sonderiana* O.Berg | Ganev, W.554 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | 🟧 | | WD | WD | 123 |
| *Eugenia speciosa* Cambess. | Pirani, J.R.13475 | MG | | | 🟩 | | | | 🟧 | | CE, FL | MG (EM) | 6 |
| *Eugenia sphenophylla* O.Berg | Faria, J.E.Q.6360 | MG | | | | 🟦 | 🟦 | | 🟧 | | CE, CR, FL | WD | 12 |
| *Eugenia splendens* O.Berg | Lucresia, L.3 | BA, MG | 🟥 | | 🟩 | | 🟦 | | | | CE, CR, FL | WD | 137 |
| *Eugenia sprengelii* DC. | Hatschbach, G.G.73809 | MG | | | | | 🟦 | | | ⬜ | CE | WD | 4 |
| *Eugenia stictopetala* DC. | Coelho, J.126 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | ⬛ | 🟧 | ⬜ | WD | EMR | 59 |
| *Eugenia suberosa* Cambess. | Pirani, J.R.4621 | MG | | | 🟩 | 🟦 | 🟦 | | | | FL | WD | 8 |
| *Eugenia subterminalis* DC. | Silva, J.M.6010 | BA, MG | 🟥 | | | 🟦 | | | | | FL | WD | 2 |
| *Eugenia tenuipedunculata* Kiaersk. | Faria, J.E.Q.1000 | MG | | | | | 🟦 | ⬛ | | ⬜ | FL | WD | 13 |
| *Eugenia tephrogyna* Sobral & Proença | Aona, L.Y.S.2934 | BA | 🟥 | | | | | | | | FL | WD | 1 |
| *Eugenia uniflora* L. | Coelho, J.130 | BA, MG | 🟥 | 🟩 | | | 🟦 | | 🟧 | | CAA, CR, FL | WD | 11 |
| *Eugenia velutifolia* Mazine & Sobral | Stadnik, A. 169 | BA | 🟥 | 🟩 | | | | | | | CE | WD | 2 |
| *Eugenia verticillata* (Vell.) Angely | Melo, E.3567 | BA | 🟥 | | | | | | | | CAA | WD | 1 |
| *Eugenia vetula* DC. | Lucresia, L.49 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | ⬛ | | | WD | WD | 109 |
| *Eugenia widgrenii* Sond. ex O.Berg | Santos, M.F.419 | MG | | | | | 🟦 | | | | NI | WD | 1 |
| *Eugenia zigzag* K.Cout. & Sobral | Queiroz, L.P.7053 | BA | 🟥 | | | | | | | | CAA | WD | 3 |
| *Eugenia zuccarinii* O.Berg | Melo, E.1327 | BA, MG | 🟥 | | | | 🟦 | | | | CR, FL | WD | 20 |
| Eugenia sp. 1 | Milliken, W.4151 | MG | | | | | 🟦 | | | | CE, FL | BA (CD) | 5 |
| Eugenia sp. 2 | Sarmento, | BA | 🟥 | | | | | | | | FL | WD | 1 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | A.C.845 |  | 🟥 |  |  |  |  |  |  |  |  |  |  |
| Myrceugenia |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Myrceugenia alpigena* (DC.) Landrum | Peron, M.618 | BA, MG | 🟥 |  |  |  | 🟦 |  | 🟧 | ⬜ | CE, CR, FL | WD | 52 |
| *Myrceugenia bracteosa* (DC.) D.Legrand & Kausel | Irwin, H.S.28762 | MG |  |  |  |  |  |  | 🟧 |  | CR, FL | WD | 6 |
| *Myrceugenia brevipedicellata* (Burret) D.Legrand & Kausel | Rezende, S.G.3727 | MG |  |  |  |  |  |  | 🟧 |  | CR | WD | 1 |
| *Myrceugenia franciscensis* (O.Berg) Landrum | Oliveira, C.T.331 | MG |  |  |  |  |  |  | 🟧 |  | NI | WD | 2 |
| *Myrceugenia miersiana* (Gardner) D.Legrand & Kausel | Pedreira, G. sn | MG |  |  |  |  |  |  | 🟧 |  | FL | WD | 1 |
| *Myrceugenia ovata* (Hook. & Arn.) O.Berg | Peron, M.743 | MG |  |  |  |  |  |  | 🟧 |  | FL | WD | 3 |
| *Myrceugenia pilotantha* (Kiaersk.) Landrum | Santos, M.F.73 | MG |  |  |  |  | 🟦 |  | 🟧 |  | FL | WD | 5 |
| Myrcia |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Myrcia acutisepala* D.F.Lima & Sobral | Martinelli, G.20355 | MG |  |  | 🟩 |  |  |  |  |  | CR | MG | 2 |
| *Myrcia albotomentosa* DC. | Cordeiro, I.7548 | MG |  |  |  |  | 🟦 |  |  |  | CR | WD | 1 |
| *Myrcia almasensis* NicLugh. | Harley, R.M.25778 | BA | 🟥 |  |  |  |  |  |  |  | CR | BA (CD) | 2 |
| *Myrcia amazonica* DC. | Ganev, W.2386 | BA, MG | 🟥 | 🟩 | 🟩 |  | 🟦 |  | 🟧 |  | CE, CR, FL | WD | 156 |
| *Myrcia anceps* (Spreng) O.Berg | Nakajima, |  MG |  |  |  |  |  |  | 🟧 |  | CR, FL | WD | 6 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J.N.4568 | | | | | | | | 🟧 | | | | |
| *Myrcia arenaria* L.L.Santos, M.F.Sales & Sobral | Couto, A.P.L.158 | BA | 🟥 | | | | | | | | NI | WD | 1 |
| *Myrcia ascendens* M.F.Santos | Lewis, G.P.7074 | BA, MG | 🟥 | | | | 🟦 | | | | CR | EMR | 8 |
| *Myrcia auxotelica* Sobral & Antunes | Rezende, S.G.2527 | MG | | | | | | | 🟧 | | FL | WD | 1 |
| *Myrcia bella* Cambess. | Lima, D.F.520 | MG | | | | | 🟦 | | | | CE | WD | 1 |
| *Myrcia bergiana* O.Berg | Amorim, B.S.722 | BA, MG | 🟥 | | | | 🟦 | | | | FL | WD | 4 |
| *Myrcia blanchetiana* (O.Berg) Mattos | Guedes, M.L.22837 | BA | 🟥 | 🟩 | | | | | | | WD | WD | 175 |
| *Myrcia brunnea* Cambess. | Mello-Barreto, H.L.10600 | MG | | | | | | | 🟧 | | NI | WD | 1 |
| *Myrcia capitata* O.Berg | Funch, L.S.2005 | BA | 🟥 | | | | | | | | NI | WD | 1 |
| *Myrcia carassana* Glaziou ex T.Fernandes | Oliveira, C.T. 344 | MG | | | | | | | 🟧 | | CR | MG (QF) | 3 |
| *Myrcia coelosepala* Kiaersk. | Faria, J.E.Q.4273 | BA, MG | 🟥 | | | | 🟦 | | 🟧 | | FL | WD | 6 |
| *Myrcia crocea* Kiaersk. | Tameirão Neto, E.3852 | MG | | | | | | ⬛ | | | FL | WD | 2 |
| *Myrcia densa* (DC.) Sobral | Guedes, M.L.12823 | BA, MG | 🟥 | 🟩 | 🟩 | | | | | | CE, CR, FL | WD | 172 |
| *Myrcia eriocalyx* DC. | Oliveira, A.M.189 | BA, MG | 🟥 | | 🟩 | 🟦 | 🟦 | | 🟧 | ⬜ | CE, CR, FL | WD | 140 |
| *Myrcia eriopus* DC. | Hatschbach, | MG | | | 🟩 | | 🟦 | ⬛ | 🟧 | | FL | WD | 21 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | G.G.73713 |  |  |  | ■ |  | ■ | ■ | ■ |  |  |  |  |
| *Myrcia eugenioides* Cambess. | Anderson, W.R.35932 | BA, MG | ■ |  |  |  | ■ |  |  |  | NI | WD | 2 |
| *Myrcia excoriata* (Mart.) E.Lucas & C.E.Wilson | Harley, R.M.27748 | BA, MG | ■ |  |  |  | ■ |  | ■ |  | CR, FL | WD | 23 |
| *Myrcia eximia* DC. | Melo, E.3441 | BA | ■ |  |  |  |  |  |  |  | FL | WD | 1 |
| *Myrcia fenzliana* O.Berg | NicLughadha, E.M.53344 | BA, MG | ■ |  | ■ | ■ | ■ |  | ■ |  | CE, CR, FL | WD | 50 |
| *Myrcia ferruginosa* Mazine | Luz, A.A.95 | MG |  |  |  |  |  |  |  | ■ | NI | WD | 1 |
| *Myrcia gestasiana* Cambess. | Santos, M.F.550 | MG |  |  |  | ■ | ■ |  |  |  | CE, CR, FL | WD | 3 |
| *Myrcia glauca* Cambess. | Hatschbach, G.G.50271 | BA, MG | ■ |  |  |  | ■ |  |  |  | CR | EMR | 3 |
| *Myrcia glazioviana* Kiaersk. | Santos, M.F.601 | MG |  |  |  |  | ■ |  | ■ |  | NI | WD | 3 |
| *Myrcia glaziovii* Mattos & D.Legrand | Faria, J.E.Q.2463 | MG |  |  |  |  | ■ |  |  |  | NI | WD | 7 |
| *Myrcia glomerata* (Cambess.) G.P.Burton & E.Lucas | Hatschbach, G.G.29034 | MG |  |  |  |  | ■ |  |  | ■ | FL | WD | 4 |
| *Myrcia grammica* (Spreng.) A.R.Lourenço & E.Lucas | Rapini, A.686 | MG |  |  |  |  | ■ |  | ■ |  | CE, CR, FL | WD | 41 |
| *Myrcia guianensis* (Aubl.) DC. | Harley, R.M.50606 | BA, MG | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | WD | WD | 549 |
| *Myrcia hartwegiana* (O.Berg) Kiaersk. | Santos, M.F.588 | BA, MG | ■ |  | ■ | ■ | ■ |  | ■ |  | CE, CR, FL | WD | 26 |
| *Myrcia hebepetala* DC. | Pedersoli, J.L.22 | BA, MG | ■ |  |  |  | ■ |  | ■ | ■ | CR, FL | WD | 21 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Myrcia hirtiflora* DC. | Vasconcelos, T.N.C.440 | BA | ■ | | | | | | | | CE | WD | 2 |
| *Myrcia hypoleuca* Spring ex Mart. | Roschel, M.B.431 | MG | | | | | | | ■ | | CE, CR | WD | 7 |
| *Myrcia ilheosensis* Kiaersk. | Guedes, M.L.14611 | BA, MG | ■ | ■ | ■ | | | | | | CAA, CR, FL | WD | 37 |
| *Myrcia lacunosa* (O.Berg) N.Silveira | Sucre, D.10196 | MG | | | | | | | ■ | | NI | WD | 1 |
| *Myrcia laricina* (O.Berg) Burret ex Luetzelb. | Snak, C.621 | BA, MG | ■ | ■ | ■ | | | | | | CAA, CE | WD | 5 |
| *Myrcia lasiantha* DC. | Fiaschi, P.63 | BA, MG | ■ | | ■ | ■ | ■ | | ■ | | CE, CR | WD | 31 |
| *Myrcia lenheirensis* Kiaersk. | Santos, M.F.69 | BA, MG | ■ | | ■ | | | | ■ | | CR, FL | WD | 14 |
| *Myrcia lituatinervia* (O.Berg) E.Lucas & C.E.Wilson | Ganev, W.510 | BA | ■ | | | | | | | | CR, FL | WD | 11 |
| *Myrcia loranthifolia* (DC.) G.P.Burton & E.Lucas | França, F.4243 | BA, MG | ■ | | ■ | ■ | ■ | | ■ | ■ | CE, CR, FL | WD | 143 |
| *Myrcia lucasae* R.B. Almeida, Antar & B.S. Amorim | Funch, R.205 | BA | ■ | | | | | | | | CR, FL | BA (CD) | 19 |
| *Myrcia lughadhae* B.S.Amorim | Giulietti, A.M.1585 | BA | ■ | ■ | | | | | | | CE, CR, FL | BA | 14 |
| *Myrcia lutescens* Cambess. | Duarte, A.P.7885 | BA, MG | ■ | | | ■ | ■ | | ■ | | CE, CR, FL | WD | 22 |
| *Myrcia megaphylla* M.F.Santos & Sobral | Santos, M.F.384 | MG | | | | | ■ | | | | FL | MG (EM) | 2 |
| *Myrcia minutiflora* Sagot | Moreira, S.N.1897 | MG | | | | | ■ | | | | NI | WD | 1 |
| *Myrcia mischophylla* Kiaersk. | Lima, D.F.416 | BA, MG | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | CE, CR, FL | WD | 104 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Myrcia montana* Cambess. | Forzza, R.C.6377 | MG | | | | | | | 🟧 | | CR, FL | WD | 7 |
| *Myrcia mucugensis* Sobral | Kral, R.75641 | BA | 🟥 | | | | | | | | CE, CR | BA (CD) | 12 |
| *Myrcia multiflora* (Lam.) DC. | Ganev, W.2913 | BA, MG | 🟥 | | 🟩 | | 🟦 | | 🟧 | | CE, CR, FL | WD | 44 |
| *Myrcia multipunctata* Mazine | Lucresia, L. 17 | BA, MG | 🟥 | 🟩 | 🟩 | | 🟦 | ⬛ | 🟧 | | CE, CR, FL | WD | 164 |
| *Myrcia mutabilis* (O.Berg) N.Silveira | Mori, S.A.13120 | BA, MG | 🟥 | | 🟩 | 🟦 | 🟦 | ⬛ | 🟧 | ⬜ | CE, CR, FL | WD | 116 |
| *Myrcia myrtillifolia* DC. | Sano, P.T.12663 | MG | | | 🟩 | 🟦 | 🟦 | | | ⬜ | CE, CR | WD | 27 |
| *Myrcia neoblanchetiana* O.Berg | Blanchet, J.S.3415 | BA, MG | 🟥 | | | | | | | | NI | WD | 1 |
| *Myrcia neoclusiifolia* A.R.Loureço & E.Lucas | Kamino, L.H.Y.1044 | BA, MG | | 🟩 | | | 🟦 | ⬛ | 🟧 | | CE, FL | WD | 18 |
| *Myrcia neoglabra* E.Lucas & C.E.Wilson | Anderson, W.R.35717 | MG | | | | | 🟦 | | | | NI | WD | 1 |
| *Myrcia neolucida* A.R.Lourenço & E.Lucas | Harley, R.M.50340 | BA | 🟥 | | | | | | | | FL | WD | 4 |
| *Myrcia neoobscura* E.Lucas & C.E.Wilson | NicLughadha, E.M.50207 | BA, MG | 🟥 | | | | 🟦 | | 🟧 | ⬜ | CE, FL | WD | 21 |
| *Myrcia neoregeliana* E.Lucas & C.E.Wilson | Fonseca, R.B.S.9 | BA, MG | 🟥 | | | | | | 🟧 | | FL | WD | 3 |
| *Myrcia neosericea* (Morais & Sobral) Faria & Proença | Faria, J.E.Q.972 | MG | | | | | | | 🟧 | | CR | MG (QF) | 4 |
| *Myrcia neospruceana* E.Lucas & Sobral | Santos, M.F.655 | MG | | | 🟩 | | 🟦 | | | | CE, CR | MG | 4 |
| *Myrcia nitida* Cambess. | Santos, M.F.831 | BA, MG | 🟥 | | 🟩 | | 🟦 | | 🟧 | | CE, CR, FL | EMR | 33 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Myrcia nivea* Cambess. | Roque, N.4723 | BA, MG | 🟥 | | 🟩 | 🟦 | 🟦 | | | | CE, CR | WD | 37 |
| *Myrcia oblongata* DC. | Godoy, F.P. sn | MG | | | | | | | 🟧 | | NI | WD | 2 |
| *Myrcia obovata* (O.Berg) Nied. | Martens, L.A.514 | BA, MG | 🟥 | | 🟩 | 🟦 | 🟦 | | 🟧 | ⬜ | CE, CR, FL | WD | 71 |
| *Myrcia oleifolia* Cambess. | Harley, R.M. 50239 | BA, MG | 🟥 | | | | 🟦 | | | | CE, CR, FL | WD | 23 |
| *Myrcia palustris* DC. | Snak, C.707 | BA, MG | 🟥 | | 🟩 | | 🟦 | | 🟧 | | CR | WD | 10 |
| *Myrcia perforata* O.Berg | Gardner, G.4663 | MG | | | | | | | 🟧 | | FL | WD | 2 |
| *Myrcia pinifolia* Cambess. | Snak, C.699 | MG | | | 🟩 | 🟦 | 🟦 | | | | CE, CR | WD | 5 |
| *Myrcia pirapama* D.F.Lima & Sobral | Zappi, D.C.2520 | MG | | | | | 🟦 | | | | CE, CR | MG (EM) | 2 |
| *Myrcia polygama* (O.Berg) M.F.Santos | Faria, J.E.Q.6445 | MG | | | | | 🟦 | | | | CR | WD | 2 |
| *Myrcia pseudosplendens* Sobral & Mazine | Sobral, M.13570 | MG | | | | | | 🟦 | | | FL | WD | 2 |
| *Myrcia pseudovenulosa* Stadnik & Sobral | Guedes, M.L.1403 | BA | 🟥 | | | | | | | | CE, CR, FL | BA (CD) | 32 |
| *Myrcia pteropoda* (O.Berg) A.R.Lourenço & E.Lucas | Rodrigues, F.M.311 | MG | | | | | | | 🟧 | | CR | WD | 4 |
| *Myrcia pubescens* DC. | Guedes, M.L.12423 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | 🟧 | | WD | WD | 71 |
| *Myrcia pubiflora* DC. | Peron, M.721 | MG | | | 🟩 | | 🟦 | | 🟧 | ⬜ | CR, FL | WD | 10 |
| *Myrcia pubipetala* Miq. | Dias, S. sn | MG | | | | | | | 🟧 | | FL | WD | 1 |
| *Myrcia pulchella* (DC.) A.R.Lourenço & E.Lucas | Kawasaki, M.L.886 | BA, MG | 🟥 | | | | 🟦 | | 🟧 | | CE, CR, FL | WD | 54 |
| *Myrcia racemosa* (O.Berg) Kiaersk. | Stadnik, A. 50 | BA, MG | 🟥 | | | | 🟦 | | 🟧 | | CE, FL | WD | 6 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Myrcia racemulosa* DC. | Hatschbach, G.G.67232 | MG | | | | 🟦 | 🟦 | | | | CR | WD | 2 |
| *Myrcia ramuliflora* (O.Berg) N.Silveira | Mendes, M.S.526 | BA | | 🟩 | | | | | | | CR | WD | 1 |
| *Myrcia reticulata* Cambess. | Thomas, W.W.12954 | BA | 🟥 | | | | | | | | FL | WD | 1 |
| *Myrcia reticulosa* Miq. | Ganev, W.2757 | BA, MG | 🟥 | | 🟩 | | 🟦 | | | | CE, CR, FL | EMR | 42 |
| *Myrcia retorta* Cambess. | Furlan, A.2584 | BA, MG | | 🟩 | 🟩 | 🟦 | 🟦 | | 🟧 | | CE, CR, FL | WD | 52 |
| *Myrcia revoluta* T. Fernandes, D. F. Lima & J. M. A. Braga | Lombardi, J.A. 3555 | MG | | | | | 🟦 | | | | CE | MG (EM) | 1 |
| *Myrcia rosangelae* NicLugh. | Monteiro, R.F.216 | BA, MG | 🟥 | | | | 🟦 | | | | CE, CR | WD | 4 |
| *Myrcia rubiginosa* Cambess. | Guedes, M.L.11769 | BA | 🟥 | | | | | | | | CR | WD | 2 |
| *Myrcia rufipes* DC. | Assis, L.C.S.220 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | 🟦 | 🟧 | ⬜ | WD | WD | 141 |
| *Myrcia rupestris* M.F.Santos | Mazine, F.F. 559 | MG | | | 🟩 | | | | | | CE, CR | MG (EC) | 29 |
| *Myrcia rupicola* D.Legrand | Roschel, M.B.392 | MG | | | | | | | 🟧 | | NI | WD | 1 |
| *Myrcia salzmannii* O.Berg | Arbo, M.M.5340 | BA | 🟥 | | | | | | | | NI | WD | 2 |
| *Myrcia selloi* (Spreng.) N.Silveira | Tameirão Neto, E.5030 | BA, MG | 🟥 | | 🟩 | | 🟦 | 🟦 | 🟧 | | CE, CR, FL | WD | 50 |
| *Myrcia sessilissima* M.F.Santos | Santos, M.F.641 | MG | | | 🟩 | | | | | | NI | MG (EC) | 1 |
| *Myrcia splendens* (Sw.) DC. | Guedes, M.L.5620 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | 🟧 | ⬜ | WD | WD | 471 |
| *Myrcia springiana* (O.Berg) Kiaersk. | Bautista, | BA | 🟥 | | | | | | | | CR, FL | WD | 5 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H.P.3080 | | ■ | | | | | | | | | | |
| *Myrcia subalpestris* DC. | Vidal, C.V.822 | BA, MG | ■ | | | | ■ | | ■ | | CE, CR, FL | WD | 41 |
| *Myrcia subavenia* (O.Berg) N.Silveira | Oliveira, C.T.330 | MG | | | | | ■ | | ■ | | CE, CR, FL | WD | 50 |
| *Myrcia subcordata* DC. | Mota, R.C.348 | BA, MG | ■ | | | | ■ | | ■ | | CE, CR, FL | WD | 61 |
| *Myrcia sylvatica* (G.Mey.) DC. | Stadnik, A. 31 | BA, MG | ■ | ■ | ■ | | ■ | | | | WD | WD | 51 |
| *Myrcia tenuifolia* (O.Berg) Sobral | Forzza, R.C.4923 | BA, MG | ■ | | ■ | ■ | ■ | | | | CE, FL | WD | 5 |
| *Myrcia tetraloba* D.F.Lima & E.Lucas | Lima, D.F.415 | BA | ■ | | | | | | | | CE, FL | BA (CD) | 8 |
| *Myrcia tomentosa* (Aubl.) DC. | Melo, E.11799 | BA, MG | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | WD | WD | 233 |
| *Myrcia undulata* O.Berg | Peron, M.472 | MG | | | | | | | ■ | | FL | WD | 1 |
| *Myrcia variabilis* DC. | Souza, V.C.29578 | MG | | | ■ | ■ | ■ | | ■ | ■ | WD | WD | 35 |
| *Myrcia vauthiereana* O.Berg | Peron, M.402 | MG | | | | | ■ | | ■ | | FL | WD | 13 |
| *Myrcia venosissima* Sobral & P.L.Viana | Viana, P.L.2515 | MG | | | | | ■ | | | | CR | MG (EM) | 2 |
| *Myrcia venulosa* DC. | Harley, R.M. 26433 | BA, MG | ■ | ■ | ■ | ■ | ■ | | ■ | | WD | WD | 168 |
| *Myrcia vestita* DC. | Peron, M.414 | BA, MG | ■ | | ■ | ■ | | | ■ | | CE | WD | 13 |
| *Myrcia* sp. | Azevêdo-Gonçalves, C.F.1155 | BA | ■ | | | | | | | | CR, FL | BA (CD) | 14 |
| *Myrcianthes* O.Berg | | | | | | | | | | | | | |
| *Myrcianthes pungens* (O.Berg) D.Legrand | Silva, J.M.6019 | MG | | | | ■ | | | | | NI | WD | 2 |
| *Myrciaria* O.Berg | | | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Myrciaria cuspidata* O.Berg | Ganev, W.8 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | | | WD | WD | 34 |
| *Myrciaria delicatula* (DC.) O.Berg | Zappi, D.C.1616 | MG | | | 🟩 | 🟦 | 🟦 | | 🟧 | ⬜ | CE, CR, FL | WD | 10 |
| *Myrciaria disticha* O.Berg | Santos, M.F.103 | MG | | | | | 🟦 | | | | NI | WD | 2 |
| *Myrciaria floribunda* (H.West ex Willd.) O.Berg | Flores, T.B.477 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | 🟧 | | WD | WD | 120 |
| *Myrciaria glanduliflora* (Kiaersk.) Mattos & D.Legrand | Guedes, M.L.14496 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | 🟦 | 🟧 | | CE, CR, FL | WD | 76 |
| *Myrciaria glazioviana* (Kiaersk.) G.M.Barroso ex Sobral | Silva, A.2140 | MG | | | | | | | 🟧 | | NI | WD | 1 |
| *Myrciaria glomerata* O.Berg | Faria, J.E.Q.6359 | BA, MG | 🟥 | | | | 🟦 | 🟦 | 🟧 | | FL | WD | 14 |
| *Myrciaria guaquiea* (Kiaersk.) Mattos & D.Legrand | Roque, N.14950 | BA | 🟥 | 🟩 | | | | | | | CAA, CE, CR | WD | 19 |
| *Myrciaria pilosa* Sobral & Couto | Venâncio, A.F.76 | BA, MG | 🟥 | 🟩 | | | 🟦 | | | | CAA, CR, FL | WD | 28 |
| *Myrciaria tenella* (DC.) O.Berg | Hatschbach, G.G.78592 | BA, MG | 🟥 | 🟩 | | | 🟦 | | 🟧 | | CE | WD | 10 |
| ***Neomitranthes*** | | | | | | | | | | | | | |
| *Neomitranthes obtusa* Sobral & Zambom | Amorim, B.S.732 | BA | 🟥 | | | | | | | | FL | WD | 2 |
| ***Pimenta*** | | | | | | | | | | | | | |
| *Pimenta pseudocaryophyllus* (Gomes) Landrum | Lima, D.F.419 | BA, MG | 🟥 | 🟩 | 🟩 | | 🟦 | 🟦 | 🟧 | | CE, FL | WD | 32 |
| ***Plinia*** | | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Plinia cauliflora* (Mart.) Kausel | Faria, J.E.Q.6224 | BA, MG | 🟥 | 🟩 | | | 🟦 | | 🟧 | CAA, FL | WD | 18 |
| *Plinia edulis* (Vell.) Sobral | Badini, J. sn | MG | | | | | | | 🟧 | NI | WD | 1 |
| *Plinia espinhacensis* Sobral | Viana, P.L.2403 | MG | | | | | 🟦 | | | FL | MG (EM) | 7 |
| *Plinia nana* Sobral | Hatschbach, G.G.69578 | MG | | | 🟩 | | 🟦 | | | CE, CR, FL | MG | 24 |
| *Plinia peruviana* (J.F.Gmel.) Govaerts | Faria, J.E.Q.6676 | MG | | | | | 🟦 | | | NI | WD | 1 |
| *Plinia pseudodichasiantha* (Kiaersk.) G.M.Barroso ex Sobral | Viana, P.L. sn | MG | | | | | | | 🟧 | FL | WD | 1 |
| *Plinia rivularis* (Cambess.) Rotman | Passos Júnior, L.A.272 | BA, MG | 🟥 | | | | 🟦 | | | NI | WD | 2 |
| *Psidium* L. | | | | | | | | | | | | |
| *Psidium appendiculatum* Kiaersk. | Stadnik, A. 275 | BA, MG | 🟥 | 🟩 | 🟩 | | | | | CAA, CE, FL | WD | 37 |
| *Psidium australe* Cambess. | Stadnik, A. 177 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | | CE | WD | 13 |
| *Psidium brownianum* Mart. ex DC. | Lucresia, L. 25 | BA, MG | 🟥 | 🟩 | 🟩 | | | | | WD | WD | 121 |
| *Psidium cattleianum* Sabine | Ribeiro, T.105 | BA, MG | 🟥 | 🟩 | | | | | 🟧 | CR, FL | WD | 13 |
| *Psidium eugenii* Kiaersk. | Giulietti, A.M. sn | MG | | | | | 🟦 | | | NI | WD | 1 |
| *Psidium firmum* O.Berg | Fernandes, T. 318 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | | 🟧 | CE, CR, FL | WD | 52 |
| *Psidium ganevii* Landrum & Funch | Stadnik, A. 216 | BA, MG | 🟥 | 🟩 | 🟩 | | | | | WD | WD | 28 |
| *Psidium glaziovianum* Kiaersk. | Hatschbach, G.G.78466 | BA, MG | 🟥 | | 🟩 | | | | | CAA, FL | EMR | 4 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Psidium grandifolium* Mart. ex DC. | Gonzaga, D.R.826 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 |  | 🟧 | ◼ | CE, CR, FL | WD | 61 |
| *Psidium guajava* L. | Roque, N.4175 | BA, MG | 🟥 | 🟩 | 🟩 |  | 🟦 |  |  |  | CAA, CE, CR | WD | 11 |
| *Psidium guineense* Sw. | Lucresia, L.31 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 |  | 🟧 |  | WD | WD | 89 |
| *Psidium laruotteanum* Cambess. | Tuler, A.C.617 | BA, MG | 🟥 | 🟩 | 🟩 | 🟦 | 🟦 | 🟦 | 🟧 |  | CE, CR | WD | 21 |
| *Psidium myrsinites* DC. | Stadnik, A. 171 | BA, MG | 🟥 | 🟩 |  |  |  |  | 🟧 |  | CE | WD | 9 |
| *Psidium myrtoides* O.Berg. | Pirani, J.R.11815 | BA, MG | 🟥 |  |  |  | 🟦 | 🟦 | 🟧 |  | CE, CR, FL | WD | 18 |
| *Psidium nutans* O.Berg | Nunes, T.S.193 | BA | 🟥 |  |  |  |  |  |  |  | NI | WD | 1 |
| *Psidium oblongatum* O.Berg | Gonzaga, D.R.571 | MG |  |  |  |  |  | 🟦 | 🟧 |  | FL | WD | 5 |
| *Psidium oligospermum* Mart. ex DC. | França, F.3061 | BA, MG | 🟥 | 🟩 | 🟩 |  | 🟦 | 🟦 | 🟧 |  | WD | WD | 26 |
| *Psidium rhombeum* O.Berg | Machado, R.F.485 | BA, MG | 🟥 | 🟩 | 🟩 |  | 🟦 |  |  |  | CAA, FL | WD | 7 |
| *Psidium robustum* O.Berg | Faria, J.E.Q.6370 | MG |  |  |  |  | 🟦 |  | 🟧 |  | CR, FL | WD | 8 |
| *Psidium rufum* Mart. ex DC. | Stadnik, A. 178 | BA, MG | 🟥 | 🟩 |  |  | 🟦 | 🟦 | 🟧 | ◼ | CE, CR, FL | WD | 101 |
| *Psidium salutare* (Kunth) O.Berg | Nascimento, F.H.F.704 | BA, MG | 🟥 | 🟩 |  |  | 🟦 |  | 🟧 |  | CE, FL | WD | 13 |
| *Psidium schenckianum* Kiaersk. | Ganev, W.2970 | BA, MG | 🟥 | 🟩 | 🟩 |  |  |  |  |  | WD | WD | 72 |
| *Psidium striatulum* DC. | Blanchet, J.S.3916 | BA | 🟥 | 🟩 |  |  |  |  |  |  | NI | WD | 2 |
| *Siphoneugena* |  |  |  |  |  |  |  |  |  |  |  |  |  |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Siphoneugena crassifolia* (DC.) Proença & Sobral | Santos, M.F.59 | MG | | | | | 🟦 | | 🟧 | | CR, FL | WD | 10 |
| *Siphoneugena densiflora* O. Berg | Saddi, E.M.836 | MG | | | | | 🟦 | 🟦 | 🟧 | | CE, CR, FL | WD | 46 |
| *Siphoneugena dussii* (Krug & Urb.) Proença | Flores, T.B.848 | BA, MG | 🟥 | 🟩 | 🟩 | | | | 🟧 | | CR, FL | WD | 9 |
| *Siphoneugena kiaerskoviana* (Burret) Kausel | Rezende, S.G.2531 | BA, MG | 🟥 | | | | 🟦 | | 🟧 | | CR, FL | WD | 7 |
| *Siphoneugena kuhlmannii* Mattos | França, F.1290 | BA | 🟥 | | | | | | | | FL | WD | 1 |
| *Siphoneugena reitzii* D.Legrand | MGC554 | MG | | | 🟩 | | | | | | NI | WD | 1 |
| *Syzygium* | | | | | | | | | | | | | |
| *Syzygium jambos* (L.) Alston | Guedes, M.L.6902 | BA, MG | 🟥 | | 🟩 | | 🟦 | | 🟧 | ⬜ | WD | WD | 31 |

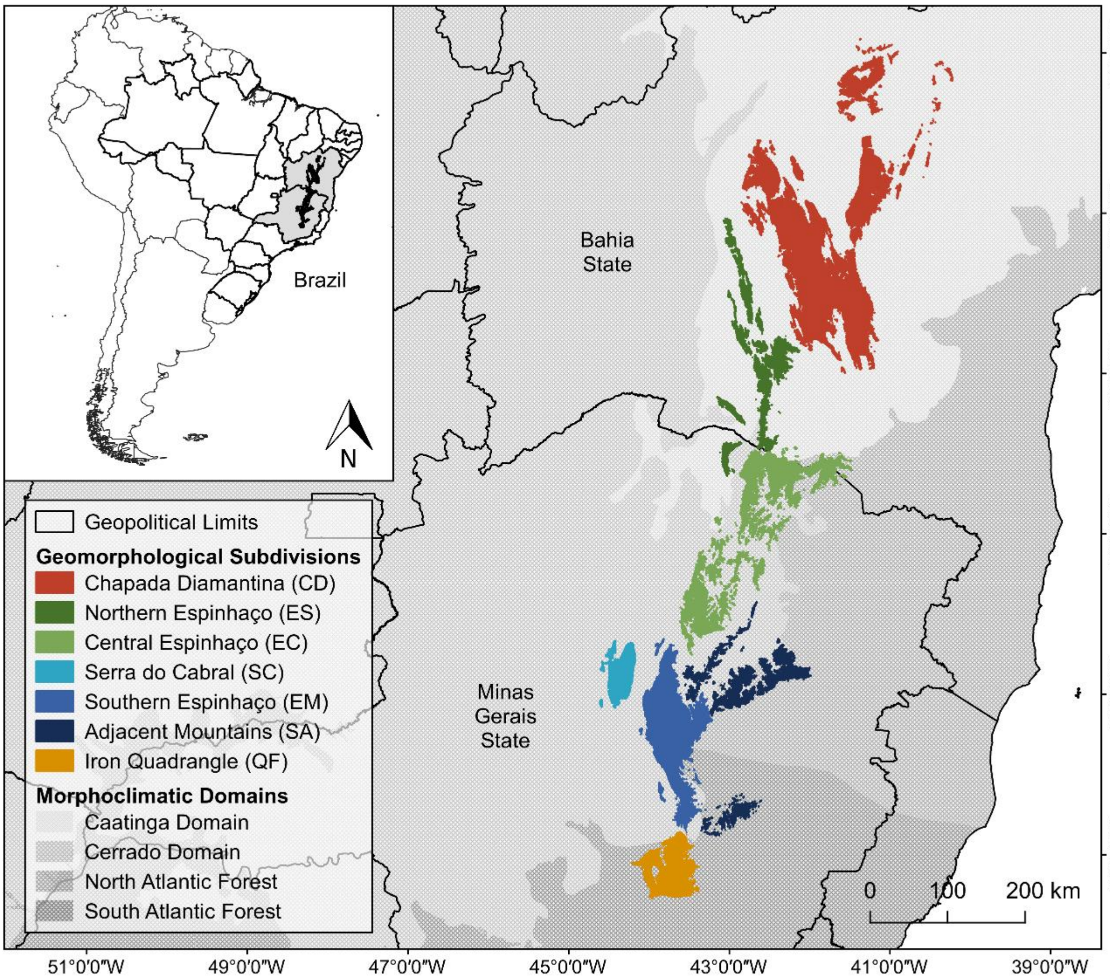

Figure 1. Study area, its geomorphological subdivisions: Chapada Diamantina (CD), Northern Espinhaço (ES), Southern Espinhaço (EM), Adjacent Mountains (SA) and Iron Quadrangle (QF); and surrounding morphoclimatic domains: Caatinga Domain (CAD), Cerrado Domain (CED), North Atlantic Forest (NAF) and South Atlantic Forest (SAF).

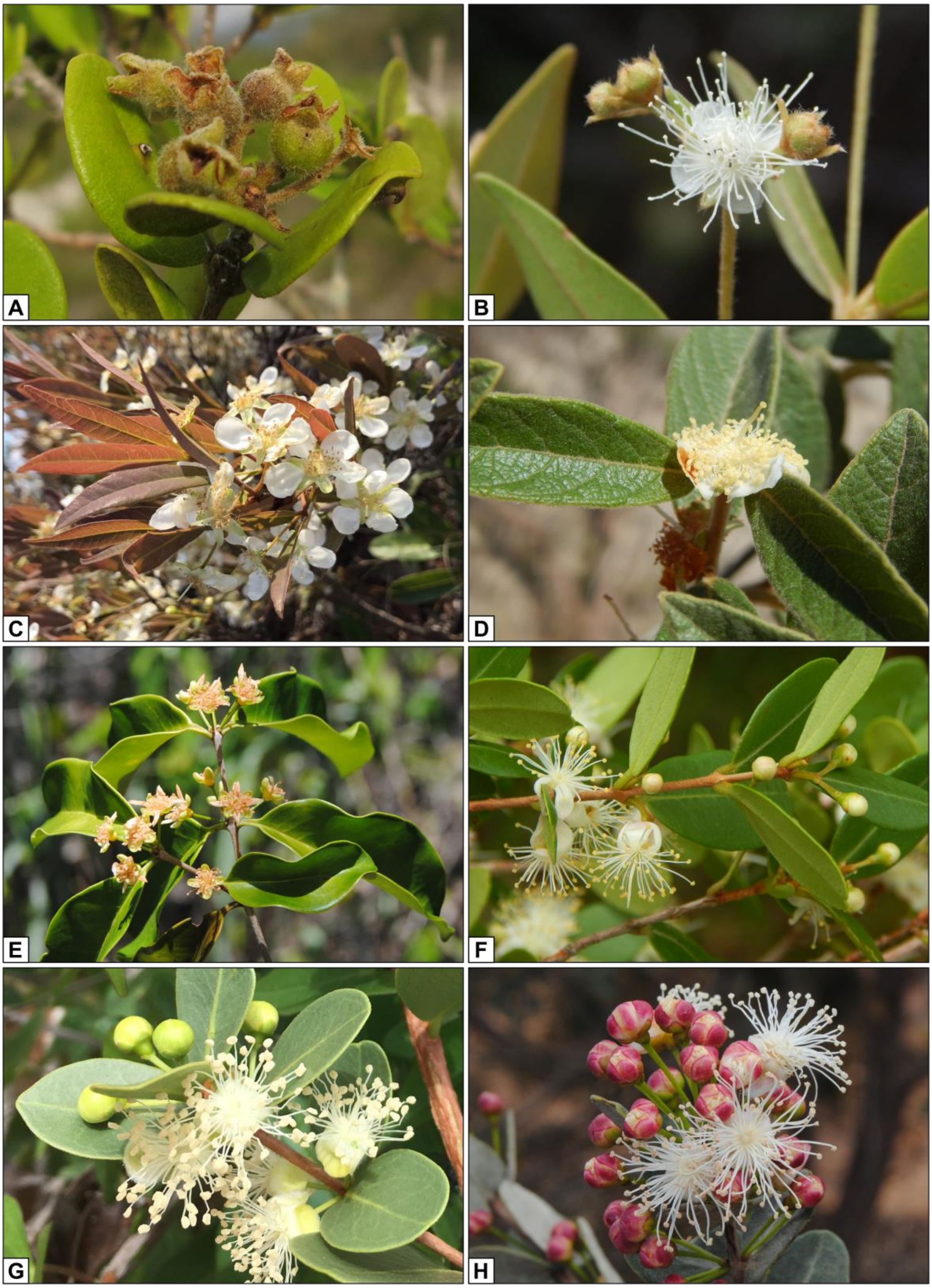

Figure 2. Myrtaceae species recorded in the Espinhaço Mountain Range: (A) *Algrizea macrochlamys;* (B) *Blepharocalyx salicifolius;* (C) *Campomanesia adamantium;* (D) *C. sessiliflora;* (E) *Eugenia cerasiflora;* (F) *E. modesta;* (G) *E. punicifolia;* and (H) *E. vetula.* (Photographs: A. Aline Stadnik; B, D and F. Janine Melo; C. Paulo Sano; and E, G and H. Luísa Lucresia)

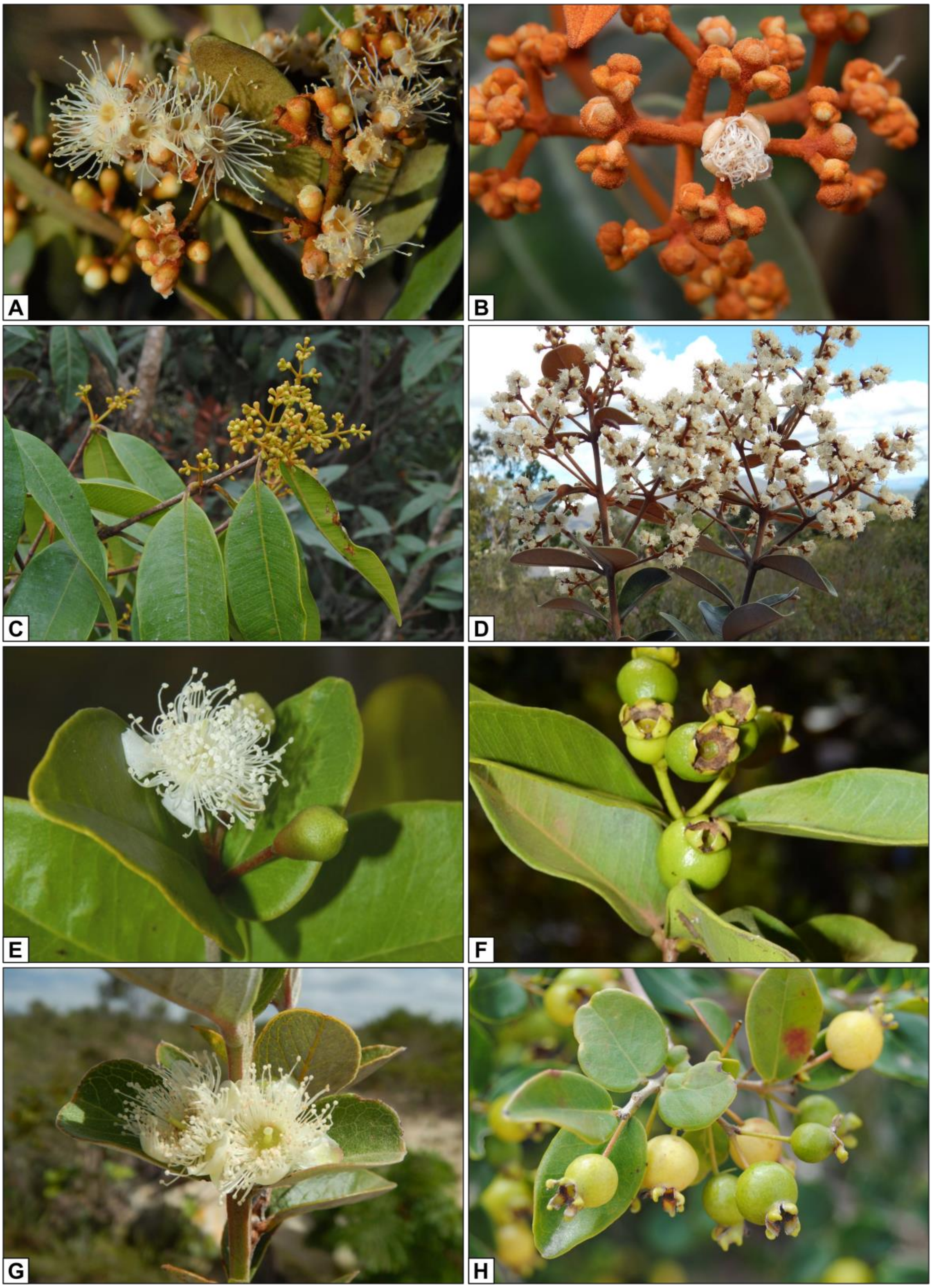

Figure 3. Myrtaceae species recorded in the Espinhaço Mountain Range. (A) *Myrcia densa;* (B) *M. mischophylla;* (C) *M. multipunctata;* (D) *M. venulosa;* (E) *Psidium brownianum;* (F) *P. firmum;* (G) *P. grandifolium;* (H) *P. schenckianum.* (Photographs: A-B, D-G. Janine Melo; C and H. Luísa Lucresia)

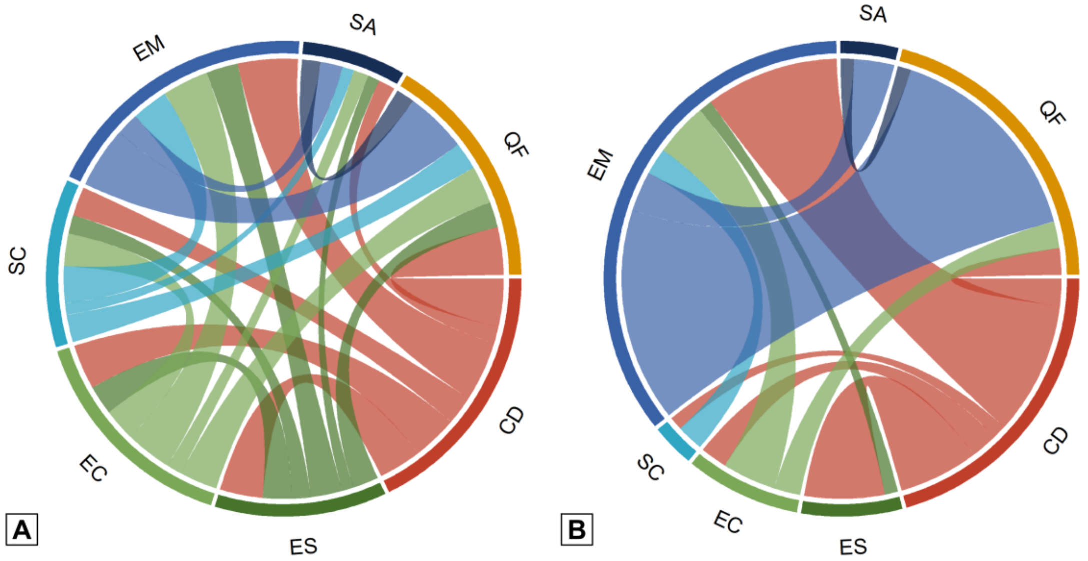

Figure 4. Chord Diagram representing shared species between the distinct geomorphological structures: Chapada Diamantina (CD), Northern Espinhaço (ES), Southern Espinhaço (EM), Adjacent Mountains (SA) and Iron Quadrangle (QF). Wider links represent a larger number of species. (A) represents all shared species and (B) includes solely exclusive floristic links: species solely distributed in two geomorphological structures.

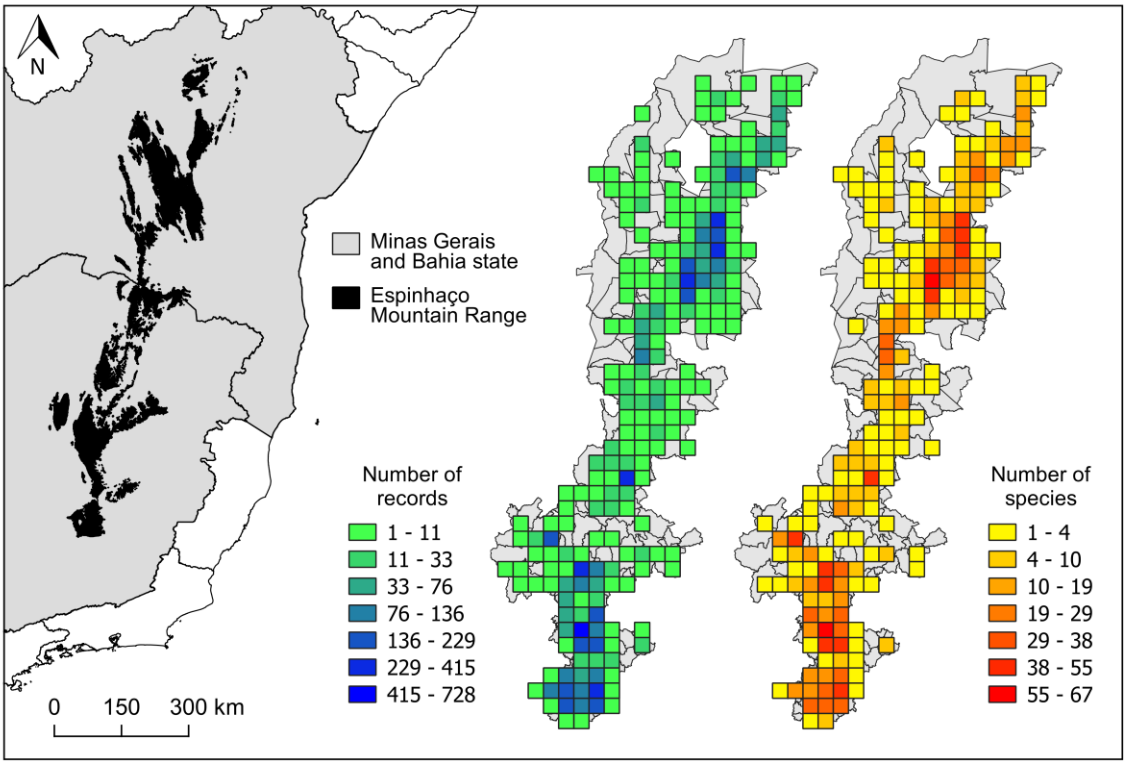

Figure 5. Espinhaço Mountain Range location within the states of Bahia and Minas Gerais and the spatial comparison between total number of records and total number of species across the municipalities within the EMR.

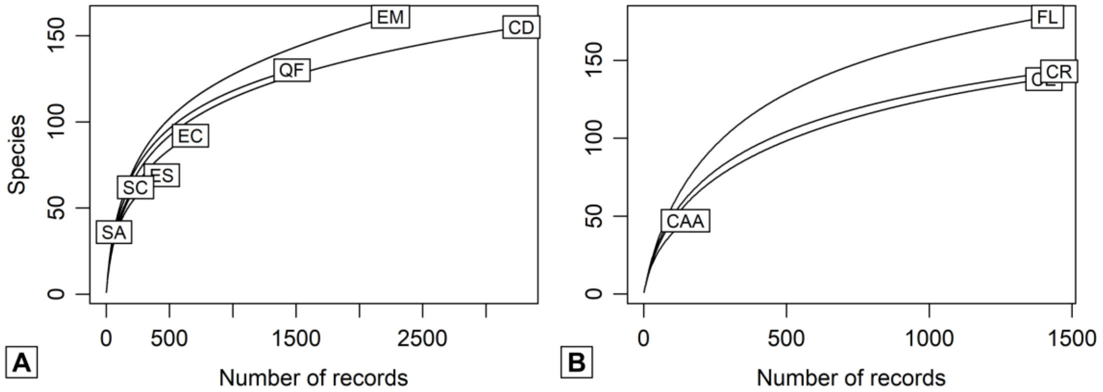

Figure 6. Rarefaction curves of different (A) geomorphological structures and (B) vegetation types.

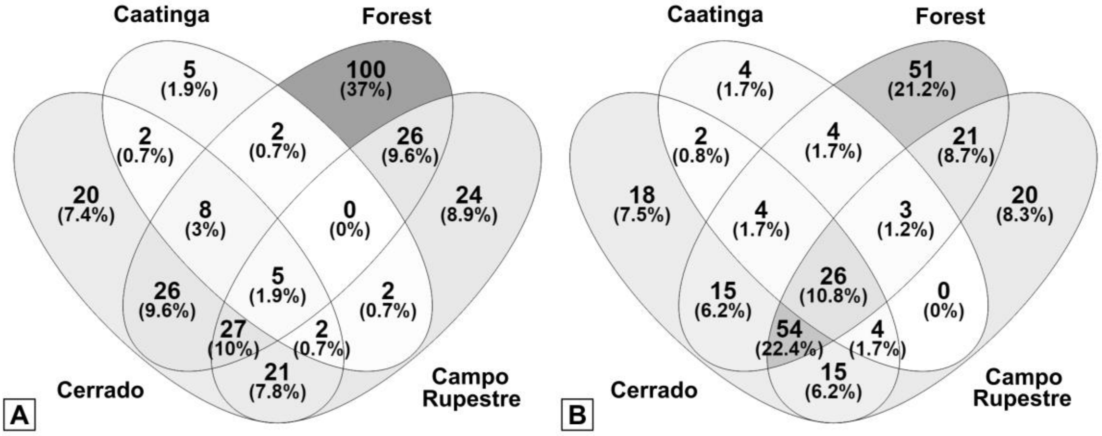

Figure 7. Venn diagrams with species distribution according to (A) literature, with 4 spp. not included due to lack of vegetation information; and (B) database, with 40 spp. not included due to lack of vegetation information.

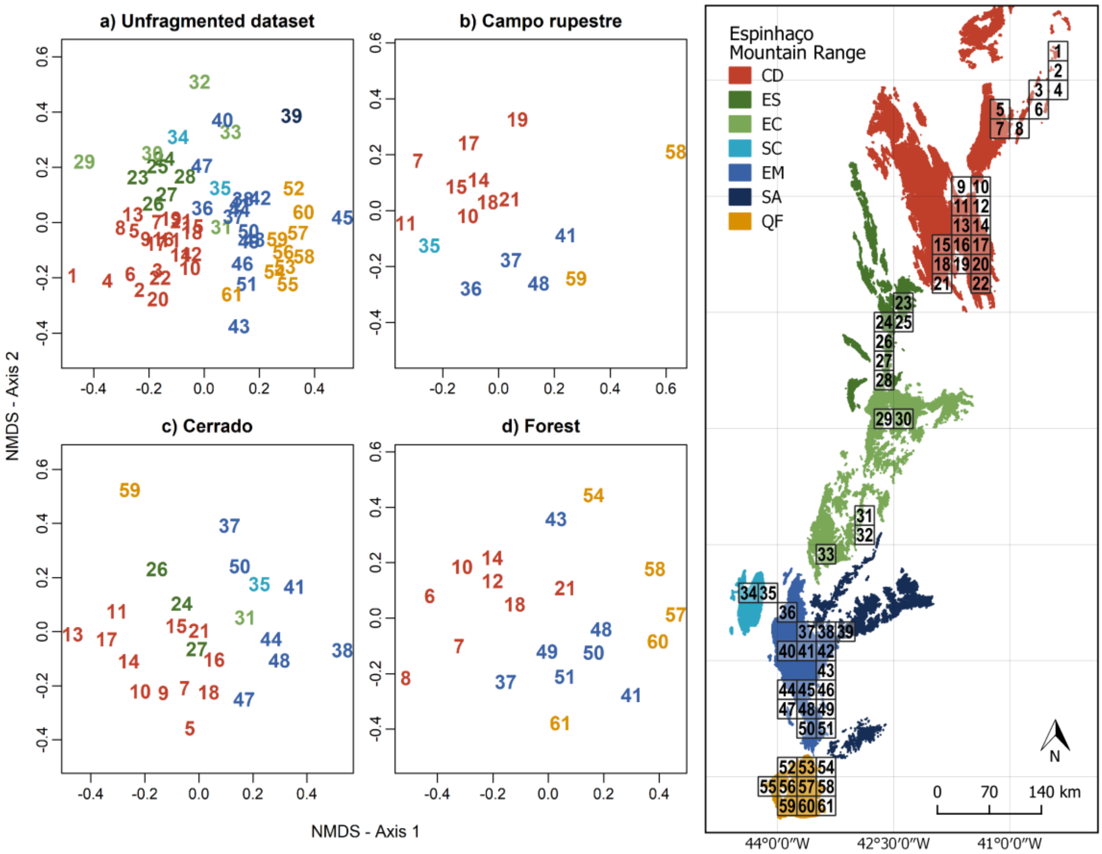

Figure 8. Ordination of Espinhaço Mountain Range areas according to Myrtaceae similarity patterns for different datasets: (A) unfragmented dataset for the EMR; datasets fragmented by species vegetation of occurrence: (B) campo rupestre; (C) cerrado and (D) forests; and the spatial distribution of the inserted grid cells within different geomorphological structures of the mountain range (CD: Chapada Diamantina; ES: Northern Espinhaço; EC: Central Espinhaço; SC: Serra do Cabral; EM: Southern Espinhaço; SA: Adjacent mountains; and QF: Iron Quadrangle).

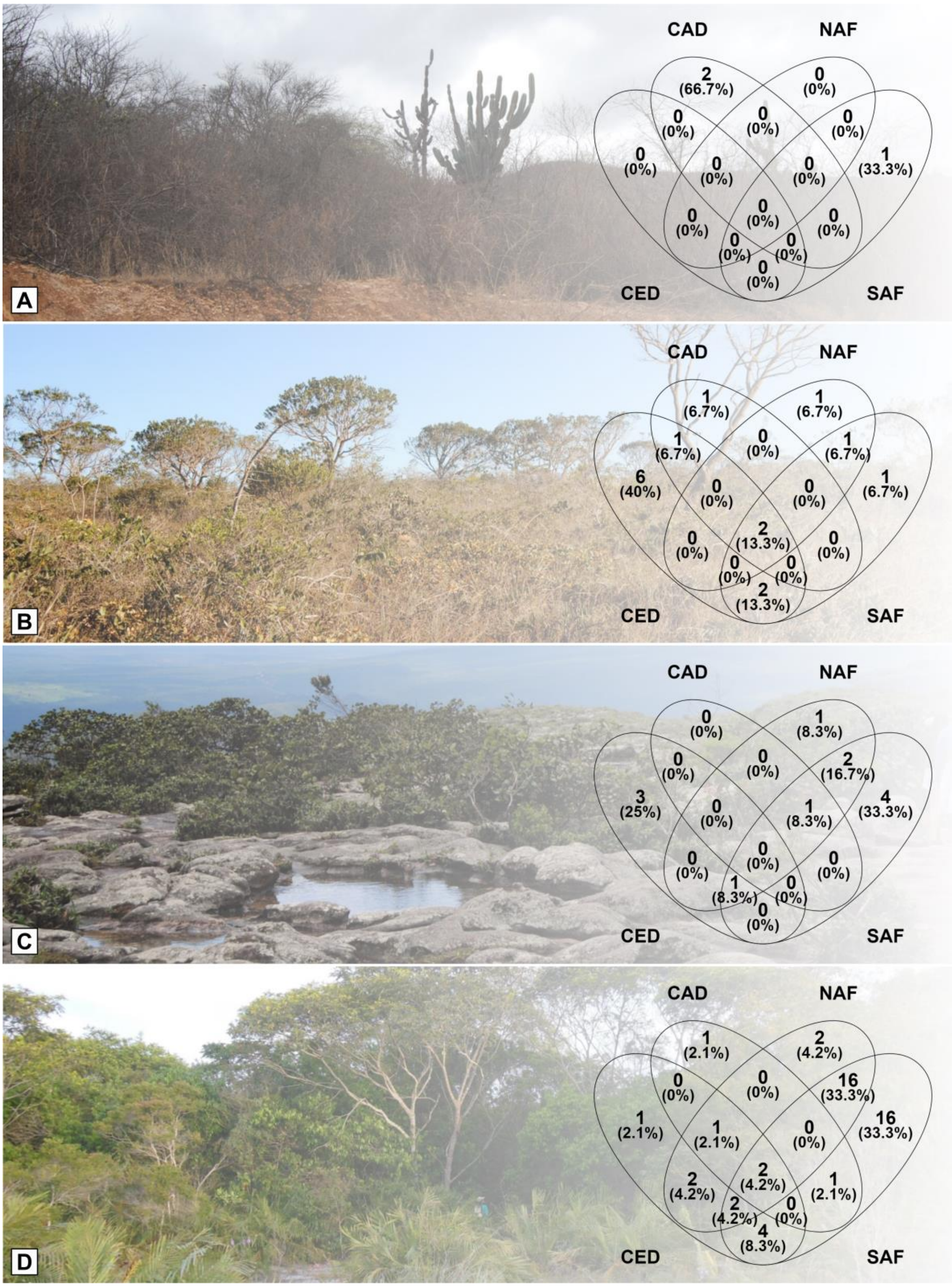

Figure 9. Occurrence of exclusive species from different vegetation types (A. caatinga *sensu lato*; B. cerrado *sensu lato*; C. campos rupestres; D. forests) in the surrounding morphoclimatic domains, being CAD - Caatinga domain, CED - Cerrado Domain, NAF - North Atlantic Forest and SAF - South Atlantic Forest.

**Supplementary material**

Table S1. Municipalities included in the Espinhaço Mountain Range, the state and geomorphological structures they are inserted in, their area in km² and the number of Myrtaceae records and species found in each municipality. State: Bahia (BA) or Minas Gerais (MG). Geomorphological structures: Chapada Diamantina (CD), Northern Espinhaço (ES), Southern Espinhaço (EM), Adjacent Mountains (SA) and Iron Quadrangle (QF).

| Municipality | State | Geomorphological structure | Area ($km^2$) | Number of records | Number of species |
|---|---|---|---|---|---|
| Abaíra | BA | CD | 530.5 | 473 | 66 |
| Água Boa | MG | SA | 1320.3 | 0 | 0 |
| Alvorada de Minas | MG | EM | 374 | 9 | 3 |
| Andaraí | BA | CD | 1861.7 | 224 | 46 |
| Angelândia | MG | SA | 185.2 | 0 | 0 |
| Antônio Dias | MG | SA | 787.1 | 1 | 0 |
| Antônio Gonçalves | BA | CD | 313.9 | 3 | 1 |
| Aricanduva | MG | SA | 243.3 | 0 | 0 |
| Augusto de Lima | MG | EM/SC | 1254.8 | 4 | 3 |
| Baldim | MG | EM | 556.3 | 1 | 0 |
| Barão dos Cocais | MG | QF | 340.6 | 53 | 20 |
| Barra da Estiva | BA | CD | 1346.6 | 26 | 12 |
| Barra do Mendes | BA | CD | 1540.6 | 4 | 3 |
| Bela Vista de Minas | MG | SA | 109.1 | 2 | 1 |
| Belo Horizonte | MG | QF | 331.4 | 635 | 50 |
| Belo Vale | MG | QF | 365.9 | 3 | 1 |
| Bocaiúva | MG | EC/EM | 3227.6 | 10 | 5 |
| Bom Jesus da Lapa | BA | ES | 4200.3 | 0 | 0 |
| Bom Jesus do Amparo | MG | EM | 195.6 | 0 | 0 |
| Boninal | BA | CD | 934 | 8 | 3 |
| Bonito | BA | CD | 726.6 | 7 | 3 |
| Boquira | BA | ES | 1482.7 | 2 | 1 |
| Botumirim | MG | EC | 1568.9 | 67 | 28 |
| Botuporã | BA | ES | 645.5 | 0 | 0 |
| Brotas de Macaúbas | BA | CD | 2240 | 18 | 7 |
| Brumadinho | MG | QF | 639.4 | 143 | 25 |

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| Brumado | BA | CD | 2226.8 | 5 | 3 |
| Buenópolis | MG | EM/SC | 1599.9 | 42 | 22 |
| Caculé | BA | ES | 668.4 | 0 | 0 |
| Caeté | MG | QF | 542.6 | 143 | 28 |
| Caetité | BA | ES | 2442.9 | 165 | 34 |
| Cafarnaum | BA | CD | 675.4 | 1 | 1 |
| Campo Formoso | BA | CD | 7258.6 | 56 | 18 |
| Candiba | BA | ES | 418 | 0 | 0 |
| Capelinha | MG | SA | 965.4 | 29 | 8 |
| Carbonita | MG | SA | 1456.1 | 6 | 3 |
| Catas Altas | MG | QF | 240 | 224 | 46 |
| Caturama | BA | CD | 664.6 | 3 | 3 |
| Coluna | MG | SA | 348.5 | 0 | 0 |
| Conceição do Mato Dentro | MG | EM | 1726.8 | 331 | 56 |
| Condeúba | BA | EC | 1285.9 | 5 | 4 |
| Congonhas | MG | QF | 304.1 | 45 | 8 |
| Congonhas do Norte | MG | EM | 398.9 | 25 | 12 |
| Contendas do Sincorá | BA | CD | 1044.7 | 3 | 2 |
| Cordeiros | BA | EC | 535.5 | 9 | 2 |
| Corinto | MG | SC | 2525.4 | 11 | 7 |
| Coronel Fabriciano | MG | SA | 221.3 | 2 | 0 |
| Couto de Magalhães | MG | EM/SA | 485.7 | 24 | 11 |
| Cristália | MG | EC | 840.673 | 61 | 21 |
| Datas | MG | EM | 310.1 | 22 | 13 |
| Diamantina | MG | EM/SA | 3891.7 | 892 | 82 |
| Dom Basilio | BA | CD | 676.9 | 0 | 0 |
| Érico Cardoso | BA | CD | 701.4 | 25 | 17 |
| Espinosa | MG | EC/ES | 1869 | 4 | 1 |
| Felício dos Santos | MG | EM/SA | 357.6 | 20 | 9 |
| Ferros | MG | SA | 1088.8 | 4 | 0 |
| Francisco Dumont | MG | SC | 1576.1 | 3 | 2 |
| Francisco Sá | MG | EC | 2747.3 | 37 | 13 |
| Frei Lagonegro | MG | SA | 167.5 | 0 | 0 |
| Fruta de Leite | MG | EC | 762.8 | 5 | 1 |
| Gameleiras | MG | ES | 1733.2 | 0 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| Gentio do Ouro | BA | CD | 3700.1 | 19 | 7 |
| Glaucilândia | MG | EC | 145.9 | 1 | 1 |
| Gouveia | MG | EM | 866.6 | 108 | 26 |
| Grão Mogol | MG | EC | 3885.3 | 429 | 58 |
| Guanambi | BA | ES | 1296.7 | 0 | 0 |
| Guaraciama | MG | EC | 390.3 | 0 | 0 |
| Ibicoara | BA | CD | 849.9 | 42 | 16 |
| Ibipeba | BA | CD | 1383.7 | 0 | 0 |
| Ibipitanga | BA | CD | 954.4 | 0 | 0 |
| Ibirité | MG | QF | 72.6 | 5 | 2 |
| Ibitiara | BA | CD | 1847.6 | 1 | 1 |
| Ibotirama | BA | ES | 1722.3 | 6 | 5 |
| Igaporã | BA | ES | 832.5 | 5 | 3 |
| Indaiabira | MG | EC | 1004.1 | 0 | 0 |
| Ipatinga | MG | SA | 164.9 | 5 | 2 |
| Ipupiara | BA | CD | 1061.2 | 5 | 4 |
| Iramaia | BA | CD | 1947.3 | 2 | 2 |
| Iraquara | BA | CD | 1029.4 | 10 | 2 |
| Itabira | MG | EM/SA | 1253.7 | 67 | 14 |
| Itabirito | MG | QF | 542.6 | 214 | 35 |
| Itacambira | MG | EC | 1788.4 | 93 | 30 |
| Itaeté | BA | CD | 1208.7 | 26 | 11 |
| Itaguaçu da Bahia | BA | CD | 4451.2 | 0 | 0 |
| Itamarandiba | MG | SA | 2735.6 | 7 | 3 |
| Itambé do Mato Dentro | MG | EM | 380.3 | 150 | 45 |
| Ituaçu | BA | CD | 1216.3 | 13 | 5 |
| Jaboticatubas | MG | EM | 1114.2 | 190 | 36 |
| Jacaraci | BA | ES | 1235.6 | 4 | 3 |
| Jacobina | BA | CD | 2360 | 207 | 39 |
| Jaguarari | BA | CD | 2456.5 | 3 | 2 |
| Jeceaba | MG | QF | 236.3 | 2 | 0 |
| Jequitaí | MG | SC | 1268.4 | 3 | 3 |
| Jequitiba | MG | EM | 445.6 | 0 | 0 |
| Joanésia | MG | SA | 233.3 | 13 | 0 |
| Joaquim Felício | MG | SC | 790.9 | 216 | 53 |
| José Gonçalves de | MG | SA | 381.3 | 0 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| Minas | | | | | |
| Josenópolis | MG | EC | 541.4 | 0 | 0 |
| Juramento | MG | EC | 431.6 | 16 | 7 |
| Jussiape | BA | CD | 585.2 | 5 | 5 |
| Ladainha | MG | SA | 866.3 | 0 | 0 |
| Lagoa Real | BA | ES | 877.4 | 3 | 3 |
| Lassance | MG | SC | 3204.2 | 7 | 3 |
| Leme do Prado | MG | SA | 280 | 1 | 0 |
| Lençois | BA | CD | 1277 | 355 | 56 |
| Licínio de Almeida | BA | ES | 843.4 | 241 | 46 |
| Livramento de Nossa Senhora | BA | CD/ES | 2135.6 | 5 | 3 |
| Macaúbas | BA | ES | 2994.1 | 19 | 12 |
| Malacacheta | MG | SA | 727.9 | 4 | 1 |
| Mamonas | MG | ES | 291.4 | 0 | 0 |
| Mariana | MG | QF | 1194.2 | 233 | 36 |
| Mário campos | MG | QF | 35.2 | 0 | 0 |
| Matina | BA | ES | 775.7 | 0 | 0 |
| Mato Verde | MG | EC | 472.2 | 11 | 8 |
| Mesquita | MG | SA | 274.9 | 0 | 0 |
| Miguel Calmon | BA | CD | 1568.2 | 54 | 15 |
| Minas Novas | MG | SA | 1812.4 | 26 | 7 |
| Mirangaba | BA | CD | 1697.7 | 2 | 1 |
| Moeda | MG | QF | 155.1 | 67 | 19 |
| Monjolos | MG | EM | 650.9 | 8 | 6 |
| Monte azul | MG | EC/ES | 994.2 | 35 | 12 |
| Montezuma | MG | EC | 1130.4 | 26 | 10 |
| Morpará | BA | CD | 1696.9 | 4 | 2 |
| Morro do Chapéu | BA | CD | 5742.9 | 565 | 55 |
| Morro do Pilar | MG | EM | 477.5 | 67 | 20 |
| Mortugaba | BA | EC | 612.2 | 1 | 1 |
| Mucugê | BA | CD | 2455 | 509 | 68 |
| Mulungu do Morro | BA | CD | 566 | 1 | 1 |
| Ninheira | MG | EC | 1108.2 | 0 | 0 |
| Nova Era | MG | SA | 361.9 | 1 | 0 |
| Nova Lima | MG | QF | 429.1 | 232 | 27 |

| | | | | | |
|---|---|---|---|---|---|
| Nova União | MG | EM | 172.1 | 4 | 0 |
| Novo Horizonte | BA | CD | 609.2 | 0 | 0 |
| Novorizonte | MG | EC | 271.9 | 0 | 0 |
| Olhos-d'Água | MG | EC/EM | 2092.1 | 2 | 1 |
| Oliveira dos Brejinhos | BA | CD/ES | 3512.7 | 9 | 7 |
| Ouro Branco | MG | QF | 258.7 | 208 | 39 |
| Ouro Preto | MG | QF | 1245.9 | 837 | 74 |
| Ourolândia | BA | CD | 1487.7 | 0 | 0 |
| Padre Carvalho | MG | EC | 446.3 | 0 | 0 |
| Palmas de Monte Alto | BA | ES | 2524.9 | 1 | 1 |
| Palmeiras | BA | CD | 657.7 | 418 | 61 |
| Paramirim | BA | CD/ES | 1170.1 | 10 | 4 |
| Paratinga | BA | ES | 2614.8 | 1 | 1 |
| Piatã | BA | CD | 1713.5 | 225 | 41 |
| Pindaí | BA | ES | 614.1 | 8 | 1 |
| Pindobaçu | BA | CD | 496.3 | 33 | 13 |
| Piripá | BA | EC | 439.7 | 3 | 1 |
| Porteirinha | MG | EC | 1749.7 | 4 | 0 |
| Presidente Kubitschek | MG | EM | 189.2 | 4 | 3 |
| Raposos | MG | QF | 72.2 | 5 | 2 |
| Riacho de Santana | BA | ES | 2582.2 | 2 | 0 |
| Riacho dos Machados | MG | EC | 1315.5 | 24 | 8 |
| Rio Acima | MG | QF | 229.8 | 49 | 9 |
| Rio de Contas | BA | CD | 1063.7 | 526 | 67 |
| Rio do Pires | BA | CD | 819.8 | 22 | 11 |
| Rio Pardo de Minas | MG | EC | 3117.4 | 92 | 27 |
| Rio Vermelho | MG | SA | 986.6 | 58 | 19 |
| Sabará | MG | QF | 302.2 | 30 | 10 |
| Salinas | MG | EC | 1887.6 | 14 | 6 |
| Santa Bárbara | MG | QF | 684.1 | 179 | 38 |
| Santa Luzia | MG | QF | 235.3 | 17 | 2 |
| Santa Maria de Itabira | MG | SA | 597.4 | 3 | 1 |
| Santana de Pirapama | MG | EM | 1255.8 | 141 | 45 |
| Santana do Paraíso | MG | SA | 276.1 | 23 | 6 |
| Santana do Riacho | MG | EM | 677.2 | 834 | 71 |
| Santo Antônio do Itambé | MG | EM | 305.7 | 26 | 13 |

| | | | | | |
|---|---|---|---|---|---|
| Santo Antônio do Retiro | MG | EC | 796.3 | 22 | 14 |
| Santo Hipólito | MG | EM | 430.7 | 6 | 4 |
| São Gonçalo do Rio Abaixo | MG | SA | 363.8 | 102 | 29 |
| São Gonçalo do Rio Preto | MG | EM/SA | 314.5 | 135 | 39 |
| São João do Paraíso | MG | EC | 1925.6 | 3 | 1 |
| São Joaquim de Bicas | MG | QF | 71.6 | 2 | 0 |
| São Sebastião do Maranhão | MG | SA | 517.8 | 0 | 0 |
| Sarzedo | MG | QF | 62.1 | 0 | 0 |
| Saúde | BA | CD | 504.3 | 13 | 6 |
| Seabra | BA | CD | 2517.3 | 40 | 17 |
| Sebastião Laranjeiras | BA | ES | 1948.5 | 0 | 0 |
| Senador Modestino Gonçalves | MG | SA | 952.1 | 7 | 4 |
| Sento sé | BA | CD | 12698.8 | 37 | 8 |
| Serra Azul de Minas | MG | EM | 218.6 | 5 | 2 |
| Serranópolis de Minas | MG | EC | 552 | 1 | 1 |
| Serro | MG | EM | 1217.8 | 81 | 31 |
| Setubinha | MG | SA | 534.7 | 0 | 0 |
| Souto Soares | BA | CD | 993.3 | 2 | 1 |
| Taiobeiras | MG | EC | 1194.5 | 19 | 2 |
| Tanhaçu | BA | CD | 1234.5 | 6 | 1 |
| Tanque Novo | BA | ES | 722.9 | 2 | 0 |
| Tapiramutá | BA | CD | 663.9 | 1 | 1 |
| Taquaraçu de Minas | MG | EM | 329.2 | 0 | 0 |
| Tremedal | BA | EC | 1679.6 | 3 | 0 |
| Turmalina | MG | SA | 1153.1 | 21 | 13 |
| Uibaí | BA | CD | 551 | 2 | 1 |
| Umburanas | BA | CD | 1670.5 | 29 | 9 |
| Urandi | BA | ES | 969.4 | 5 | 5 |
| Utinga | BA | CD | 638.2 | 4 | 2 |
| Vargem Grande do Rio Pardo | MG | EC | 491.5 | 1 | 0 |
| Várzea da Palma | MG | SC | 2220.3 | 28 | 15 |

| | | | | | |
|---|---|---|---|---|---|
| Várzea Nova | BA | CD | 1192.9 | 0 | 0 |
| Veredinha | MG | SA | 631.7 | 0 | 0 |
| Xique-Xique | BA | CD | 5502.3 | 3 | 2 |

Table S2. Myrtaceae species, their distribution according to literature and respective references. Brazilian Biomes: Amazon (AM), Caatinga (CAA), Cerrado (CE), North of the Atlantic Forest (MAN), South of the Atlantic Forest (MAS) and Pampa (PAM); Vegetation types: caatinga (CAA), campos (CAM), capoeira (CAP), cerrado (CE), campo rupestre (CR), forest (FL) and restinga (RES); Brazilian States: Acre (AC), Alagoas (AL), Bahia (BA), Distrito Federal (DF), Espirito Santo (ES), Goiás (GO), Minas Gerais (MG), Maranhão (MA), Mato Grosso do Sul (MS), Pernambuco (PE), Piauí (PI), Paraíba (PB), Paraná (PR), Rio de Janeiro (RJ), Rio Grande do Sul (RS), Santa Catarina (SC), São Paulo (SP), Sergipe (SE) and Tocantis (TO). NI stands for not identified, used when there is no available information to assess distribution; and WD stands for widely distributed, when species occur in most classes mentioned above.

| **Species** | **Occurrence according to literature** | | | |
|---|---|---|---|---|
| | Brazilian Biomes | Vegetation types | Brazilian States | References |
| *Acca* O.Berg | | | | |
| *Acca sellowiana* (O.Berg) Burret | MAS | CAM, FL | WD | (Landrum, 1986; Wagner & Fiaschi, 2020) |
| *Accara* Landrum | | | | |
| *Accara elegans* (DC.) Landrum | | CAP, CR | MG | (Landrum, 1990; Morais & Lombardi, 2006) |
| *Algrizea* Proença & NicLugh. | | | | |
| *Algrizea macrochlamys* (DC.) Proença & NicLugh. | | CAR, CE, CR | BA | (C. E. B. Proença *et al.*, 2006) |
| *Blepharocalyx* O.Berg | | | | |
| *Blepharocalyx myriophyllus* (Casar.) Morais & Sobral | | CR | MG | (Morais & Lombardi, 2006) |
| *Blepharocalyx salicifolius* (Kunth) | CE, MAN, | CAR, CE, | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; M. F. Santos & |

| | | | | |
|---|---|---|---|---|
| O.Berg | MAS | CR, FL | | Sano, 2012; Stadnik, Oliveira, & Roque, 2018; Wagner & Fiaschi, 2020) |
| *Calycolpus* O.Berg | | | | |
| *Calycolpus australis* Landrum | | CR | MG | (Landrum, 2010) |
| *Campomanesia* Ruiz et Pav. | | | | |
| *Campomanesia adamantium* (Cambess.) O.Berg | CE, MAS | CAP, CE, CR, FL | WD | (Landrum, 1986; Kawasaki, 2004; Morais & Lombardi, 2006; Lima, Goldenberg, & Sobral, 2011; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012) |
| *Campomanesia aromatica* (Aubl.) Griseb. | WD | CAA, FL | WD | (M. I. U. de Oliveira, Funch, & Landrum, 2012) |
| *Campomanesia costata* M.Ibrahim & Landrum | | CAA, CE, CR | BA | (M. I. U. de Oliveira *et al.*, 2013) |
| *Campomanesia dichotoma* (O.Berg) Mattos | CAA, MAN, MAS | CAA, CE, FL, RES | WD | (Landrum, 1986; M. I. U. de Oliveira, Funch, & Landrum, 2012) |
| *Campomanesia eugenioides* (Cambess.) D.Legrand ex Landrum | WD | CAA, CE, FL, RES | WD | (Landrum, 1986; Lima, Goldenberg, & Sobral, 2011; M. I. U. de Oliveira, Funch, & Landrum, 2012) |
| *Campomanesia grandiflora* (Aubl.) Sagot | AM, CE, MAN | FL, RES | WD | (M. I. U. de Oliveira, Funch, & Landrum, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Campomanesia guaviroba* (DC.) Bertoni | WD | FL, RES | WD | (Lima, Goldenberg, & Sobral, 2011; M. de O. Bünger *et al.*, 2012; M. I. U. de Oliveira, Funch, & Landrum, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Campomanesia guazumifolia* | MAN, MAS | FL, RES | WD | (Landrum, 1986; Lima, Goldenberg, & Sobral, 2011; M. I. U. |

| | | | | |
|---|---|---|---|---|
| (Cambess.) O. Berg | | | | de Oliveira, Funch, & Landrum, 2012; Giaretta & Peixoto, 2015) |
| *Campomanesia laurifolia* Gardner | MAN, MAS | CR, FL RES | WD | (M. I. U. de Oliveira, Funch, & Landrum, 2012) |
| *Campomanesia lineatifolia* Ruiz & Pav. | AM, MAS | FL | WD | (Landrum, 1986) |
| *Campomanesia phaea* (O.Berg) Landrum | MAS | FL | WD | (Landrum, 1986; Sobral, 2007; M. de O. Bünger, 2011) |
| *Campomanesia pubescens* (Mart. ex DC.) O. Berg | CAA, CE, MAS | CAM, CAP, CAR, CE, CR, FL | WD | (Landrum, 1986; Kawasaki, 2004; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012) |
| *Campomanesia rufa* (O.Berg) Nied. | CE, MAS | CE, FL | MG, MS | (Landrum, 1986; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012) |
| *Campomanesia sessiliflora* (O.Berg) Mattos | CE, MAS | CE, CR | WD | (Landrum, 1986; Sobral *et al.*, 2016; Stadnik, Oliveira, & Roque, 2018) |
| *Campomanesia simulans* M.L.Kawas. | MAS | FL | MG, SP | (Kawasaki, 2000; M. de O. Bünger *et al.*, 2012) |
| *Campomanesia velutina* (Cambess.) O.Berg | CAA, CE | CAA, CAR, FL | WD | (M. I. U. de Oliveira, Funch, & Landrum, 2012) |
| *Campomanesia xanthocarpa* (Mart.) O.Berg | CE, MAS | FL | WD | (Landrum, 1986; Sobral, 2007) |
| *Eugenia* L. | | | | |
| *Eugenia acutata* Miq. | CE, MAS | CE, FL | WD | (Faria Júnior, 2010; Giaretta, Lucas, & Sano, 2021) |
| *Eugenia angustissima* O.Berg | CE | CE | WD | (Faria Júnior, 2010; Stadnik, Oliveira, & Roque, 2018) |

| | | | | |
|---|---|---|---|---|
| *Eugenia anisomischa* Sobral & K.Cout. | | CE | BA | (Sobral, Faria Júnior, & Coutinho, 2018) |
| *Eugenia anomala* D.Legrand | CE, PAM | CE | WD | (Flora do Brasil, 2020) |
| *Eugenia arvensis* Vell. | MAN, MAS | FL, RES | WD | (Giaretta, Lucas, & Sano, 2021) |
| *Eugenia astringens* Cambess. | MAN, MAS | FL, RES | WD | (Giaretta & Peixoto, 2015; Lima, Caddah, & Goldenberg, 2015) |
| *Eugenia aurata* O.Berg | AD | CE | WD | (Faria Júnior, 2010) |
| *Eugenia azuruensis* O.Berg | | CE | BA | (Flora do Brasil, 2020) |
| *Eugenia bahiana* Mattos | CAA | CAA | BA, SE | (Santana, 2018) |
| *Eugenia beaurepairiana* (Kiaersk.) D.Legrand | MAN, MAS | FL | WD | (Faria Júnior, 2014) |
| *Eugenia bimarginata* DC. | CE, MAS | CE, CR, FL | WD | (Kawasaki, 2004; Faria Júnior, 2010; M. F. Santos & Sano, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Eugenia blanda* Sobral | | CE, CR | MG | (Kawasaki, 2004) |
| *Eugenia brasiliensis* Lam. | MAN, MAS | FL, RES | WD | (Giaretta & Peixoto, 2015; Santana *et al.*, 2017) |
| *Eugenia brejoensis* Mazine | CAA | FL | PE | (Fiorella Fernanda Mazine & Souza, 2008a) |
| *Eugenia brunneopubescens* Mazine | MAS | FL | PR | (Fiorella Fernanda Mazine & Souza, 2009) |
| *Eugenia candolleana* DC. | WD | FL, RES | WD | (Fiorella F. Mazine, 2006; Sobral, 2007; Lourenço & Barbosa, 2012) |
| *Eugenia capparidifolia* DC. | | CE, CR, FL | MG | (Fiorella F. Mazine, 2006) |
| *Eugenia cerasiflora* Miq. | WD | CE, FL, RES | WD | (Morais & Lombardi, 2006; Sobral, 2007; M. de O. Bünger *et al.*, 2012) |

| | | | | |
|---|---|---|---|---|
| *Eugenia complicata* O.Berg | CE | CE | DF, GO, MG | (Fiorella F. Mazine, 2006) |
| *Eugenia copacabanensis* Kiaersk. | MAS | FL, RES | RJ | (Souza, 2005; Sobral, 2007) |
| *Eugenia costatifructa* Mazine | MAN | RES | BA, SE | (Fiorella Fernanda Mazine & Souza, 2009) |
| *Eugenia crassa* Sobral | MAS | FL | ES | (Sobral, 2010a) |
| *Eugenia dictyophleba* O.Berg | CAA | CAA | BA | (Flora do Brasil, 2020) |
| *Eugenia dimorpha* O.Berg | PAM | CAM | RS | (Flora do Brasil, 2020) |
| *Eugenia duarteana* Cambess. | CAA | CAA | BA, PI, MA, MG | (Santana, 2018) |
| *Eugenia dysenterica* DC. | WD | CAA, CAM, CE, CR | WD | (Kawasaki, 2004; Sobral *et al.*, 2016; Santana *et al.*, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Eugenia ellipsoidea* Kiaersk. | MAS | FL | MG, RJ, ES | (Sobral, 2007; Flora do Brasil, 2020) |
| *Eugenia espinhacensis* Bünger & Sobral | | FL | MG | (M. de O. Bünger, Sobral, & Stehmann, 2013) |
| *Eugenia expansa* Spring ex. Mart. | MAN, MAS | FL, RES | WD | (Flora do Brasil, 2020) |
| *Eugenia flavescens* DC. | AM, CAA, CE, MAN | CE, FL | WD | (Holst, Landrum, & Grifo, 2003) |
| *Eugenia florida* DC. | WD | FL | WD | (Fiorella F. Mazine, 2006; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012) |
| *Eugenia francavilleana* O.Berg | CE, MAN, MAS | CE, FL | WD | (Sobral, 2007; Faria Júnior, 2010; Silva & Mazine, 2016; Flora do Brasil, 2020) |
| *Eugenia gracillima* Kiaersk. | CAA, MAS | FL | WD | (Stadnik, Oliveira, & Roque, 2018) |

| | | | | |
|---|---|---|---|---|
| *Eugenia grandissima* Sobral, Mazine & E.A.D. Melo | | FL | MG | (Sobral *et al.*, 2016) |
| *Eugenia hiemalis* Cambess. | CE, MAN, MAS | CAM, FL | WD | (Sobral *et al.*, 2016) |
| *Eugenia hilariana* DC. | CE | CE, CR | WD | (Kawasaki, 2004; Faria Júnior, 2010) |
| *Eugenia hirta* O.Berg | MAN | FL, RES | WD | (Lourenço & Barbosa, 2012; Giaretta & Peixoto, 2015) |
| *Eugenia indistincta* Sobral & Stadnik | CAA | CE, FL | BA | (Sobral *et al.*, 2015) |
| *Eugenia involucrata* DC. | CE, MAN, MAS | CR, FL | WD | (Morais & Lombardi, 2006; Sobral, 2007) |
| *Eugenia itajurensis* Cambess. | MAS | FL | MG | (Faria Júnior, 2014) |
| *Eugenia itapemirimensis* Cambess. | MAN, MAS | FL, RES | AC, AL, BA, ES | (Sobral, 2007; Stadnik, Oliveira, & Roque, 2018) |
| *Eugenia klotzschiana* O.Berg | CE | CE | WD | (Faria Júnior, 2010; Villarroel & Proença, 2013) |
| *Eugenia lagoensis* Kiaersk. | CE | CE, FL | MG | (Flora do Brasil, 2020) |
| *Eugenia langsdorffii* O.Berg | CE | CE | WD | (Faria Júnior, 2014) |
| *Eugenia laruotteana* Cambess. | MAS | CE, CR, FL | MG, RJ | (Kawasaki, 2004) |
| *Eugenia laxa* DC. | | NI | BA | |
| *Eugenia ligustrina* (Sw.) Willd. | WD | CR, FL | WD | (M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Santana *et al.*, 2017) |
| *Eugenia longipedunculata* Nied. | MAN, MAS | FL | WD | (Flora do Brasil, 2020) |
| *Eugenia luschnathiana* (O. Berg) | MAN, MAS | RES | WD | (Flora do Brasil, 2020) |

| | | | | |
|---|---|---|---|---|
| Klotzsch ex B.D. Jacks. | | | | |
| *Eugenia macrosperma* DC. | MAN, MAS | FL | WD | (Fiorella F. Mazine, 2006) |
| *Eugenia mansoi* O.Berg | CE, MAS, PAM | CAM, FL | WD | (Faria Júnior, 2010) |
| *Eugenia maritima* DC. | CAA, MAN, MAS | FL, RES | WD | (Lima, Caddah, & Goldenberg, 2015) |
| *Eugenia megaflora* Govaerts | CE | CE, FL | GO, TO | (Faria Júnior, 2010) |
| *Eugenia melanogyna* (D.Legrand) Sobral | MAS | FL | WD | (Sobral, 2007; Sobral *et al.*, 2016) |
| *Eugenia modesta* DC. | CE, MAN, MAS | CAP, CE, CR | WD | (Fiorella F. Mazine, 2006; Morais & Lombardi, 2006) |
| *Eugenia moonioides* O.Berg | MAS | FL | MG, ES, RJ | (Valdemarin, 2018) |
| *Eugenia mosenii* Kausel (Sobral) | MAS | FL, RES | PR, RJ, SC, SP | (Flora do Brasil, 2020) |
| *Eugenia mucugensis* Sobral | | CE | BA | (Sobral *et al.*, 2015) |
| *Eugenia myrcianthes* Nied. | CE, MAS | CE, FL | WD | (Flora do Brasil, 2020) |
| *Eugenia nutans* O.Berg | MAS | FL | WD | (Morais & Lombardi, 2006; Sobral, 2007) |
| *Eugenia pantagensis* O.Berg | CE, MAS | CE, CR, FL | WD | (Sobral, 2007; Flora do Brasil, 2020) |
| *Eugenia parvula* Glaz. | | - | MG | |
| *Eugenia piloensis* Cambess. | CE, MAS | FL | WD | (Sobral, 2007; Flora do Brasil, 2020) |

|  |  |  |  |  |
|---|---|---|---|---|
| *Eugenia pistaciifolia* DC. | CAA | CAA, CE, CR, FL | BA, MG | (Fiorella Fernanda Mazine *et al.*, 2018; Stadnik, Oliveira, & Roque, 2018) |
| *Eugenia pitanga* (O.Berg) Kiaersk. | CE, MAS | CAA, CE, FL | WD | (Santana *et al.*, 2017) |
| *Eugenia pohliana* DC. | CAA, CE, MAN | CAR, CE, CR | WD | (Faria Júnior, 2014) |
| *Eugenia prasina* O.Berg | MAN, MAS | NI | WD | (Valdemarin, 2018) |
| *Eugenia punicifolia* (Kunth) DC. | WD | CAA, CAP, CAR, CE, CR, FL, RES | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; Faria Júnior, 2010; Stadnik, Oliveira, & Roque, 2018) |
| *Eugenia pyriformis* Cambess. | CE, MAN, MAS | CE, FL | WD | (Faria Júnior, 2014) |
| *Eugenia rosea* DC. | CAA | CAA | BA | (Flora do Brasil, 2020) |
| *Eugenia rotula* Sobral |  | CE, CR | BA | (Sobral *et al.*, 2012) |
| *Eugenia sellowiana* DC. | CE | CE | WD | (Faria Júnior, 2014) |
| *Eugenia sonderiana* O.Berg | WD | CAP, CE, FL | BA, GO, MG | (Kawasaki, 2004; Morais & Lombardi, 2006; Faria Júnior, 2010; Stadnik, Oliveira, & Roque, 2018) |
| *Eugenia speciosa* Cambess. | MAN, MAS | FL, RES | WD | (M. de O. Bünger *et al.*, 2016) |
| *Eugenia sphenophylla* O.Berg | MAS | FL | SP, MG, RJ | (M. de O. Bünger, 2011; Flora do Brasil, 2020) |
| *Eugenia splendens* O.Berg |  | CE, CR | BA, MG | (M. de O. Bünger, 2011) |

| | | | | |
|---|---|---|---|---|
| *Eugenia sprengelii* DC. | MAS | FL | RJ | (Sobral *et al.*, 2012; Flora do Brasil, 2020) |
| *Eugenia stictopetala* DC. | WD | CAR, CE, CR, FL | WD | (Kawasaki, 2004; Sobral, 2007; Faria Júnior, 2010; Stadnik, Oliveira, & Roque, 2018) |
| *Eugenia suberosa* Cambess. | CE, MAS | CE | WD | (Faria Júnior, 2010; Sobral *et al.*, 2016) |
| *Eugenia subterminalis* DC. | CE, MAN, MAS | FL, RES | WD | (Giaretta, 2018) |
| *Eugenia tenuipedunculata* Kiaersk. | MAN, MAS | FL | WD | (Amorim & Alves, 2012; Lima, Caddah, & Goldenberg, 2015; Flora do Brasil, 2020) |
| *Eugenia tephrogyna* Sobral & Proença | MAN | FL | BA, SE | (C. E. B. Proença *et al.*, 2014) |
| *Eugenia uniflora* L. | AD | FL, RES | WD | (Giaretta & Peixoto, 2015) |
| *Eugenia velutifolia* Mazine & Sobral | CE | CE | SP | (Fiorella Fernanda Mazine *et al.*, 2019) |
| *Eugenia verticillata* (Vell.) Angely | MAS | FL | WD | (Flora do Brasil, 2020) |
| *Eugenia vetula* DC. | CE | CE, CR | BA, GO, MG, SP | (Stadnik, Oliveira, & Roque, 2018) |
| *Eugenia widgrenii* Sond. ex O.Berg | MAS | FL | MG, RJ | (Flora do Brasil, 2020) |
| *Eugenia zigzag* K.Cout. & Sobral | | CAA | BA | (Sobral, Faria Júnior, & Coutinho, 2018) |
| *Eugenia zuccarinii* O.Berg | MAN, MAS | FL, RES | WD | (Giaretta, 2018) |
| *Eugenia* sp. 1 | | FL | MG | (Faria Júnior, 2014) |
| *Eugenia* sp. 2 | CAA | FL | BA | (Faria Júnior, 2014) |
| Myrceugenia | | | | |
| *Myrceugenia alpigena* (DC.) Landrum | MAS | FL | WD | (Landrum, 1981; M. de O. Bünger *et al.*, 2012; M. F. Santos & |

| | | | | |
|---|---|---|---|---|
| | | | | Sano, 2012) |
| *Myrceugenia bracteosa* (DC.) D.Legrand & Kausel | MAS | CAM, FL | MG, SC, SP, PR, RJ | (Landrum, 1981; Flora do Brasil, 2020) |
| *Myrceugenia brevipedicellata* (Burret) D.Legrand & Kausel | MAS | CAM, FL | SP | (Landrum, 1981) |
| *Myrceugenia franciscensis* (O.Berg) Landrum | MAS | FL | SC | (Landrum, 1981; Flora do Brasil, 2020) |
| *Myrceugenia miersiana* (Gardner) D.Legrand & Kausel | MAN, MAS | FL | WD | (Landrum, 1981; M. de O. Bünger *et al.*, 2012) |
| *Myrceugenia ovata* (Hook. & Arn.) O.Berg | MAS | FL | WD | (Morais & Lombardi, 2006) |
| *Myrceugenia pilotantha* (Kiaersk.) Landrum | MAN, MAS | CE, CR, FL | WD | (Landrum, 1981; Flora do Brasil, 2020) |
| Myrcia | | | | |
| *Myrcia acutisepala* D.F.Lima & Sobral | | CR | MG | (Sobral & Lima, 2021) |
| *Myrcia albotomentosa* DC. | CE | CE, CR | WD | (Rosa, 2015; E. Lucas *et al.*, 2016) |
| *Myrcia almasensis* NicLugh. | | CR | BA | (Nic Lughadha, 1994) |
| *Myrcia amazonica* DC. | WD | CAP, CAR, CE, CR, FL | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Rosa & Romero, 2012; E. Lucas *et al.*, 2016) |
| *Myrcia anceps* (Spreng) O.Berg | MAS | CR, FL | SP, MG, | (Rosa & Romero, 2012) |

| | | | | |
|---|---|---|---|---|
| | | | RJ, ES | |
| *Myrcia arenaria* L.L.Santos, M.F.Sales & Sobral | MAN | FL, RES | AL, BA, PE, SE | (L. L. dos Santos, Sales, & Sobral, 2016; Flora do Brasil, 2020) |
| *Myrcia ascendens* M.F.Santos | | CR | BA | (M. F. Santos, Lucas, & Sano, 2015) |
| *Myrcia auxotelica* Sobral & Antunes | MAS | FL | MG, RJ | (Sobral & Antunes, 2018) |
| *Myrcia bella* Cambess. | CE | CE, CR | WD | (Rosa, 2015; Flora do Brasil, 2020) |
| *Myrcia bergiana* O.Berg | MAN, MAS | FL, RES | WD | (Sobral, 2007; Lourenço & Barbosa, 2012; Flora do Brasil, 2020) |
| *Myrcia blanchetiana* (O.Berg) Mattos | CAA, MAN | CAA, CR | BA | (E. Lucas *et al.*, 2016) |
| *Myrcia brunnea* Cambess. | MAS | FL | MG, SP | (Amorim, Maciel, & Alves, 2015; Flora do Brasil, 2020) |
| *Myrcia capitata* O.Berg | CE | CE, CR | GO | (Flora do Brasil, 2020) |
| *Myrcia carassana* Glaziou ex T.Fernandes | | CR | MG | Fernandes *et al.* 2020 |
| *Myrcia coelosepala* Kiaersk. | MAS | CE, FL | WD | (E. Lucas *et al.*, 2016) |
| *Myrcia crocea* Kiaersk. | MAN, MAS | FL | BA, ES, MA, RJ | (Amorim, 2017; Flora do Brasil, 2020) |
| *Myrcia densa* (DC.) Sobral | CAA, MAN | CE, CR, FL, RES | BA, PB, PE, MG | (Flora do Brasil, 2020) |
| *Myrcia eriocalyx* DC. | CE, MAS | CAP, CE, CR, FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Rosa & Romero, 2012) |
| *Myrcia eriopus* DC. | CE, MAS | CE, CR, FL | WD | (Morais & Lombardi, 2006; Rosa, 2009; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Rosa & Romero, 2012) |

| | | | | |
|---|---|---|---|---|
| *Myrcia eugenioides* Cambess. | MAS | FL | RJ | (Flora do Brasil, 2020) |
| *Myrcia excoriata* (Mart.) E.Lucas & C.E.Wilson | MAN, MAS | FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; E. Lucas *et al.*, 2016) |
| *Myrcia eximia* DC. | CE, MAN | CE, FL | WD | (Amorim, Maciel, & Alves, 2015) |
| *Myrcia fenzliana* O.Berg | CE, MAS | CR | WD | (Rosa & Romero, 2012) |
| *Myrcia ferruginosa* Mazine | MAS | FL | WD | (Sobral, 2007; Flora do Brasil, 2020) |
| *Myrcia gestasiana* Cambess. | MAS | FL | ES, RJ, MG | (Amorim, Maciel, & Alves, 2015; Flora do Brasil, 2020) |
| *Myrcia glauca* Cambess. | | NI | BA, MG | |
| *Myrcia glazioviana* Kiaersk. | MAS | FL | ES, RJ, MG | (Flora do Brasil, 2020) |
| *Myrcia glaziovii* Mattos & D.Legrand | CE | CE | GO, MG | (Flora do Brasil, 2020) |
| *Myrcia glomerata* (Cambess.) G.P.Burton & E.Lucas | MAS | CE, FL | WD | (Lourenço, 2015) |
| *Myrcia grammica* (Spreng.) A.R.Lourenço & E.Lucas | MAS | FL | WD | (Morais & Lombardi, 2006) |
| *Myrcia guianensis* (Aubl.) DC. | WD | CE, CR, FL | WD | (Kawasaki, 2004; M. de O. Bünger *et al.*, 2012; Rosa & Romero, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Myrcia hartwegiana* (O.Berg) Kiaersk. | CE, MAN, MAS | CAP, CR, FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; Rosa & Romero, 2012; Amorim, Maciel, & Alves, 2015) |
| *Myrcia hebepetala* DC. | MAS | CR, FL | WD | (Morais & Lombardi, 2006; Rosa, 2009; M. de O. Bünger *et al.*, 2012) |

| | | | | |
|---|---|---|---|---|
| *Myrcia hirtiflora* DC. | MAN | RES | BA, SE | (C. E. B. Proença *et al.*, 2014) |
| *Myrcia hypoleuca* Spring ex Mart. | CE | CE, CR | GO, MG, MT | (Flora do Brasil, 2020) |
| *Myrcia ilheosensis* Kiaersk. | MAN | CAA, CR | WD | (Stadnik, Oliveira, & Roque, 2018) |
| *Myrcia lacunosa* (O.Berg) N.Silveira | MAS | FL | MG | (Flora do Brasil, 2020) |
| *Myrcia laricina* (O.Berg) Burret ex Luetzelb. | CAA, CE | CAA, CE | BA, MG, TO | (Rosa, 2015; Lima, 2017) |
| *Myrcia lasiantha* DC. | CE | CE, CR | WD | (Rosa & Romero, 2012; Rosa, 2015) |
| *Myrcia lenheirensis* Kiaersk. | MAS | CAM, CR, FL | WD | (Kawasaki, 2004; M. F. Santos & Sano, 2012; Flora do Brasil, 2020) |
| *Myrcia lituatinervia* (O.Berg) E.Lucas & C.E.Wilson | AM | CR | WD | (E. Lucas *et al.*, 2016) |
| *Myrcia loranthifolia* (DC.) G.P.Burton & E.Lucas | MAN, MAS | CAA, CAR, CE, CR, FL | WD | (Kawasaki, 2004; Lourenço, 2015) |
| *Myrcia lucasae* R.B. Almeida, Antar & B.S. Amorim | | CR | BA | (R. B. P. Almeida *et al.*, 2020) |
| *Myrcia lughadhae* B.S.Amorim | | CR, FL | BA | (Amorim, Lucas, & Alves, 2014) |
| *Myrcia lutescens* Cambess. | CE, MAN, MAS | CE, CR, FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; Rosa & Romero, 2012; Flora do Brasil, 2020) |
| *Myrcia megaphylla* M.F.Santos & Sobral | | FL | MG | (M. F. Santos *et al.*, 2015; Flora do Brasil, 2020) |
| *Myrcia minutiflora* Sagot | AM, MAS | FL | WD | (E. Lucas *et al.*, 2016) |
| *Myrcia mischophylla* Kiaersk. | CE, MAN, | CR, FL | BA, MG, | (Rosa & Romero, 2012; Stadnik, Oliveira, & Roque, 2018) |

| | | | | |
|---|---|---|---|---|
| | MAS | | GO | |
| *Myrcia montana* Cambess. | MAS | CR, FL | SP, MG, RJ, ES | (M. de O. Bünger *et al.*, 2012; Flora do Brasil, 2020) |
| *Myrcia mucugensis* Sobral | | CR | BA | (Sobral, 2010b) |
| *Myrcia multiflora* (Lam.) DC. | WD | CAP, CR, FL | WD | (Morais & Lombardi, 2006; Rosa & Romero, 2012) |
| *Myrcia multipunctata* Mazine | MAN, MAS | CAR, CE, CR, FL | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Myrcia mutabilis* (O.Berg) N.Silveira | CE, MAN, MAS | CE, CR, FL | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; Rosa & Romero, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Myrcia myrtillifolia* DC. | CE | CE, CR | WD | (Rosa, 2009; E. Lucas *et al.*, 2016) |
| *Myrcia neoblanchetiana* O.Berg | MAN, MAS | FL | WD | (Amorim & Alves, 2012; Rosa, 2015; Flora do Brasil, 2020) |
| *Myrcia neoclusiifolia* A.R.Loureço & E.Lucas | CE, MAN, MAS | CE, CR, FL, RES | WD | (M. F. Santos & Sano, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Myrcia neoglabra* E.Lucas & C.E.Wilson | MAN, MAS | FL | WD | (E. Lucas *et al.*, 2016; Flora do Brasil, 2020) |
| *Myrcia neolucida* A.R.Lourenço & E.Lucas | WD | FL | WD | (Lima, Caddah, & Goldenberg, 2015) |
| *Myrcia neoobscura* E.Lucas & C.E.Wilson | MAN, MAS | CR, FL | WD | (M. de O. Bünger *et al.*, 2012; E. Lucas *et al.*, 2016; Flora do Brasil, 2020) |
| *Myrcia neoregeliana* E.Lucas & | MAN, MAS | FL | WD | (E. Lucas *et al.*, 2016) |

| | | | | |
|---|---|---|---|---|
| C.E.Wilson | | | | |
| *Myrcia neosericea* (Morais & Sobral) Faria & Proença | | CR, FL | MG | (Morais & Lombardi, 2006; Flora do Brasil, 2020) |
| *Myrcia neospruceana* E.Lucas & Sobral | | CR | BA, MG | (Amorim, 2017) |
| *Myrcia nitida* Cambess. | | CAR, CR, FL | BA, MG | (Kawasaki, 2004; Flora do Brasil, 2020) |
| *Myrcia nivea* Cambess. | CE | CR | MG, BA, GO, DF | (Rosa, 2009; Rosa & Romero, 2012) |
| *Myrcia oblongata* DC. | MAS | CE, CR, FL | WD | (Amorim, Maciel, & Alves, 2015) |
| *Myrcia obovata* (O.Berg) Nied. | MAN, MAS | CE, CR, FL | BA, MG, SP | (Morais & Lombardi, 2006; Rosa & Romero, 2012; Lima, 2017) |
| *Myrcia oleifolia* Cambess. | MAS | CR, FL | BA, MG, SP, RJ | (Flora do Brasil, 2020) |
| *Myrcia palustris* DC. | CE, MAN, MAS | FL, RES | WD | (Lima, Caddah, & Goldenberg, 2015) |
| *Myrcia perforata* O.Berg | AM, CE, MAN, MAS | FL | AC, BA, MG | (Flora do Brasil, 2020) |
| *Myrcia pinifolia* Cambess. | CE | CE, CR | BA, MG, GO | (Rosa & Romero, 2012; Lima, 2017; Flora do Brasil, 2020) |
| *Myrcia pirapama* D.F.Lima & Sobral | | CR | MG | (Sobral & Lima, 2021) |
| *Myrcia polygama* (O.Berg) M.F.Santos | MAN, MAS | FL | BA, MG, ES, RJ | (Flora do Brasil, 2020) |

| | | | | |
|---|---|---|---|---|
| *Myrcia pseudosplendens* Sobral & Mazine | MAS | FL | MG | (Sobral *et al.*, 2016) |
| *Myrcia pseudovenulosa* Stadnik & Sobral | | CR | BA | (Sobral *et al.*, 2015) |
| *Myrcia pteropoda* (O.Berg) A.R.Lourenço & E.Lucas | MAS | FL | WD | (Lourenço, 2015; Flora do Brasil, 2020) |
| *Myrcia pubescens* DC. | CE, MAN, MAS | CAR, CR, FL | WD | (Kawasaki, 2004; Rosa & Romero, 2012) |
| *Myrcia pubiflora* DC. | MAN, MAS | CR, FL | WD | (M. de O. Bünger *et al.*, 2012; Rosa & Romero, 2012; E. Lucas *et al.*, 2016) |
| *Myrcia pubipetala* Miq. | MAS | FL, RES | RJ, SP | (Barroso & Peixoto, 1992; Flora do Brasil, 2020) |
| *Myrcia pulchella* (DC.) A.R.Lourenço & E.Lucas | AM, MAS | CR, FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Lourenço, 2015) |
| *Myrcia racemosa* (O.Berg) Kiaersk. | MAN, MAS | FL | WD | (Lima, Caddah, & Goldenberg, 2015; E. Lucas *et al.*, 2016) |
| *Myrcia racemulosa* DC. | CE | CE, CR | WD | (Rosa & Romero, 2012; Rosa, 2015; E. Lucas *et al.*, 2016) |
| *Myrcia ramuliflora* (O.Berg) N.Silveira | MAN | RES | BA | (E. Lucas *et al.*, 2016) |
| *Myrcia reticulata* Cambess. | MAS | FL | BA, MG, RJ | (Flora do Brasil, 2020) |
| *Myrcia reticulosa* Miq. | | CR | BA, MG | (Kawasaki, 2004; Rosa, 2009) |
| *Myrcia retorta* Cambess. | MAS | CAM, CR, FL | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Rosa & Romero, 2012) |

| | | | | |
|---|---|---|---|---|
| *Myrcia revoluta* T. Fernandes, D. F. Lima & J. M. A. Braga | | CR | MG | (Flora do Brasil, 2020; T. Fernandes, Lima, & Braga, 2020) |
| *Myrcia rosangelae* NicLugh. | MAN | CE, FL, RES | AL, BA, SE | (Nic Lughadha *et al.*, 2012) |
| *Myrcia rubiginosa* Cambess. | MAS | FL | RJ | (E. Lucas *et al.*, 2016) |
| *Myrcia rufipes* DC. | WD | CAP, CE, CR, FL | WD | (Morais & Lombardi, 2006; Rosa, 2009, 2015; Rosa & Romero, 2012) |
| *Myrcia rupestris* M.F.Santos | | CR | MG | (M. F. Santos, Lucas, & Sano, 2015) |
| *Myrcia rupicola* D.Legrand | MAS | CAM, FL | MG, SP, PR, SC | (Flora do Brasil, 2020) |
| *Myrcia salzmannii* O.Berg | MAN | FL, RES | BA, AL | (Flora do Brasil, 2020) |
| *Myrcia selloi* (Spreng.) N.Silveira | CAA, CE, MAS | CAM, CR, FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; Rosa & Romero, 2012; Rosa, 2015) |
| *Myrcia sessilissima* M.F.Santos | | CR | MG | (M. F. Santos *et al.*, 2015) |
| *Myrcia splendens* (Sw.) DC. | WD | CE, CR, FL | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; Rosa & Romero, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Myrcia springiana* (O.Berg) Kiaersk. | MAN | CE, FL | BA, ES, MG, SP | (Flora do Brasil, 2020) |
| *Myrcia subalpestris* DC. | CE, MAS | CR, FL | WD | (Rosa, 2009; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Rosa & Romero, 2012) |
| *Myrcia subavenia* (O.Berg) N.Silveira | CE | CR, FL | MG | (Morais & Lombardi, 2006; Rosa & Romero, 2012) |

| | | | | |
|---|---|---|---|---|
| *Myrcia subcordata* DC. | CE, MAS | CAP, CR, FL | WD | (Morais & Lombardi, 2006; Rosa & Romero, 2012) |
| *Myrcia sylvatica* (G.Mey.) DC. | AM, CAA, CE, MAN | CE, FL, RES | WD | (Holst, Landrum, & Grifo, 2003; Lourenço & Barbosa, 2012) |
| *Myrcia tenuifolia* (O.Berg) Sobral | MAN | FL | BA, ES | (Flora do Brasil, 2020) |
| *Myrcia tetraloba* D.F.Lima & E.Lucas | | CE | BA | Lima *et al.* 2017 |
| *Myrcia tomentosa* (Aubl.) DC. | WD | CE, CR, FL | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; Lourenço & Barbosa, 2012; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Rosa & Romero, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Myrcia undulata* O.Berg | MAS | FL | MG, RS, PR, SC | (Flora do Brasil, 2020) |
| *Myrcia variabilis* DC. | CE, MAS | CE, CR | WD | (Rosa & Romero, 2012; Lima, 2017; Flora do Brasil, 2020) |
| *Myrcia vauthiereana* O.Berg | MAS | CAP, CR, FL | WD | (M. de O. Bünger *et al.*, 2012; Rosa & Romero, 2012) |
| *Myrcia venosissima* Sobral & P.L.Viana | | CR | MG | (Sobral *et al.*, 2016) |
| *Myrcia venulosa* DC. | CE, MAS | CE, CR, FL | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Rosa & Romero, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Myrcia vestita* DC. | CE | CE, FL | WD | (Rosa & Romero, 2012) |
| *Myrcia* sp. | | CE | BA | (L. L. dos Santos, 2017) |
| *Myrcianthes* O.Berg | | | | |

| | | | | |
|---|---|---|---|---|
| *Myrcianthes pungens* (O.Berg) D.Legrand | CE, MAS | CE, CR, FL | WD | (Romagnolo & Souza, 2004; Flora do Brasil, 2020) |
| *Myrciaria* O.Berg | | | | |
| *Myrciaria cuspidata* O.Berg | WD | CE, FL, RES | WD | (Sobral, 1993; Stadnik, Oliveira, & Roque, 2018) |
| *Myrciaria delicatula* (DC.) O.Berg | CE, MAN, MAS | CAP, CR | WD | (Morais & Lombardi, 2006) |
| *Myrciaria disticha* O.Berg | MAS | FL | SP, RJ | (Sobral, 1993) |
| *Myrciaria floribunda* (H.West ex Willd.) O.Berg | WD | CAA, CE, CR, FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Myrciaria glanduliflora* (Kiaersk.) Mattos & D.Legrand | CE, MAN, MAS | CAR, CE, FL | BA, MG | (Sobral, 1993; Kawasaki, 2004; Morais & Lombardi, 2006; Stadnik, Oliveira, & Roque, 2018) |
| *Myrciaria glazioviana* (Kiaersk.) G.M.Barroso ex Sobral | CAA, MAN, MAS | FL | WD | (Amorim & Alves, 2012) |
| *Myrciaria glomerata* O.Berg | AM, MAN, MAS | FL | PA, MG | (Morais & Lombardi, 2006) |
| *Myrciaria guaquiea* (Kiaersk.) Mattos & D.Legrand | CAA, MAN, MAS | CAA, CE, FL | WD | (Stadnik, Oliveira, & Roque, 2018) |
| *Myrciaria pilosa* Sobral & Couto | CAA, MAN | CE, FL | BA, MG | (Stadnik, Oliveira, & Roque, 2018) |
| *Myrciaria tenella* (DC.) O.Berg | WD | CE, FL | WD | (Sobral, 1993; Holst, Landrum, & Grifo, 2003) |
| *Neomitranthes* | | | | |
| *Neomitranthes obtusa* Sobral & | MAN, MAS | FL, RES | ES, BA, | (Souza, 2009; Giaretta & Peixoto, 2015) |

| | | | | |
|---|---|---|---|---|
| Zambom | | | SE | |
| *Pimenta* | | | | |
| *Pimenta pseudocaryophyllus* (Gomes) Landrum | CE, MAN, MAS | CE, CR, FL, RES | WD | (Fiorella Fernanda Mazine & Souza, 2008b) |
| *Plinia* | | | | |
| *Plinia cauliflora* (Mart.) Kausel | MAN, MAS | CE, FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; Stadnik, Oliveira, & Roque, 2018) |
| *Plinia edulis* (Vell.) Sobral | MAS | FL | SP, RJ | (Sobral & Stehmann, 2009) |
| *Plinia espinhacensis* Sobral | | CAR, FL | MG | (Sobral, 2010b) |
| *Plinia nana* Sobral | | CE, CR | MG | (Sobral, 2005) |
| *Plinia peruviana* (J.F.Gmel.) Govaerts | MAN, MAS | FL | WD | (Romagnolo & Souza, 2004) |
| *Plinia pseudodichasiantha* (Kiaersk.) G.M.Barroso ex Sobral | MAS | FL | WD | (Sobral, 2007; Souza, 2009) |
| *Plinia rivularis* (Cambess.) Rotman | AM, CAA, MAN, MAS | FL, RES | WD | (Holst, Landrum, & Grifo, 2003; Souza, 2009) |
| *Psidium* L. | | | | |
| *Psidium appendiculatum* Kiaersk. | CAA | CAA, CE, FL | WD | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium australe* Cambess. | CE, MAS | CAM, CE, FL | WD | (Landrum, 2017) |
| *Psidium brownianum* Mart. ex DC. | CAA, MAN, MAS | CAA, CE, FL | WD | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |

| | | | | |
|---|---|---|---|---|
| *Psidium cattleianum* Sabine | CAA, MAN, MAS | CAM, FL, RES | WD | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium eugenii* Kiaersk. | CE | CE | MG | (Flora do Brasil, 2020) |
| *Psidium firmum* O.Berg | CE, MAS | CE, CR, FL | WD | (M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012; Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium ganevii* Landrum & Funch | CAA | CE, FL | BA | (Stadnik, Oliveira, & Roque, 2018) |
| *Psidium glaziovianum* Kiaersk. | | CAA, CE, FL | BA, MG | (Stadnik, Oliveira, & Roque, 2016; Landrum, 2017) |
| *Psidium grandifolium* Mart. ex DC. | CE, MAS | CAM, CE | WD | (Landrum, 2017) |
| *Psidium guajava* L. | WD | AN | WD | (Landrum, 2017) |
| *Psidium guineense* Sw. | WD | CAA, CAM, CE, CR, FL, RES | WD | (Kawasaki, 2004; Morais & Lombardi, 2006; Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium laruotteanum* Cambess. | AM, CAA, CE, MAS | CE | WD | (Holst, Landrum, & Grifo, 2003; Landrum, 2017) |
| *Psidium myrsinites* DC. | CAA, CE | CE, CR | WD | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium myrtoides* O.Berg. | WD | CAP, CR, FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; Landrum, 2017) |
| *Psidium nutans* O.Berg | CAA, CE, MAN | CE, FL | WD | (Landrum, 2017) |
| *Psidium oblongatum* O.Berg | MAN, MAS | FL | ES, MG, RJ | (Morais & Lombardi, 2006; Tuler *et al.*, 2017; Flora do Brasil, 2020) |

| | | | | |
|---|---|---|---|---|
| *Psidium oligospermum* Mart. ex DC. | WD | CAA, CE, FL | WD | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium rhombeum* O.Berg | CAA, MAN, MAS | CE, RES | WD | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium robustum* O.Berg | MAS | CR | SP, MG, MA | (M. de O. Bünger *et al.*, 2012) |
| *Psidium rufum* Mart. ex DC. | CE, MAS | CAM, FL | WD | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium salutare* (Kunth) O.Berg | WD | CE, CR | WD | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium schenckianum* Kiaersk. | CAA, MAN | CAA, CE | BA, PE | (Landrum, 2017; Stadnik, Oliveira, & Roque, 2018) |
| *Psidium striatulum* DC. | AM, CE, MAN, MAS | CE | WD | (Holst, Landrum, & Grifo, 2003; Sobral *et al.*, 2015) |
| *Siphoneugena* | | | | |
| *Siphoneugena crassifolia* (DC.) Proença & Sobral | MAS | FL | WD | (Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012; M. F. Santos & Sano, 2012) |
| *Siphoneugena densiflora* O. Berg | AM, CE, MAS | CR, FL | WD | (C. Proença, 1990; M. de O. Bünger *et al.*, 2012) |
| *Siphoneugena dussii* (Krug & Urb.) Proença | AM, CE, MAS | CR | WD | (C. Proença, 1990; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012) |
| *Siphoneugena kiaerskoviana* (Burret) Kausel | MAS | CR | MG, SP, RJ | (C. Proença, 1990; Morais & Lombardi, 2006; M. de O. Bünger *et al.*, 2012) |
| *Siphoneugena kuhlmannii* Mattos | MAS | FL | MG, SP | (C. Proença, 1990) |
| *Siphoneugena reitzii* D.Legrand | MAS | FL | WD | (C. Proença, 1990) |

| | | | | |
|---|---|---|---|---|
| *Syzygium* | | | | |
| *Syzygium jambos* (L.) Alston | WD | AN | WD | (Holst, Landrum, & Grifo, 2003; Lima, Caddah, & Goldenberg, 2015) |

1

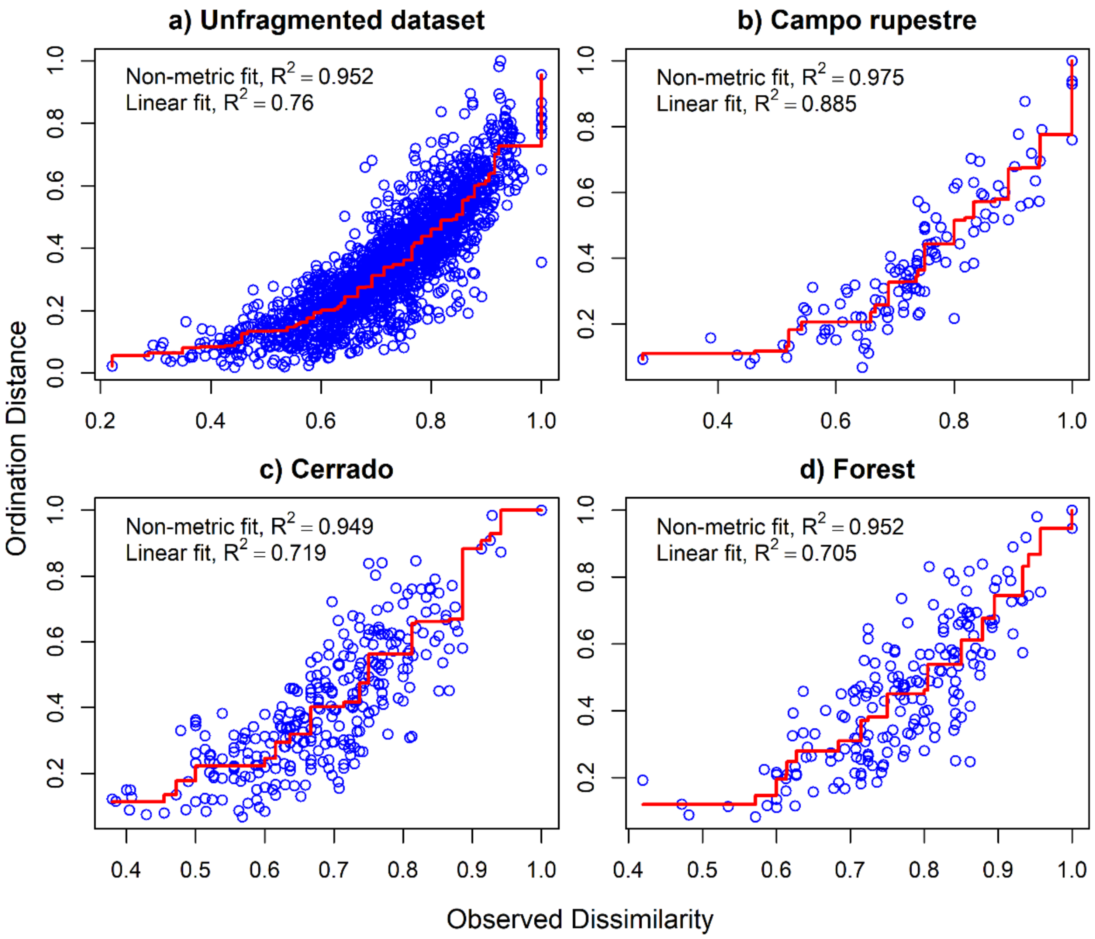

Figure S1. Shepard's plot for the ordination of Espinhaço Mountain Range areas according to Myrtaceae similarity patterns for different datasets: (A) unfragmented dataset for the EMR; and datasets fragmented by species vegetation of occurrence: (B) campo rupestre; (C) cerrado and (D) forests.

## Chapter Two.

# Environmental drivers of Myrtaceae beta-diversity turnover in different vegetation types of the Espinhaço Mountain Range, Brazil

*Target journal: FLORA*

## Abstract

Mountain ranges are model systems that combines an enormous biodiversity and a deep gradient of environmental variation. In east Brazil, the Espinhaço Mountain Range (EMR) encompasses an impar biodiversity in a heterogeneous landscape, being composed by a mosaic of vegetation types encompassing campos rupestres (CR), cerrados (CE) and forests (FL). In this context, Myrtaceae is a species-rich plant family highlighted for its relevance in these different landscapes. We used Generalized Dissimilarity Modelling to identify environmental predictors associated to Myrtaceae species turnover across different vegetation types of the EMR. Our results concur with ecophysiological constraints in different vegetation types, but all vegetation types presented an overall congruent pattern, with species turnover being mostly driven by chemical and physical components of soil, especially organic carbon content, soil pH and clay content. These results did not agree with investigations using other biological models in CR, being Myrtaceae the first case where pedological constraints were more relevant to species turnover than climate. Geographical distance did not explain the variance in species composition within CR but explained 5-7% in CE and FL, indicating a smaller geographical isolation in CR for Myrtaceae. The dataset unfragmented by vegetation of occurrence selected precipitation, bulk density for soil surface, soil pH and clay content as environmental predictors associated with vegetation shifts in the mountain range, rendering similar patterns to analysis investigating vegetation shifts in the Cerrado Domain.

**Keywords:** campo rupestre; cerrado; forest; beta-diversity;

## 1. Introduction

Highlands have been pointed as paramount in understanding biological diversity in the world, acting as a model system that combines an enormous biodiversity and a deep gradient of environmental variation (Perrigo *et al.*, 2020; Rahbek *et al.*, 2019b). Previous studies have documented that these regions can act as reservoirs, museums and refugia for biological diversity, emphasizing the urgency to understand how biodiversity is structured in these regions to forecast problems that highland species can suffer in the future (Rahbek *et al.*, 2019a). In this context, the Espinhaço Mountain Range (EMR), the highlands situated in east Brazil, have been consistently cited over the years for its species richness and relevance for conservation (Harley and Simmons, 1986; Neves *et al.*, 2018; Rapini *et al.*, 2008; Silveira *et al.*, 2016). It extends over 1100 km and crosses three highly diverse Brazilian morphoclimatic domains (Caatinga, Cerrado and Atlantic Forest), encompassing distinct climatic influences and ecological communities (Harley, 1995; Zappi *et al.*, 2003).

The heterogeneous climatic influences, in addition to variations in soil properties and elevation, render a mosaic landscape with a mix of different phytophysiognomies that have been described in detail by a few comprehensive floras (*e.g.* Harley & Simmons 1986; Harley 1995; Pirani *et al.* 2003; Zappi *et al.* 2003). Mountaintops in the EMR are usually covered by phytophysiognomies with shallow, rocky, and impoverished soils, like campos rupestres and ferruginous cangas. In areas up to 1,500 m with marked climatic seasonality and deep, aluminum-rich soils, cerrado vegetations are predominant – including all phytophysiognomies described in the continuum of cerrado *sensu lato*: campos limpos, campos sujos, campos cerrado, cerrado *sensu stricto* and cerradão (Coutinho, 1978). Throughout the EMR, in areas with deeper soils and greater water availability, there is a wide array of forest phytophysiognomies (deciduous, semi-deciduous, nebular, riparian and "capões de mata") that vary according to precipitation and temperature variations (Saiter *et al.*, 2015). Also, as the northern portion of the mountain range is inserted within Brazilian semi-arid, lower elevations within this area are frequently occupied by caatinga *sensu lato*, being intrinsically linked to leaf loss and desiccation (Andrade-Lima, 1981).

This puzzle of ecological variation shaping biodiversity is still underexplored in the EMR: While previous investigations revealed climatic factors associated with species distribution in campos rupestres (*e.g.* Bünger *et al.* 2014; Neves *et al.* 2018; Campos *et al.* 2019; Pacifico *et al.* 2021), other vegetation types inside EMR and other environmental parameters have been neglected. One of these neglected environmental factors are soil parameters, such as fertility, pH and texture - important variables that define plant niches and have been previously associated with woody species distribution (Bueno *et al.*, 2018; Gomes *et al.*, 2020). In addition, studies evaluating shifts in biodiversity are frequently focused solely on species richness (alpha diversity), overlooking changes in diversity and species composition (beta-diversity) despite its relevance for biodiversity assessments. Beta diversity has been recognized as a useful ecological parameter to understand the underlying processes that drive diversity patterns – being related to organisms physiology and their historical, ecological and evolutionary processes, which is extremely valuable in a scenario of climate change and biodiversity crisis (Gaston, 2000; Soininen *et al.*, 2007).

In this context and considering the representativeness of the hyperdiverse plant family Myrtaceae in EMR landscapes (Campos *et al.*, 2017; Giulietti *et al.*, 1987; Pirani *et al.*, 2003; Santos *et al.*, 2012; Versieux *et al.*, 2011; Zappi *et al.*, 2003), the family is a prime model to compare environmental drivers of species turnover in woody plants across different vegetations types in the area. Therefore, the aim of this study was to investigate which large-scale environmental predictors are correlated to Myrtaceae species turnover in the Espinhaço Mountain Range and within its different vegetation types and compare the results with other previously investigated biological models (*e.g.* Campos *et al.*, 2019; Pacifico *et al.*, 2021). Our hypothesis is that the environmental predictors relevant to explain species turnover in the EMR will vary for each vegetation type and we predict that known physiological constraints that limit organism's establishment in different phytophysiognomies will be relevant in a macro-scale but will be insignificant within vegetation types where stablished communities have adapted to these constraints.

## 2. Materials and Methods

### 2.1. Study Area

The Espinhaço Mountain Range (EMR; Fig. 1) was delimited by selecting aggregated pixels with elevation equal or higher than 900 m in the altitude raster provided by WorldClim (Fick and Hijmans, 2017). The elevation threshold was determined according to Echternacht *et al.* (2011) – since this delimitation allows a robust outline of the main structures within the mountainous complex. Due to the proximity to "Serra da Mantiqueira", the south limit of the study area was hardly detectable through this method, therefore being delimitated manually according to literature (Coelho, 2014; Giulietti and Pirani, 1988; Santos and Sano, 2012; Verdi *et al.*, 2015). This delimitation comprehended mountain formations with distinct origin, comprehending the broader definition of EMR and including mountains from the Espinhaço Supergroup, from the Minas Supergroup and areas within conflicting geological information, mostly attributed to the Macaúbas Group (Abreu, 1995; Chemale Jr. *et al.*, 2011; Saadi, 1995; Schobbenhaus, 1996). All geoprocessing procedures were performed in QGIS software (version 3.6.2).

Located within latitudes 9º and 21ºS, the EMR is one of the largest mountain ranges in Brazil, extending over 1,000 km north-south and 50 to 100 km east-west and presenting elevations around 800 m above sea level (Giulietti and Pirani, 1988). It encompasses four Köppen-Geiger climate zones: Aw (Tropical Savanna with dry winter), Bsh (Semi-arid), Cwa and Cwb (Mild temperature with dry winter), with overall mild to hot summers and dry winters (Chen and Chen, 2013). Despite the concentration of precipitation in the summer, there can also be a second peak of humidity during the dry season due to low temperatures at night and consequent formation of fogs (Harley and Simmons, 1986).

## 2.2. Compilation of datasets

Myrtaceae records were obtained from species descriptions and from the online platforms SpeciesLink (http://splink.cria.org.br) and Jardim Botânico do Rio de Janeiro (http://jabot.jbrj.gov.br). To improve taxonomical accuracy, herbarium visits were carried out at ALCB, HUEFS, MBM, RB and SPF (acronyms according to Thiers 2020), digitalized images of exsiccate were seen on the online herbaria REFLORA (http://reflora.jbrj.gov.br/reflora/herbarioVirtual), and only records seen in the present work or identified by specialists were considered reliable. Duplicates were excluded and synonyms were transferred to valid names according to literature, World Checklist (https://wcsp.science.kew.org) and Flora do Brasil 2020 (http://floradobrasil.jbrj.gov.br). Species that do not occur naturally, like *Backhousia* spp., *Corymbia* spp., *Eucalyptus* spp., *Melaleuca* spp., *Ugni* spp. and most *Syzygium* species (*S. aromaticum* (L.) Merr. & L.M.Perry , *S. cumini* (L.) Skeels and *S. malaccense* (L.) Merr. & L.M.Perry) were excluded from the list. Myrtaceae species composition and distribution were described in detail elsewhere (Lucresia *et al.* in prep).

The occurrence records for the complete dataset were fragmented according to the vegetation type where it was recorded. Vegetation of occurrence was attributed to each record according to collector's description and different phytophysiognomies were grouped in four classes of vegetation according to environmental factors (Fig. 1): 1. Campo rupestre (CR) included phytophysiognomies with thin layer of soil and predominance of exposed rocks, like ferruginous cangas and campos rupestres *sensu stricto*; 2. Cerrado (CE) included formations with deeper aluminum-rich soils with the influence of fire, like savannah phytophysiognomies within Cerrado *sensu lato* (Cerrado *sensu stricto*, cerradão, campos limpos, campos sujos); 3. Caatinga (CAA) included phytophysiognomies with lower water availability and strong deciduity, as arboreal caatinga and caatinga *sensu stricto*; and 4. Forest (FL) included perennial or semideciduous vegetations with deeper soils with leaf litter and canopy formation, like evergreen, semideciduous, nebular or riparian forests. Records without precise description of vegetation, either with no information or with dubious terms ("shrubland", "transition vegetation", "carrascos" etc) were not assigned to a vegetation class.

The study area was overlapped with squared grid cells of 0.25° (27.75 x 27.75 km) in QGIS software (version 3.6.2). Myrtaceae records with original coordinates were plotted in the study area and, in an attempt to maximize data, records without geographical coordinates that were collected in municipalities completely inserted within one grid cell (*e.g.* Catas Altas, Sarzedo and Presidente Kubitschek, in Minas Gerais state) were attributed manually to those areas. A presence/absence matrix was compiled for species found within each grid cell for every vegetation class (CAA, CE, CR, FL) and for the complete unfragmented dataset. Grid cells with less than 10 species were removed to avoid further noise to the analyses. After cleaning procedures, the caatinga vegetation matrix did not present usable grid cells, therefore not being included in the analysis. The remaining models fragmented by vegetation of occurrence (CR, CE and FL) were composed by a distinct set of grid cells and species (Fig. 2). Since the unfragmented dataset (UD) included a large amount of grid cells that were not included in any of the vegetation-fragmented models, two models were constructed for this dataset to allow comparability: a complete one (UDc), using the exclusive grid cells and all cells included in fragmented models; and a partial model (UDp) with the same species composition but only grid cells included in at least one of the vegetation-fragmented models.

Nineteen climatic and two geomorphological variables were gathered from WorldClim (Fick and Hijmans, 2017) and 19 pedological variables were gathered from SoilGrids (Hengl *et al.*, 2017), 18 of which referred to the same 9 pedological variable in depths 0 and 1 meter (Table S1). The median of every environmental variable was calculated for each grid cell in the study area as a measure of central tendency and computed in a matrix of explanatory variables. All procedures that involved geoprocessing were performed in QGIS software (version 3.6.2) and the resultant matrices were manipulated in R software.

## 2.3. Generalized Dissimilarity Modeling (GDM)

To investigate the role of the environmental predictors on species composition we used Generalized Dissimilarity Modelling (Ferrier *et al.*, 2007, 2002). A GDM is a statistical method that analyzes and predicts spatial patterns of species turnover as a function of geographical distance and environmental factors (Ferrier *et al.*, 2007). The approach uses maximum likelihood and modelled I-splines to generate the best supported function between geo-climatic variation and floristic dissimilarities between pairs of sites. Floristic dissimilarity was measured using Sørensen index in the presence/absence matrices compiled (Gotelli and Ellison, 2011).

Since GDM combines elements of generalized linear modelling and matrix regression, it can potentially be sensitive to collinearity between predictors (Leathwick *et al.*, 2006). To reduce the impact of correlation in the final model, Pearson correlation coefficient was measured for every pair of predictors and highly correlated variables ($p>0.8$) were removed – reducing the explanatory environmental variables from 40 to 13. Selection between correlated variables prioritized predictors with higher explanatory power for each dataset, which rendered a different set of predictors for each model. In addition to the 13 geoclimatic predictors, geographical distance between grid cells was included in all models as a fourteenth predictor. The variables included in the analysis were then dropped through backward elimination until each model presented the highest explained variance with the lower number of predictors. All GDM procedures were performed in R software with package GDM (Fitzpatrick *et al.*, 2021). Diagnostic graphics of the models and the relationship between species turnover and the environmental predictors selected for each model were included in the supplementary material (Fig. S1-S5).

## 3. Results

Models included a different subset of grid cells, species, and environmental predictors (Fig. 2; Table 1). The complete unfragmented datasets (UDc) included 245 species in 61 grid cells, presenting the most homogeneous distribution and complete sampling throughout the study area. Cerrado dataset (CE) encompassed 123 spp. in 25 grid cells and the most spatially homogeneous sampling among vegetation-fragmented models, including areas in the central portion of the mountain range. Forest dataset (FL) included 153 spp. in 20 grid cells, all mainly distributed in opposite portions of the study area (north/south), and campo rupestre (CR) presented 133 spp. in 16 grid cells mainly distributed in three clusters. The partial model for the unfragmented dataset (UDp) encompassed the 245 spp. included in UDc within the 38 grid cells that were included in at least one of the vegetation-fragmented models.

Unfragmented models explained a different proportion of variance and included a different subset of predictors (Tab.1). UDc presented a higher proportion on unexplained variance (59.56%) and species turnover was mostly driven by geographical distance (21.62%). Alternatively, UDp presented a smaller proportion of variance explained by geographical distance (11.32%), whereas bulk density for 0m depth was the most relevant predictor for species turnover (22.59%) – albeit explaining 0.37% of variance in UDc. Precipitation of coldest quarter was the second most relevant predictor for UDc (8.40%) while precipitation seasonality was the most relevant precipitation predictor for UDp, explaining a smaller proportion of variance (6.80%). Soil pH was equally relevant for both models – explaining 4.57% of variance in UDc and 4.82% in UDp, and soils clay content, though relevant in both models, explained a larger proportion of variance in UDp (7.54% versus 3.63% in UDc). Other predictors that were included in UDc explaining under 1% of the model's total variance (annual mean temperature, absolute depth to bedrock, coarse fragment volumetric and declivity) were also included in UDp, albeit explaining a larger proportion of variance in this model.

Models fragmented by vegetation of occurrence (CR, CE and FL) presented overall congruent results, with Myrtaceae species turnover being mostly driven by edaphic predictors (Tab. 1; Fig. 3). Soil chemical components were highly relevant drivers of species turnover in every model: soil organic carbon content for soil surface explained a high proportion of variance in open habitats (14.91% in CR and 10.80% in CE); soil organic carbon content for 1m depth explained a small proportion of variance in deeper-soil environments (3.49% in CE and 1.32% in FL); soil pH was highly relevant for all models except CE (20.54% in CR, 14.99% in FL and only 4.34% in CE) and cation exchange capacity presented a small relevance in CR (2.38%). Soil physical components were the second-most relevant class of predictors, with clay content explaining a high proportion of variance in all three vegetation types, especially CR and FL (14.95% in CR, 7.15% in CE and 13.46% in FL). Other predictors related to physical composition of soil explained little variance in different models: Silt content for soil surface (0.35% in CR and 1.82% in CE); and bulk density for soil surface (2.77% in FL). Depth to bedrock was kept in all the models albeit explaining under 1% of variance in all of them, and declivity explained a very small proportion of variance in CE (0.89%) and FL (0%), and a bigger amount in CR (4.89%). Spatial patterns of predictors related to soil are presented in Figure 4.

Predictors related to climate explained a moderate to small proportion of variance in all three models (Tab. 1; Fig. 3), being precipitation seasonality the most relevant climatic predictor and the only one representing precipitation patterns – explaining 3.27% of variance in CR, 2.73% in CE and 6.25% in FL. Climatic predictors related to temperature were all dropped by backward elimination in CE but were selected in CR and FL albeit explaining a small proportion of variance: maximum temperature of warmest month (1.09% in CR and 0% in FL); mean diurnal temperature range (1.62% in FL) and temperature annual range (1.51% in CR). Spatial patterns of predictors related to climate are presented in Figure 5. Geographical distance explained 0% of variance in CR and was moderately relevant in CE (7.01%) and FL (5.03%). The proportion of unexplained variance also varied mildly between models: CR presented the smallest proportion of unexplained variance (35.75%), FL had an intermediate amount (53.84%) and CE presented the highest unexplained variance (60.9%).

## 4. Discussion

Soil chemical components were the most relevant predictors in the models fragmented by vegetation of occurrence (CR, CE and FL). Among these predictors, soil pH was the most relevant for CR and FL and organic carbon content was highly relevant in open habitats (CR and CE) – being both associated with nutrient availability: organic carbon content is highly correlated with organic matter and overall fertility; and variations in soil pH affect nutrient uptake by modifying their ionic forms (Carmo and Jacobi, 2016; Lambers *et al.*, 2008a, 2008b). Cation exchange capacity, the other predictor related to chemical composition of soil that was kept solely in the CR model (2.38%), though not strongly correlated with the other predictors, is affected by soil fertility and pH, as exchangeable cations include $K^+$, $Ca^{+2}$, $Mg^{+2}$, $Al^{+3}$ and $H^+$ (Robertson *et al.*, 1999).

Previous papers assessing species turnover in different environments (*e.g.* dunes, savannas and drylands) have highlighted nutrient availability as the most relevant predictor of plant species turnover (Bueno *et al.*, 2018; Fernandez-Going *et al.*, 2013; Zemunik *et al.*, 2016). Fernandez-Going *et al.* (2013) suggested that this pattern would be exclusive to habitats with impoverished soils since plant growth would be most strongly limited by low levels of nutrients instead of water. Therefore, this result reinforces the reduced fertility in forests associated with the EMR, as these formations tend to be as nutrient impoverished as the surrounding habitats (Bueno *et al.*, 2018; Nóbrega and Vilas Boas, 2020). In that regard, both CE and CR have extremely impoverished soils and previous authors have described reduced nutrient availability as a selective barrier for species and traits related to resource conservation in these formations (Benites *et al.*, 2007; Caminha-Paiva *et al.*, 2021; Negreiros *et al.*, 2014; Silveira *et al.*, 2016). Another interesting aspect of these results is that the CE model attributed lower relevance to pH when compared to the other models fragmented by vegetation class. pH is strongly correlated to aluminum content and soil toxicity (Lopes and Cox, 1977; Ruggiero *et al.*, 2002), limiting factors for plant growth in cerrado, indicating that these factors may not be relevant when assessing species turnover within CE, as established species are adapted to these conditions (Haridasan, 2008).

The second class of predictors with higher relevance in all three models was the physical components of soil, represented by clay and silt content, bulk density, and coarse fragments volumetric. All these predictors are related to grain size, porosity, soil compaction and overall soil texture, impacting on soils water holding capacity (Al-Shammary *et al.*, 2018; Lambers *et al.*, 2008b). Previous papers have described CR as edaphically challenging formations for plant species, with rocky shallow soils and low water holding capacity. These characteristics could act as a selective barrier for plant species and therefore impact species turnover (Caminha-Paiva *et al.*, 2021; Negreiros *et al.*, 2014; Silveira *et al.*, 2016). For CE, previous papers assessing beta diversity in savanna phytophysiognomies within the Cerrado domain have found a correlation between species turnover and water availability, though it appears these predictors present higher relevance in the EMR (Bueno *et al.*, 2018). Forests, on the other hand, are distributed in soils with higher water holding capacity within the EMR (Bueno *et al.*, 2018; Nóbrega and Vilas Boas, 2020), whereas there is no indication of a harsh stress related to drought. Nonetheless, a moderate water stress could act as a strong selective barrier, as drought impacts germination and overall reproduction in these environments (Terra *et al.*, 2018).

The last soil predictors included in the models were terrain (declivity) and depth to bedrock. Declivity was kept in all three models explaining up to 4.89% of variance, being more relevant in CR. In this context, declivity may act as a dubious predictor: In experimental papers it has been related to the vertical percolation of water in the soil, affecting water availability in deeper soil strata (Souza *et al.*, 2018); but it may also indicate a more strenuous relief – indicating a larger geographical isolation between peaks and valleys within one grid cell. Absolute depth to bedrock was also kept in all the models, albeit explaining a very small fraction of variance in all three (0.35% in CR; 0.87% in CE; and 0.70% in FL). Depth to bedrock is associate with overall soil depth and its physical space, limiting root growth, animal presence and other biological activities (Arrouays *et al.*, 2014). This predictor is usually more relevant as a limiting factor in vegetation types with higher mean rooting depth (Arrouays *et al.*, 2014), which is the case of tropical forests and savannas – coinciding with the models where the predictor slightly explained a larger proportion of variance.

Climatic predictors explained a smaller proportion of variance in all three models. For CR, precipitation seasonality, maximum temperature of warmest month and temperature annual range were selected explaining over 1% of variance, reinforcing the relevance of drought, evapotranspiration and overheat in this vegetation type – factors already described as limiting for plant growth in these formations (Safford, 1999; Scarano, 2002). Forests presented the highest proportion of variance explained by climate when compared to CE and CR. Precipitation seasonality presented the highest relevance (6.25%) in this model, which corroborates previous studies that indicate the length of the dry season as a selective barrier for reproduction in forests (Terra *et al.*, 2018). The CE model kept only one climatic predictor: precipitation seasonality – explaining the smallest proportion of variation when compared to the other two models (2.73%). Prolonged dry seasons in Cerrado have been linked to a higher incidence of fire – which itself drastically reduces the water content in the upper strata of the soil, deepening the stress relate to drought (Coutinho, 1990; Quesada *et al.*, 2004). The relatively small relevance of this predictor is an interesting finding, since both precipitation and fire have been documented as filters for woody plants establishment in savannas (Sankaran *et al.*, 2005).

While environmental predictors related to species turnover within vegetation types are an indicator of filters that restrict species distribution in these environments, predictors related to species turnover in unfragmented models (UDc and UDp) are probably related to vegetation shifts. Both models selected a few congruent predictors as relevant for species turnover: soil pH, clay content and a precipitation variable (precipitation of coldest quarter or precipitation seasonality). From these, soil pH is correlated to aluminum toxicity, a determinant factor in the occurrence of campo rupestre and cerrados (Coutinho, 1990; Silveira *et al.*, 2016) and clay content and precipitation are related to water stress – described as a factor defining the occurrence of forests and a limiting environmental factor in campos rupestres (Harley, 1995; Silveira *et al.*, 2016; Zappi *et al.*, 2003). The main difference between the relevance of environmental predictors in both models was the higher relevance attributed to bulk density for 0m depth in UDp. Bulk density is the ratio of soils dried mass to its total volume, and it is especially relevant for woody species establishment, as a high bulk density impose a challenge for rooting and a low bulk density reduces the contact between root and soil, restricting transport of water and nutrients (Stirzaker *et al.*, 1996). This predictor could be included in UDp as a proxy for soil quality in species turnover and vegetation shifts, as this parameter is heavily related to physical qualities of soil, being impacted by soil moisture, organic carbon content, particle-size, porosity and soil thermal properties (Al-Shammary *et al.*, 2018; Heuscher *et al.*, 2005).

Although predictors associated with vegetation shifts have been explored in literature for different areas, none has assessed them specifically for the EMR. Still, two investigations focused on larger areas that include the mountain range: Neves *et al.* (2015), when evaluating species turnover in the South American Dry Diagonal (Caatinga, Cerrado and Chaco), stressed the relevance of multiple climatic predictors (isothermality, minimum temperature of coldest month, severity of water deficit, precipitation of driest month, cloud cover, sediment coarseness, days of frost, soil water storage capacity and precipitation of the wettest month); and Bueno *et al.* (2018) evaluated woody species turnover in the Cerrado Domain and highlighted flammability index, soil fertility and drainage as the most relevant drivers across savannas and forests. Although our findings do not corroborate Neves *et al.* (2015) results, there is a high congruence among our findings and Bueno *et al.* (2018), since soil fertility and pH are correlated, and clay content and bulk density are determinant factor for soil drainage.

Finally, geographical distance was not important to understand compositional turnover in CR but explained a small proportion of variance in FL (5.03%) and CE (7.01%). When combining these results with previous papers evaluating Myrtaceae distribution and endemicity in the EMR (Lucresia *et al.* in prep), there is strong evidence that species are neither highly endemic as well as do not present limited dispersal in the EMR, even in vegetation types described as highly isolated, like campos rupestres. CR are known for its high level of species endemism and isolation; this pattern is mostly based on species with abiotic dispersal (*e.g.* anemochory or autochory). However, by focusing on a plant family with zoochoric species we find that this isolation factor stated in the literature is not an important predictor driving composition inside CR. Animal-dispersed species with specialized dispersal organs usually present smaller dispersal limitations (Lin *et al.*, 2013; Silveira *et al.*, 2016), and it is possible that the relevance of geographical distance found in different models reflect dispersers behavior and composition in different environments: zoochoric plants in CR are usually dispersed by habitat-generalist birds that present a wide distribution (Costa and Rodrigues, 2012; Guerra *et al.*, 2016). Although generalist birds also act as dispersers in FL and CE, these environments have a higher proportion of habitat-specific frugivores (Costa and Rodrigues, 2012; Purificação *et al.*, 2014), which could lead to a more restrictive distribution and render an overall higher geographical isolation for animal-dispersed plants in these environments.

Dispersers biology and behavior may also impact geographical isolation among forests and cerrado *sensu lato*, whereas savannah bird species usually migrate to humid habitats during the dry season (Purificação *et al.*, 2014), reducing the amount of dispersers in these environments for a substantial period of time. This might be especially relevant for Myrtaceae species since this family has been representative in the diet of frugivores and it has been previously documented as a key resource throughout periods of food scarcity (Faustino and Machado, 2006; Staggemeier *et al.*, 2017). Nonetheless, more studies are required to comprehend in detail how seed dispersal by frugivores in these areas take place and if there are significant differences in habitat-range and niche use for birds in different vegetation types across the mountain range.

The relevance of geographical distance for species turnover may also vary according to the isolation of grid cell inserted within each model. This is probably what caused the difference in the relevance of geographical distance in unfragmented models, with a large proportion of variance in UDc being explained by geographical distance and a significant reduction in UDp. Nonetheless, the difference in the number of grid cells included in each model could be rendered by different sampling efforts or natural differences in the distribution of these vegetation types – as some grid cells may be mostly composed by a homogeneous habitat. Previous landcover investigations in the mountain range reported that few vegetation types present an overall continuous distribution while others can be more fragmented, but also reported that sampling effort is not homogeneous within neighboring vegetation types (Lucresia *et al.*, 2021). In this context, it is imperative that future studies focus on poorly sampled areas to allow a better comprehension of the relevance of geographical distance for species turnover.

The amount of unexplained variance in the models varied, which could be a result of a combination of factors. First, the proportion of unexplained variance can increase due to an augmentation of overall variance in the model without an improvement of explained variation (O'Grady, 1982). This increase in overall variance could be led by (1) natural differences among vegetation types; (2) the inclusion of more grid cells – which seems to be the case when comparing UDc and UDp; or (3) the inclusion of variance from other model systems, reflecting the heterogeneous vegetation delimitation adopted in the present paper. This scenario coincides with the models obtained, whereas CE was the least explicative of the models fragmented by vegetation class and its delimitation included phytophysiognomies with distinct ecological properties, such as cerradões and campos sujos. FL model explained an intermediate amount of variance when compared to CR and CE – and the delimitation of “forest” in the present paper also contemplated an intermediate amount of heterogeneity, comprehending a smaller ecological range, with distinct types of forest formations. Finally, species distribution are influenced by historical and ecological factors in multiple scales, thus the proportion of variance unexplained by the models can be attributed to predictors that were either not included in the present analysis or were included in larger or finer scales. A previous paper, for example, selected flammability index as one of the three most relevant predictors for arboreal species turnover in the Cerrado domain (Bueno *et al.*, 2018), which could be a portion of variance that remained unexplained in the CE model in the present paper.

Although this study was the first to investigate turnover for forests and cerrado *sensu lato* within the Espinhaço range, the results concur with previous analysis in similar phytophysiognomies in other locations (Bueno *et al.*, 2018; Gomes *et al.*, 2020). Nonetheless, when comparing our results with studies evaluating community turnover for other botanical groups in campos rupestres of the EMR, different set of predictors were highlighted. Turnover for Microliciaeae (Melastomataceae) was mostly driven by precipitation seasonality (16.43%), geographical distance (14.32%), temperature annual range (10.63%) and soil pH (9.98%), with an overall higher relevance of climatic variables (41.35%) and soil variables explaining, together, ca. 21.78% of variance (Pacifico *et al.*, 2021). For Asteraceae, climatic predictors were the only ones selected as relevant, with variance being largely attributed to precipitation of the wettest month, mean temperature of coldest quarter, precipitation of driest month and annual precipitation (Campos *et al.*, 2019). While precipitation seasonality was selected as relevant for Myrtaceae turnover in CR, the predictor explained only 3.27% of variation within this dataset. Nonetheless, Myrtaceae different biological characteristics regarding floral and fruit morphology, seed dispersal mechanisms and habit (Campos *et al.*, 2019; Pacifico *et al.*, 2021), may drastically affect how different environmental conditions pose constraints for plant growth and reproduction, therefore affecting its geographical distribution.

When comparing previous assessments (Campos *et al.*, 2019; Pacifico *et al.*, 2021) with our findings, there is an overall higher relevance of climatic predictors and geographical distance in species turnover for Asteraceae and Microlicieae in CR than Myrtaceae. In that regard, some aspects of these results are more similar to UDp than CR. While this congruence may not be meaningful, it could indicate that the UDp uses a dataset that is similar to the ones used by these previous investigations – which could reflect the use of different approaches in delimiting campos rupestres: While

Pacifico *et al.* (2021) selected all occurrences of Microlicieae due to habitat preferences, Campos *et al.* (2019) selected species with distribution predicted for CR – whereas our study only selected occurrences described as collected within CR. Overall, phytophysiognomies delimitation in the Espinhaço Mountain Range has little congruence in literature. The use of the term “carrascal” or “carrasco” is an illustration of this challenge in the area, as different authors use the term to refer to wildly different phytophysiognomies (Araújo *et al.*, 1999; Harley, 1995). This lack of congruence renders a particular challenge in understanding biodiversity in these areas, as different conclusions concerning biogeographical patterns may not reflect the same study area.

Additionally, analyses evaluating species diversity patterns based in metadata, although extremely relevant, face a series of limitations. Despite adapting methods to reduce sampling bias, uneven sampling effort hinders our knowledge of species distribution. In addition to that, while using collectors’ description to assess vegetation of occurrence maximizes usable records, this type of data does not allow further refinement, as different collectors have different definitions of the same phytophysiognomy. Consequently, the reduced dataset demands wider delimitations of vegetation classes, comprehending a wide array of different ecological structures within one category – as we’ve seen with cerrado. Other constraints include the scale of the analysis, as it is a generalization of a biogeographical pattern – therefore ignoring patterns in finer scale. Also, multiple other factors and environmental variables that could potentially be related to Myrtaceae species turnover were not included in the analysis and it is hard to predict the extent to which beta diversity reflects current ecological preferences and dispersal limitations (Soininen *et al.*, 2007).

## 5. Conclusion

Overall, Myrtaceae species turnover aligned with ecophysiological studies that assessed environmental constraints in different vegetation types of the Espinhaço Mountain Range and did not concur with patterns of species turnover found for other biological groups. Our hypothesis was not supported by our data since models fragmented by different vegetation classes rendered overall congruent results and selected a similar subset of environmental predictors, indicating the higher relevance of edaphic predictors for Myrtaceae across multiple phytophysiognomies. One exception to this overall pattern was pH in CE, the only factor described as limiting for plants establishment that did not explain a large proportion of variance within that dataset.

Despite soil being highlighted as relevant for CR ecology and species physiology, this is the first evidence suggesting the relevance of edaphic predictors on species turnover in campos rupestres. This is also the first investigation of species turnover in CR using animal-dispersed species and the first evidence of a reverse pattern of endemism, whereas campos rupestres appear to be less isolated than forests in the mountain range. These results either indicate (A) that Myrtaceae distinct biology renders a different pattern of species distribution, whereas patterns in beta diversity may be more intrinsically linked to the biological group rather than the environment; or (B) models used to assess species turnover in CR lack congruence when delineating species occurrence and campo rupestre extension – reinforcing the imperative need to improve vegetation delimitation in complex landscapes such as the Espinhaço Mountain Range.

## 6. References

Abreu, P.A.A., 1995. O Supergrupo Espinhaço da Serra do Espinhaço Meridional (Minas Gerais): o rifte, a bacia e o orógeno. Geonomos 3, 1–18. https://doi.org/10.18285/geonomos.v3i1.211

Al-Shammary, A.A.G., Kouzani, A.Z., Kaynak, A., Khoo, S.Y., Norton, M., Gates, W., 2018. Soil bulk density estimation methods: a review. Pedosphere 28, 581–596. https://doi.org/10.1016/S1002-0160(18)60034-7

Amaral, S., Costa, C.B., Arasato, L.S., Ximenes, A.C., Rennó, C.D., 2013. AMBDATA: Variáveis ambientais para modelos de distribuição de espécies (SDMS), in: Simpósio Brasileiro de Sensoriamento Remoto. Foz do Iguaçu, pp. 6930–6937.

Andrade-Lima, D. de, 1981. The Caatingas dominium. Rev. Bras. Bot. 4, 149–153.

Araújo, F.S. de, Martins, F.R., Shepherd, G.J., 1999. Variações estruturais e florísticas do carrasco no planalto da Ibiapaba, estado do Ceará. Rev. Bras. Biol. 59, 663–678. https://doi.org/10.1590/s0034-71081999000400015

Arrouays, D., Grundy, M.G., Hartemink, A.E., Hempel, J.W., Heuvelink, G.B.M., Hong, S.Y., Lagacherie, P., Lelyk, G., McBratney, A.B., McKenzie, N.J., Mendonca-Santos, M. d. L., Minasny, B., Montanarella, L., Odeh, I.O.A., Sanchez, P.A., Thompson, J.A., Zhang, G.L., 2014. GlobalSoilMap. Toward a fine-resolution Global Grid of Soil Properties. Adv. Agron. 125, 93–134. https://doi.org/10.1016/B978-0-12-800137-0.00003-0

Benites, V.M., Schaefer, C.E.G.R., Simas, F.N.B., Santos, H.G., 2007. Soils associated with rock outcrops in the Brazilian mountain ranges Mantiqueira and Espinhaço. Rev. Bras. Bot. 30, 569–577. https://doi.org/10.1590/S0100-84042007000400003

Bueno, M.L., Dexter, K.G., Pennington, R.T., Pontara, V., Neves, D.M., Ratter, J.A., Oliveira-Filho, A.T., 2018. The environmental triangle of the Cerrado Domain: ecological factors driving shifts in tree species composition between forests and savannas. J. Ecol. 106, 2109–2120. https://doi.org/10.1111/1365-2745.12969

Bünger, M. de O., Stehmann, J.R., Oliveira-Filho, A.T., 2014. Myrtaceae throughout the Espinhaço Mountain Range of centraleastern Brazil: floristic relationships and geoclimatic controls. Acta Bot. Brasilica 28, 109–119. https://doi.org/10.1590/S0102-33062014000100011

Caminha-Paiva, D., Negreiros, D., Barbosa, M., Fernandes, G.W., 2021. Functional trait coordination in the ancient and nutrient-impoverished campo rupestre: Soil properties drive stem, leaf and architectural traits. Biol. J. Linn. Soc. 133, 531–545. https://doi.org/10.1093/biolinnean/blaa153

Campos, L., Freire Moro, M., Funk, V.A., Roque, N., 2019. Biogeographical review of Asteraceae in the Espinhaço Mountain Range, Brazil. Bot. Rev. 85, 293–336. https://doi.org/10.1007/s12229-019-09216-9

Campos, L., Guedes, M.L.S., Acevedo-Rodríguez, P., Roque, N., 2017. Contributions to the floristic and vegetation knowledge of Espinhaço Septentrional, Bahia, Brazil. Brazilian J. Bot. 40, 427–437. https://doi.org/10.1007/s40415-016-0347-y

Carmo, F.F., Jacobi, C.M., 2016. Diversity and plant trait-soil relationships among rock outcrops in the Brazilian Atlantic rainforest. Plant Soil 403, 7–20. https://doi.org/10.1007/s11104-015-2735-7

Chemale Jr., F., Dussin, I.A., Martins, M., Santos, M.N. dos, 2011. Nova abordagem tectono-estratigráfica do Supergrupo Espinhaço em sua porção meridional (MG). Geonomos 19, 173–41. https://doi.org/10.18285/geonomos.v19i2.52

Chen, D., Chen, H.W., 2013. Using the Köppen classification to quantify climate variation and change: An example for 1901-2010. Environ. Dev. 6, 69–79. https://doi.org/10.1016/j.envdev.2013.03.007

Coelho, M.S., 2014. Os capões de mata da Cadeia do Espinhaço: padrões e processos ecológicos. Universidade Federal de Minas Gerais, Belo Horizonte, Brazil.

Costa, L.M., Rodrigues, M., 2012. Bird community structure and dynamics in the campos rupestres of southern Espinhaço Range, Brazil: diversity, phenology and conservation. Rev. Bras. Ornitol. 20, 132–147.

Coutinho, L.M., 1990. Fire in the ecology of the Brazilian Cerrado, in: Fire in the Tropical Biota. pp. 82–105. https://doi.org/10.1007/978-3-642-75395-4_6

Coutinho, L.M., 1978. O conceito de cerrado. Rev. Bras. Biol. 1, 17–23.

Echternacht, L., Trovó, M., Oliveira, C.T., Pirani, J.R., 2011. Areas of endemism in the Espinhaço Range in Minas Gerais, Brazil. Flora Morphol. Distrib. Funct. Ecol. Plants 206, 782–791. https://doi.org/10.1016/j.flora.2011.04.003

Faustino, T.C., Machado, C.G., 2006. Frugivoria por aves em uma área de campo rupestre na Chapada Diamantina, BA. Rev. Bras. Ornitol. 14, 137–143.

Fernandez-Going, B.M., Harrison, S.P., Anacker, B.L., Safford, H.D., 2013. Climate interacts with soil to produce beta diversity in Californian plant communities. Ecology 94, 2007–2018. https://doi.org/10.1890/12-2011.1

Ferrier, S., Manion, G., Elith, J., Richardson, K., 2007. Using generalized dissimilarity modelling to analyse and predict patterns of beta diversity in regional biodiversity assessment. Divers. Distrib. 13, 252–264. https://doi.org/10.1111/j.1472-4642.2007.00341.x

Ferrier, S., Watson, G., Pearce, J., Drielsma, M., 2002. Extended statistical approaches to modelling spatial pattern in biodiversity in northeast New South Wales. II. Community-level modelling. Biodivers. Conserv. 11, 2309–2338. https://doi.org/https://doi.org/10.1023/A:1021374009951

Fick, S.E., Hijmans, R.J., 2017. WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. Int. J. Climatol. 37, 4302–4315. https://doi.org/10.1002/joc.5086

Fitzpatrick, M.C., Mokany, K., Manion, G., Lisk, M., Ferrier, S., Nieto-lugilde, D., 2021. Package “gdm.”

Gaston, K.J., 2000. Global patterns in biodiversity. Nature 405, 220–227. https://doi.org/10.1038/35012228

Giulietti, A.M., Menezes, N.L. de, Pirani, J.R., Meguro, M., Wanderley, M. das G.L., 1987. Flora da Serra do Cipó, Minas Gerais: caracterização e lista das espécies. Bol. Botânica da Univ. São Paulo. https://doi.org/10.11606/issn.2316-9052.v9i0p1-

151

Giulietti, A.M., Pirani, J.R., 1988. Patterns of geographic distribution of some plant species from the Espinhaço Range, Minas Gerais and Bahia, Brazil, in: Vanzolini, P.E., Heyer, W.R. (Eds.), Proceedings of a Workshop on Neotropical Distribution Patterns. Academia Brasileira de Ciências, Rio de Janeiro, pp. 39–69.

Gomes, J.P., Stedille, L.I.B., Milani, J.E. de F., Montibeller-Silva, K., da Costa, N.C.F., Gatiboni, L.C., Mantovani, A., Bortoluzzi, R.L. da C., 2020. Edaphic filters as abiotic drivers of Myrtaceae assemblages in subtropical Araucaria Forest. Plant Soil 454, 187–206. https://doi.org/10.1007/s11104-020-04645-7

Gotelli, N.J., Ellison, A.M., 2011. Princípios de Estatística em Ecologia, 1st ed. Artmed, Porto Alegre.

Guerra, T.J., Carstensen, D.W., Morel*lato*, L.P.C., Silveira, F.A.O., Costa, F. V., 2016. Mutualistic interactions among free-living species in rupestrian grasslands. Ecol. Conserv. Mt. Grasslands Brazil 1–567. https://doi.org/10.1007/978-3-319-29808-5

Haridasan, M., 2008. Nutritional adaptations of native plants of the cerrado biome in acid soils. Brazilian J. Plant Physiol. 20, 183–195. https://doi.org/10.1590/s1677-04202008000300003

Harley, R.M., 1995. Introduction, in: Stannard, B.L. (Ed.), Flora of the Pico Das Almas. Kew, Royal Botanic Gardens, pp. 1–37.

Harley, R.M., Simmons, N.A., 1986. Florula of Mucugê, Chapada Diamantina, Bahia, Brazil: a descriptive check-list of a campo rupestre area, 1st ed. Royal Botanical Gardens.

Hengl, T., De Jesus, J.M., Heuvelink, G.B.M., Gonzalez, M.R., Kilibarda, M., Blagotić, A., Shangguan, W., Wright, M.N., Geng, X., Bauer-Marschallinger, B., Guevara, M.A., Vargas, R., MacMillan, R.A., Batjes, N.H., Leenaars, J.G.B., Ribeiro, E., Wheeler, I., Mantel, S., Kempen, B., 2017. SoilGrids250m: Global gridded soil information based on machine learning, PLoS ONE. https://doi.org/10.1371/journal.pone.0169748

Heuscher, S.A., Brandt, C.C., Jardine, P.M., 2005. Using soil physical and chemical properties to estimate bulk density. Soil Sci. Soc. Am. J. 69, 51–56. https://doi.org/10.2136/sssaj2005.0051a

Lambers, H., Chapin, F.S., Pons, T.L., 2008a. Mineral nutrition, in: Lambers, H., Chapin, F.S., Pons, T.L. (Eds.), Plant Physiological Ecology. Springer, Crawley, WA, pp. 255–320. https://doi.org/10.1007/978-3-030-29639-1

Lambers, H., Chapin, F.S., Pons, T.L., 2008b. Plant water relations, in: Lambers, H., Chapin, F.S., Pons, T.L. (Eds.), Plant Physiological Ecology. Springer, Crawley, WA, pp. 163–223. https://doi.org/10.1007/978-3-030-29639-1

Leathwick, J.R., Elith, J., Hastie, T., 2006. Comparative performance of generalized additive models and multivariate adaptive regression splines for statistical modelling of species distributions. Ecol. Modell. 199, 188–196. https://doi.org/10.1016/j.ecolmodel.2006.05.022

Lin, G., Stralberg, D., Gong, G., Huang, Z., Ye, W., Wu, L., 2013. Separating the effects of environment and space on tree species distribution: From Population to Community. PLoS One 8. https://doi.org/10.1371/journal.pone.0056171

Lopes, A.S., Cox, F.R., 1977. A survey of the fertility status of surface soils under “Cerrado” vegetation in Brazil. Soil Sci. Soc. Am. J. 41, 742–747. https://doi.org/10.2136/sssaj1977.03615995004100040026x

Lucresia, L., Stadnik, A., Campos, L., Roque, N., 2021. Myrtaceae floristic survey and vegetation distribution in a central portion of Chapada Diamantina, Brazil. Phytotaxa 498, 71–86. https://doi.org/10.11646/phytotaxa.498.2.1

Negreiros, D., Le Stradic, S., Fernandes, G.W., Rennó, H.C., 2014. CSR analysis of plant functional types in highly diverse tropical grasslands of harsh environments. Plant Ecol. 215, 379–388. https://doi.org/10.1007/s11258-014-0302-6

Neves, D.M., Dexter, K.G., Pennington, R.T., Bueno, M.L., Miranda, P.L.S. de, Oliveira-Filho, A.T., 2018. Lack of floristic identity in campos rupestres — A hyperdiverse mosaic of rocky montane savannas in South America. Flora Morphol. Distrib. Funct. Ecol. Plants 238, 24–31. https://doi.org/10.1016/j.flora.2017.03.011

Neves, D.M., Dexter, K.G., Pennington, R.T., Bueno, M.L., Oliveira Filho, A.T., 2015. Environmental and historical controls of floristic composition across the South American Dry Diagonal. J. Biogeogr. 42, 1566–1576. https://doi.org/10.1111/jbi.12529

Nóbrega, M.A. da, Vilas Boas, A.M., 2020. Soil/Phytofisionomy Relationship in Southeast of Chapada Diamantina, Bahia, Brazil. Int. J. Geol. Environ. Eng. 14, 348–356.

O’Grady, K.E., 1982. Measures of explained variance: cautions and limitations.

Psychol. Bull. 92, 766–777. https://doi.org/10.1037/0033-2909.92.3.766

Pacifico, R., Almeda, F., Fidanza, K., 2021. Modeling of Microlicieae (Melastomataceae) species composition provides insights into the evolution of campo rupestre vegetation on eastern Brazilian mountaintops. Flora Morphol. Distrib. Funct. Ecol. Plants 281. https://doi.org/10.1016/j.flora.2021.151850

Perrigo, A., Hoorn, C., Antonelli, A., 2020. Why mountains matter for biodiversity. J. Biogeogr. 47, 315–325. https://doi.org/10.1111/jbi.13731

Pirani, J.R., Mello-Silva, R. de, Giulietti, A.M., 2003. Flora de Grão-Mogol, Minas Gerais, Brasil. Bol. Botânica da Univ. São Paulo 21, 1–24. https://doi.org/10.11606/issn.2316-9052.v21i1p1-24

Purificação, K.N., Pascotto, M.C., Pedroni, F., Pereira, J.M.N., Lima, N.A., 2014. Interactions between frugivorous birds and plants in savanna and forest formations of the Cerrado. Biota Neotrop. 14. https://doi.org/10.1590/1676-06032014006814

Quesada, C.A., Miranda, A.C., Hodnett, M.G., Santos, A.J.B., Miranda, H.S., Breyer, L.M., 2004. Seasonal and depth variation of soil moisture in a burned open savanna (campo sujo) in central Brazil. Ecol. Appl. 14, 33–41. https://doi.org/10.1890/01-6017

Rahbek, C., Borregaard, M.K., Antonelli, A., Colwell, R.K., Holt, B.G., Nogues-Bravo, D., Rasmussen, C.M.Ø., Richardson, K., Rosing, M.T., Whittaker, R.J., Fjeldså, J., 2019a. Building mountain biodiversity: geological and evolutionary processes. Science (80-. ). 365, 1114–1119. https://doi.org/10.1126/science.aax0151

Rahbek, C., Borregaard, M.K., Colwell, R.K., Dalsgaard, B., Holt, B.G., Morueta-Holme, N., Nogues-Bravo, D., Whittaker, R.J., Fjeldså, J., 2019b. Humboldt's enigma: what causes global patterns of mountain biodiversity? Science (80-. ). 365, 1108–1113. https://doi.org/10.1126/science.aax0149

Rapini, A., Ribeiro, P.L., Lambert, S., Pirani, J.R., 2008. A flora dos campos rupestres da Cadeia do Espinhaço. Megadiversidade 4, 16–24.

Robertson, G.P., Sollins, P., Ellis, B.G., Lajtha, K., 1999. Exchangeable ions, pH, and cation exchange capacity, in: Robertson, G.P., Coleman, D.C., Bledsoe, C.S., Sollins, P. (Eds.), Standard Soil Methods for Long-Term Ecological Research. Oxford University Press, Oxford, pp. 106–114.

Ruggiero, P.G.C., Batalha, M.A., Pivello, V.R., Meirelles, S.T., 2002. Soil-vegetation relationships in cerrado (Brazilian savanna) and semideciduous forest, Southeastern Brazil. Plant Ecol. 160, 1–16. https://doi.org/10.1023/A:1015819219386

Saadi, A., 1995. A geomorfologia da Serra do Espinhaço em Minas Gerais e de suas margens. Geonomos 3, 41–63. https://doi.org/10.18285/geonomos.v3i1.215

Safford, H.D., 1999. Brazilian Páramos I. An introduction to the physical environment and vegetation of the campos de altitude. J. Biogeogr. 26, 693–712.

Saiter, F.Z., Eisenlohr, P. V., França, G.S., Stehmann, J.R., Thomas, W.W., De Oliveira-Filho, A.T., 2015. Floristic units and their predictors unveiled in part of the Atlantic Forest hotspot: implications for conservation planning. An. Acad. Bras. Cienc. 87, 2031–2046. https://doi.org/10.1590/0001-3765201520140132

Sankaran, M., Hanan, N.P., Scholes, R.J., Ratnam, J., Augustine, D.J., Cade, B.S., Gignoux, J., Higgins, S.I., Le Roux, X., Ludwig, F., Ardo, J., Banyikwa, F., Bronn, A., Bucini, G., Caylor, K.K., Coughenour, M.B., Diouf, A., Ekaya, W., Feral, C.J., February, E.C., Frost, P.G.H., Hiernaux, P., Hrabar, H., Metzger, K.L., Prins, H.H.T., Ringrose, S., Sea, W., Tews, J., Worden, J., Zambatis, N., 2005. Determinants of woody cover in African savannas. Nature 438, 846–849. https://doi.org/10.1038/nature04070

Santos, M.F., Sano, P.T., 2012. Flora fanerogâmica da Serra do Ouro Branco, Minas Gerais: Myrtaceae. Rodriguésia 63, 1065–1083. https://doi.org/https://doi.org/10.1590/S2175-78602012000400019

Santos, M.F., Serafim, H., Sano, P.T., 2012. Composição e estrutura arbórea em floresta estacional semidecidual no Espinhaço Meridional (Serra do Cipó, MG). Rodriguésia 63, 985–997. https://doi.org/https://doi.org/10.1590/S2175-78602012000400015

Scarano, F.R., 2002. Structure, function and floristic relationships of plant communities in stressful habitats marginal to the Brazilian Atlantic rainforest. Ann. Bot. 90, 517–524. https://doi.org/10.1093/aob/mcf189

Schobbenhaus, C., 1996. As tafrogêneses superpostas Espinhaço e Santo Onofre, estado da Bahia: revisão e novas propostas. Rev. Bras. Geociências 26, 265–276. https://doi.org/10.25249/0375-7536.19964265276

Silveira, F.A.O., Negreiros, D., Barbosa, N.P.U., Buisson, E., Carmo, F.F. do, Carstensen, D.W., Conceição, A.A., Cornelissen, T.G., Echternacht, L., Fernandes, G.W., Garcia, Q.S., Guerra, T.J., Jacobi, C.M., Lemos-Filho, J.P., Le Stradic, S., Morel*lato*, L.P.C., Neves, F.S., Oliveira, R.S., Schaefer, C.E., Viana, P.L., Lambers, H., 2016. Ecology and evolution of plant diversity in the endangered campo rupestre: a neglected conservation priority. Plant Soil 403, 129–152. https://doi.org/10.1007/s11104-015-2637-8

Soininen, J., Lennon, J.J., Hillebrand, H., 2007. A multivariate analysis of beta diversity across organisms and environments. Ecology 88, 2830–2838. https://doi.org/10.1890/06-1730.1

Souza, J.A.R., Moreira, D.A., Salomão, L.C., Cunha, F.F., Pedroso, R.S., Silva, E.L., Gonçalves, J.M., Rezende, J.G.F., Costa, J.V.C., Filho, J.F.S., 2018. Wet bulb dimensions associated with different flow and terrain declivity. African J. Agric. Res. 13, 425–431. https://doi.org/10.5897/ajar2015.9941

Staggemeier, V.G., Cazetta, E., Morel*lato*, L.P.C., 2017. Hyperdominance in fruit production in the Brazilian Atlantic rain forest: the functional role of plants in sustaining frugivores. Biotropica 49, 71–82. https://doi.org/10.1111/btp.12358

Stirzaker, R.J., Passioura, J.B., Wilms, Y., 1996. Soil structure and plant growth: Impact of bulk density and biopores. Plant Soil 185, 151–162. https://doi.org/10.1007/BF02257571

Terra, M. de C.N.S., Santos, R.M. dos, Prado Júnior, J.A. do, Mello, J.M. de, Scolforo, J.R.S., Fontes, M.A.L., Schiavini, I., Reis, A.A. dos, Bueno, I.T., Magnago, L.F.S., Steege, H. ter, 2018. Water availability drives gradients of tree diversity, structure and functional traits in the Atlantic-Cerrado-Caatinga transition, Brazil. J. Plant Ecol. 11, 803–814. https://doi.org/10.1093/jpe/rty017

Thiers, B., 2020. Index Herbariorum [WWW Document]. New York Bot. Gard. Virtual Herb. URL http://sweetgum.nybg.org/ih/ (accessed 7.9.20).

Verdi, M., Pougy, N., Martins, E., Martinelli, G., 2015. A Serra do Espinhaço Meridional, in: Plano de Ação Nacional Para a Conservação Da Flora Ameaçada de Extinção Da Serra Do Espinhaço Meridional. pp. 19–31.

Versieux, L. de M., Medeiros, M.C.M.P. de, Spósito, T.C.S., Stehmann, J.R., 2011. Characterization of the tree component in a semideciduous forest in the Espinhaço Range: A subsidy to conservation. Rev. Caatinga 24, 85–94.

Zappi, D.C., Lucas, E., Stannard, B.L., Nic Lughadha, E., Pirani, J.R., Queiroz, L.P. de, Atkins, S., Hind, D.J.N., Giulietti, A.M., Harley, R.M., Carvalho, A.M. de, 2003.

Lista das plantas vasculares de Catolés, Chapada Diamantina, Bahia, Brasil. Bol. Botânica da Univ. São Paulo. https://doi.org/10.11606/issn.2316-9052.v21i2p345-398

Zemunik, G., Turner, B.L., Lambers, H., Laliberté, E., 2016. Increasing plant species diversity and extreme species turnover accompany declining soil fertility along a long-term chronosequence in a biodiversity hotspot. J. Ecol. 104, 792–805. https://doi.org/10.1111/1365-2745.12546

## 7. Tables and Figures

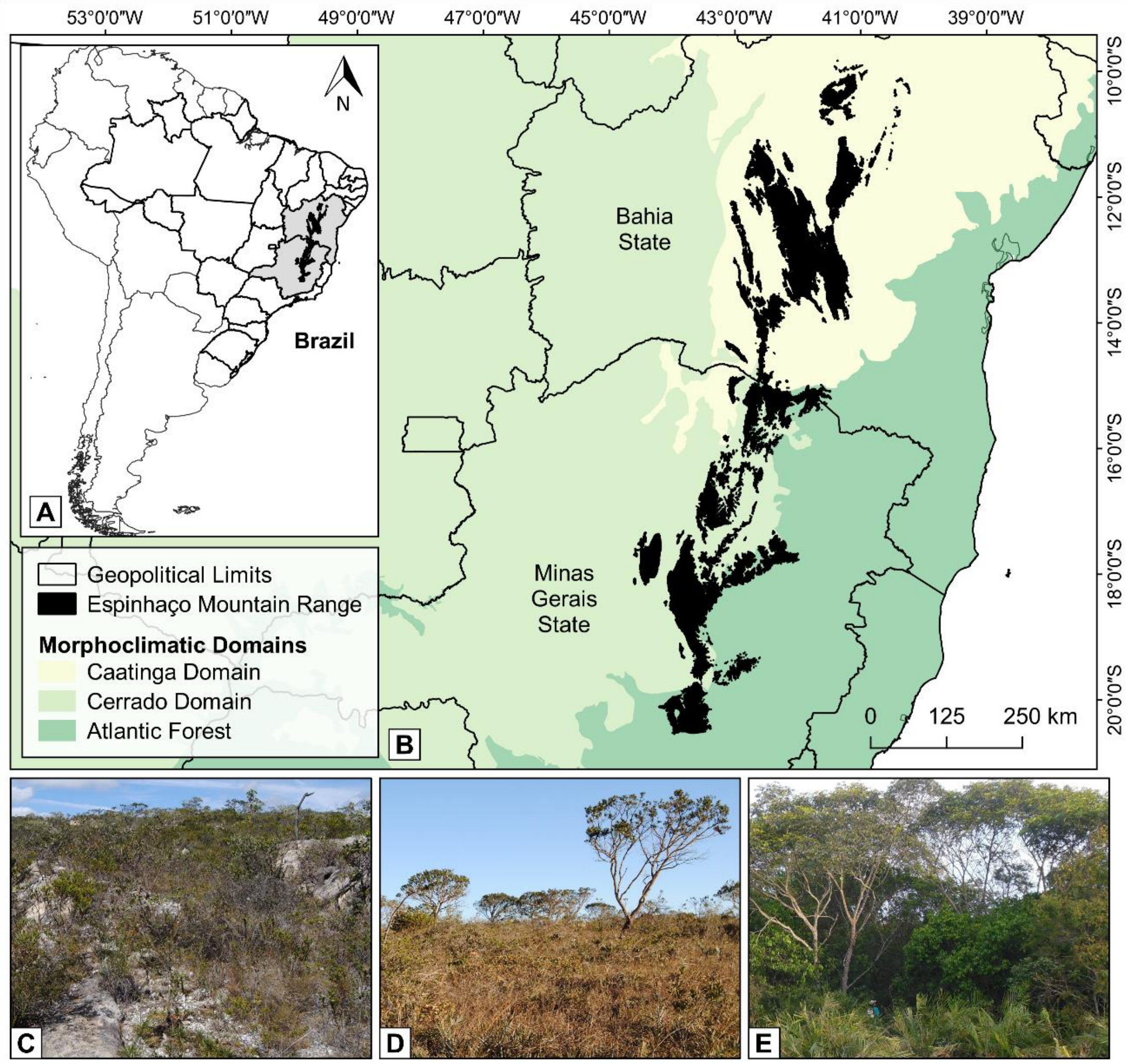

Figure 1. Location of the study area (in black) and the morphoclimatic domains from IBGE (2019). Vegetation types targeted in this study: campo rupestre (C); cerrado (D); forests (E).

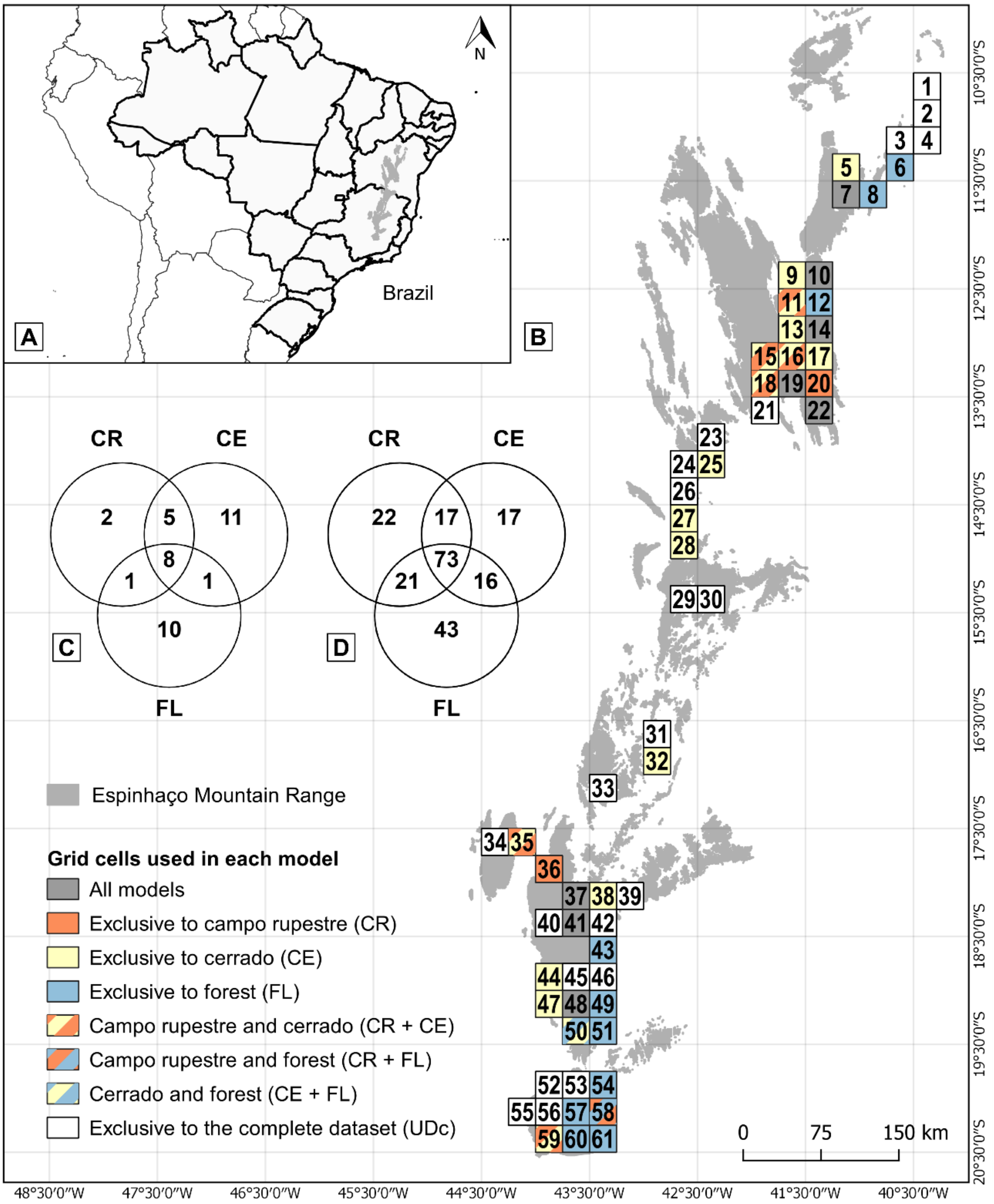

Figure 2. A. Location of the Espinhaço range. B. distribution of the grid cells included in each model; C. number of grid cells shared by fragmented models; and D. number of species shared by fragmented models.

Table 1. Environmental predictors included in the models and the percentage of variance explained by each of them in the four models constructed. Asterisks (*) indicates predictors that were manually included in each model but were dropped by

backward elimination. Environmental data sources: [1] Fick & Hijmans (2017); [2] Hengl *et al.* (2017); [3] Amaral *et al.* (2013).

| **Class** | **Predictor** | **Constructed Models** | | | | |
|---|---|---|---|---|---|---|
| | | **UDc** | **UDp** | **CR** | **CE** | **FL** |
| Climate – Precipitation | Precipitation of coldest quarter[1] | 8.40 | | | | |
| | Precipitation seasonality[1] | | 6.80 | 3.27 | 2.73 | 6.25 |
| Climate – Temperature | Annual mean temperature[1] | 0.18 | 2.15 | | | |
| | Maximum temperature of warmest month[1] | | | 1.09 | * | 0.00 |
| | Mean diurnal temperature range[1] | 0.58 | * | * | * | 1.62 |
| | Temperature annual range[1] | * | 1.18 | 1.51 | * | * |
| Depth to Bedrock | Absolute depth to bedrock[2] | 0.13 | 2.95 | 0.35 | 0.87 | 0.70 |
| Geographical Distance | Geographical distance | 21.62 | 11.32 | 0.00 | 7.01 | 5.03 |
| Soil Chemical Components | Cation exchange capacity of soil for 1m depth[2] | * | * | 2.38 | * | * |
| | Soil organic carbon content for 0m depth[2] | | | 14.91 | 10.80 | |
| | Soil organic carbon content for 1m depth[2] | * | * | * | 3.49 | 1.32 |
| | Soil pH for 0m depth[2] | | | 20.54 | | |
| | Soil pH for 1m depth[2] | 4.57 | 4.82 | | 4.34 | 14.99 |
| Soil Physical Components | Bulk density for 0m depth[2] | 0.37 | 22.59 | | | 2.77 |
| | Clay content for 0m depth[2] | 3.63 | | | 7.15 | |
| | Clay content for 1m depth[2] | | 7.54 | 14.95 | | 13.46 |
| | Coarse fragments volumetric for 1m depth[2] | 0.47 | 1.35 | * | * | * |
| | Silt content for 0m depth[2] | * | | 0.35 | 1.82 | * |
| | Silt content for 1m depth[2] | | 2.42 | | | |
| Terrain | Declivity[3] | 0.00 | 0.51 | 4.89 | 0.89 | 0.00 |
| | % of unexplained deviance | 59.56 | 36.38 | 35.75 | 60.90 | 53.84 |

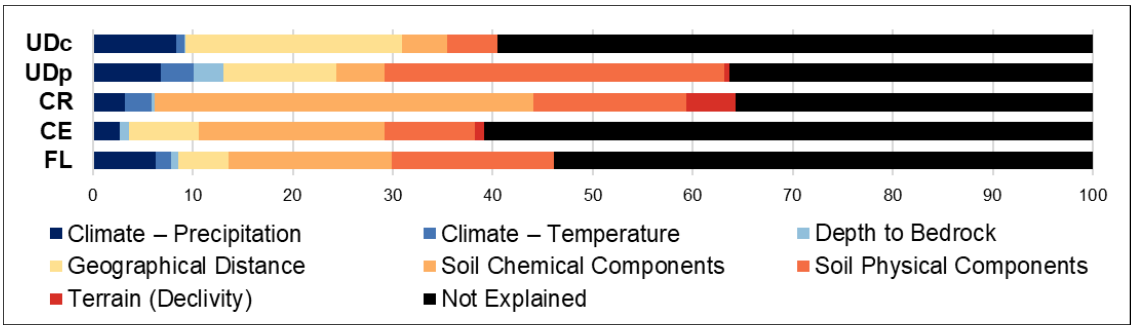

Figure 3. Comparison of the proportion of deviance explained by each class of predictor included in the GDM in each of the models.

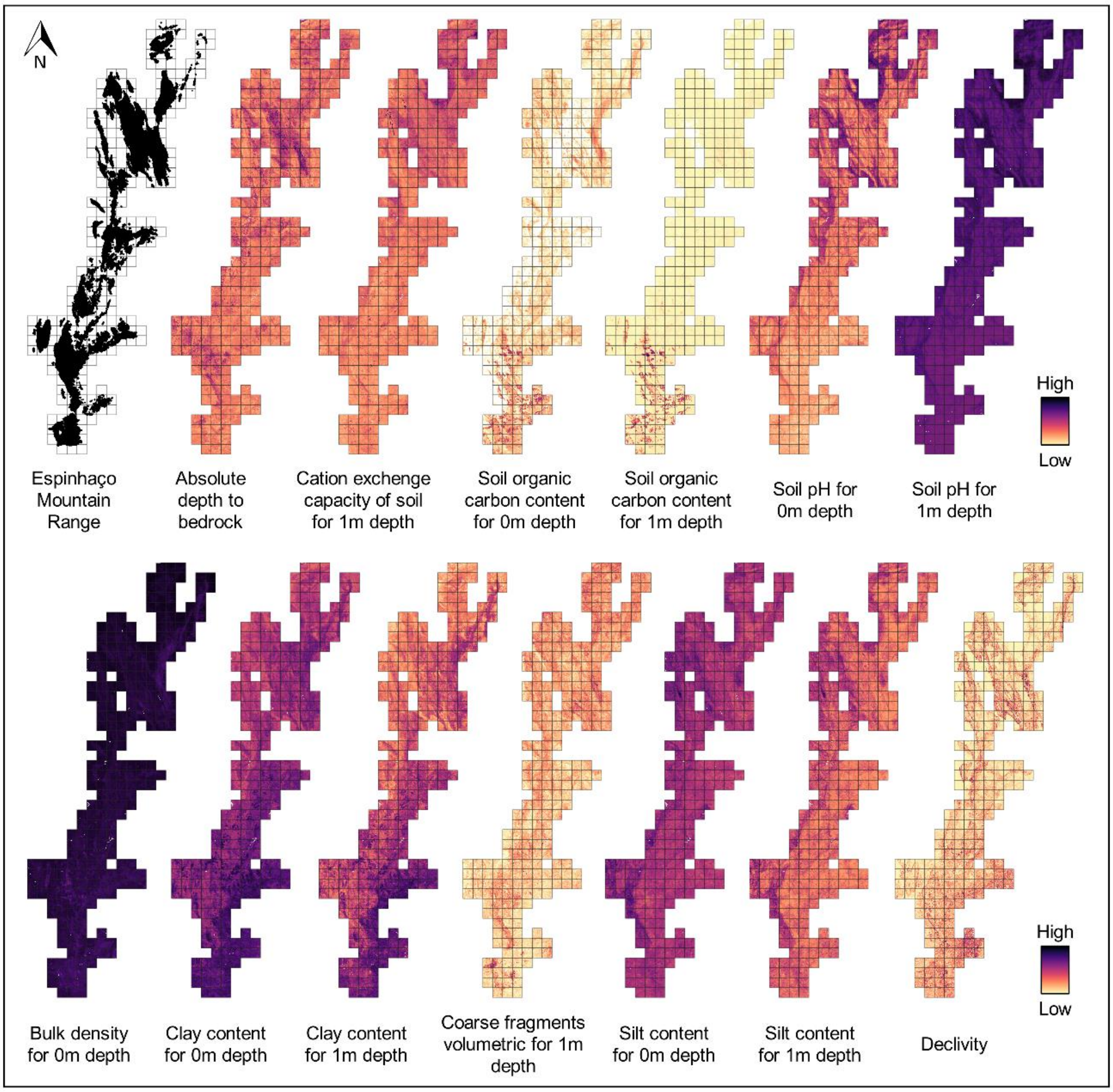

Figure 4. Outline of the Espinhaço Mountain Range – highlighted grid cells included in at least one model; and environmental predictors related to soil.

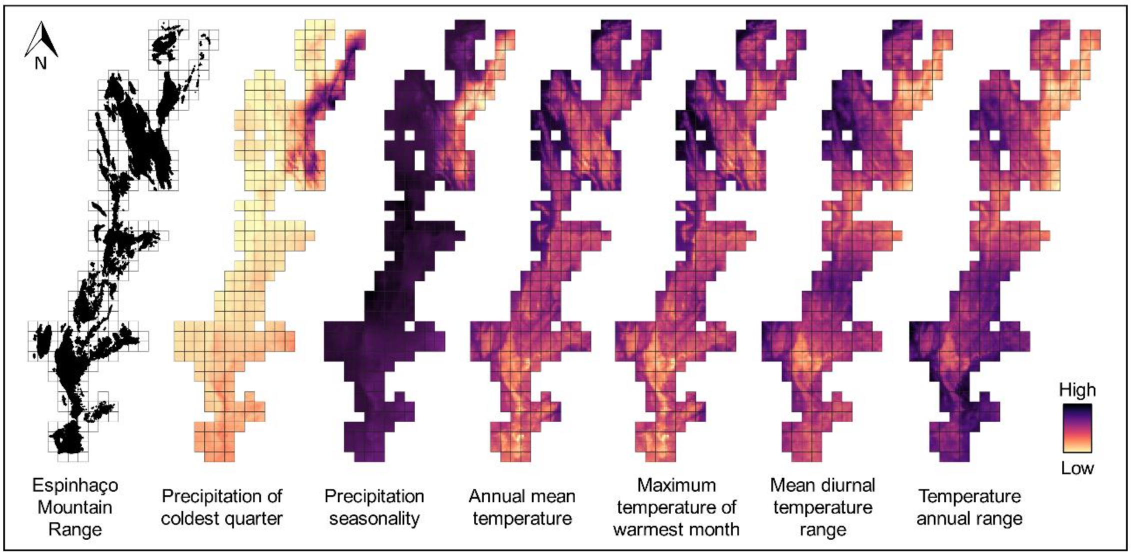

Figure 5. Outline of the Espinhaço Mountain Range – highlighted grid cells included in at least one model; and environmental predictors related to precipitation and temperature.

## Supplementary Material

Table S1. Complete set of environmental predictors

| Code | Environmental Variables | Category |
|---|---|---|
| clim1 | Annual mean temperature | Temperature |
| clim2 | Mean diurnal range | |
| clim3 | Isothermality | |
| clim4 | Temperature seasonality | |
| clim5 | Maximum temperature of warmest month | |
| clim6 | Minimum temperature of coldest month | |
| clim7 | Temperature annual range | |
| clim8 | Mean temperature of wettest quarter | |
| clim9 | Mean temperature of driest quarter | |
| clim10 | Mean temperature of warmest quarter | |
| clim11 | Mean temperature of coldest quarter | |
| clim12 | Annual precipitation | Precipitation |
| clim13 | Precipitation of wettest month | |
| clim14 | Precipitation of driest month | |
| clim15 | Precipitation seasonality | |

| | | |
|---|---|---|
| clim16 | Precipitation of wettest quarter | |
| clim17 | Precipitation of driest quarter | |
| clim18 | Precipitation of warmest quarter | |
| clim19 | Precipitation of coldest quarter | |
| ped1 | Elevation | Geomorphology |
| ped2 | Declivity | |
| ped3 | Absolute depth to bedrock | |
| ped4 | Bulk density (fine earth) for 0m depth | Physical Soil |
| ped5 | Bulk density (fine earth) for 1m depth | |
| ped6 | Cation exchange capacity of soil for 0m depth | Chemical Soil |
| ped7 | Cation exchange capacity of soil for 1m depth | |
| ped8 | Coarse fragments volumetric for 0m depth | Physical Soil |
| ped9 | Coarse fragments volumetric for 1m depth | |
| ped10 | Clay content mass fraction for 0m depth | |
| ped11 | Clay content mass fraction for 1m depth | |
| ped12 | Soil organic carbon stock for 0m depth | Chemical Soil |
| ped13 | Soil organic carbon stock for 1m depth | |
| ped14 | Soil pH in $H_20$ for 0m depth | |
| ped15 | Soil pH in $H_20$ for 1m depth | |
| ped16 | Sand content mass fraction for 0m depth | Physical Soil |
| ped17 | Sand content mass fraction for 1m depth | |
| ped18 | Silt content mass fraction for 0m depth | |
| ped19 | Silt content mass fraction for 1m depth | |
| ped20 | Soil organic carbon content for 0m depth | Chemical Soil |
| ped21 | Soil organic carbon content for 1m depth | |

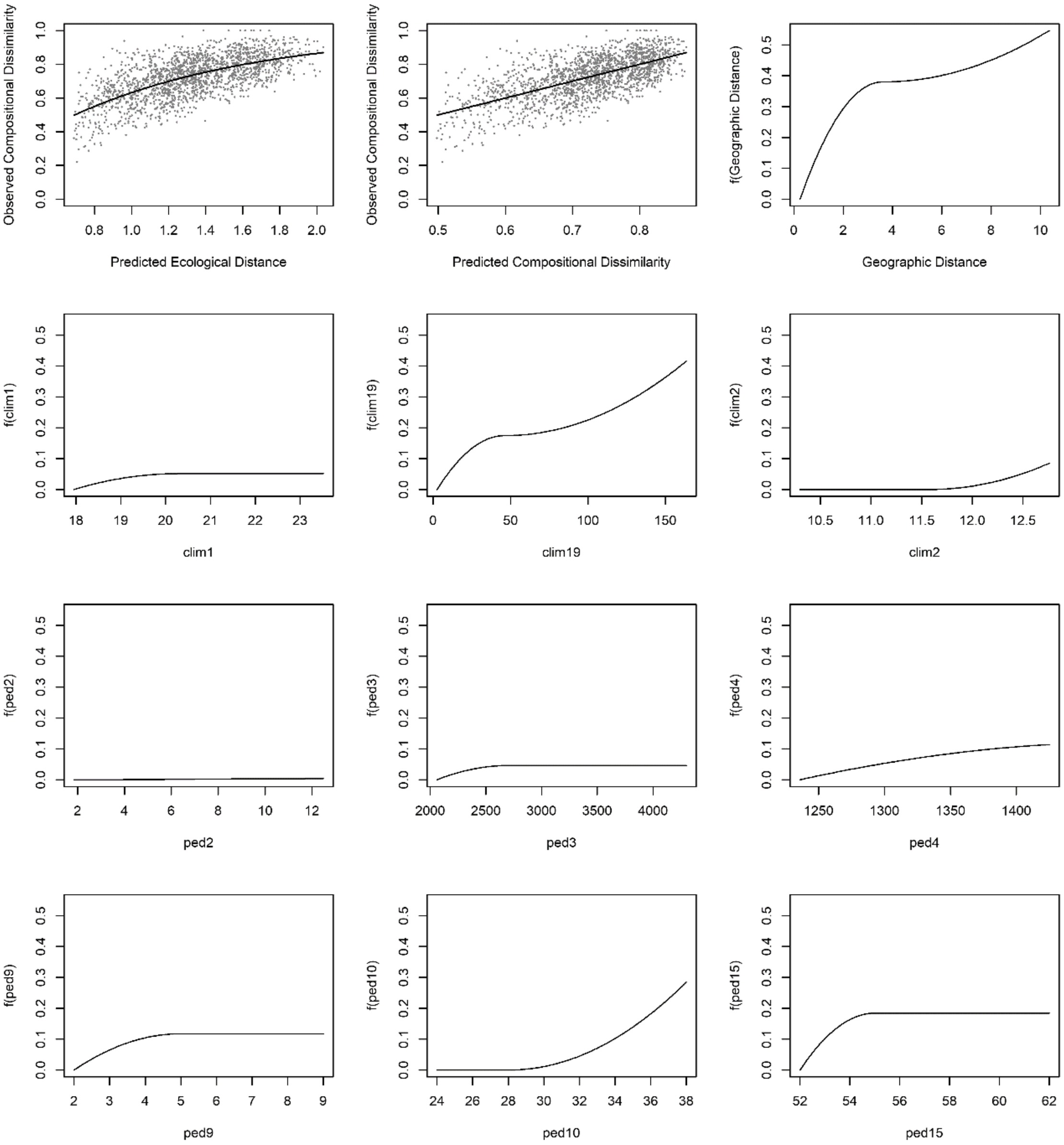

Figure S1. Complete unfragmented dataset (UDc) diagnostic graphics and relationship between relevant predictors and species turnover.

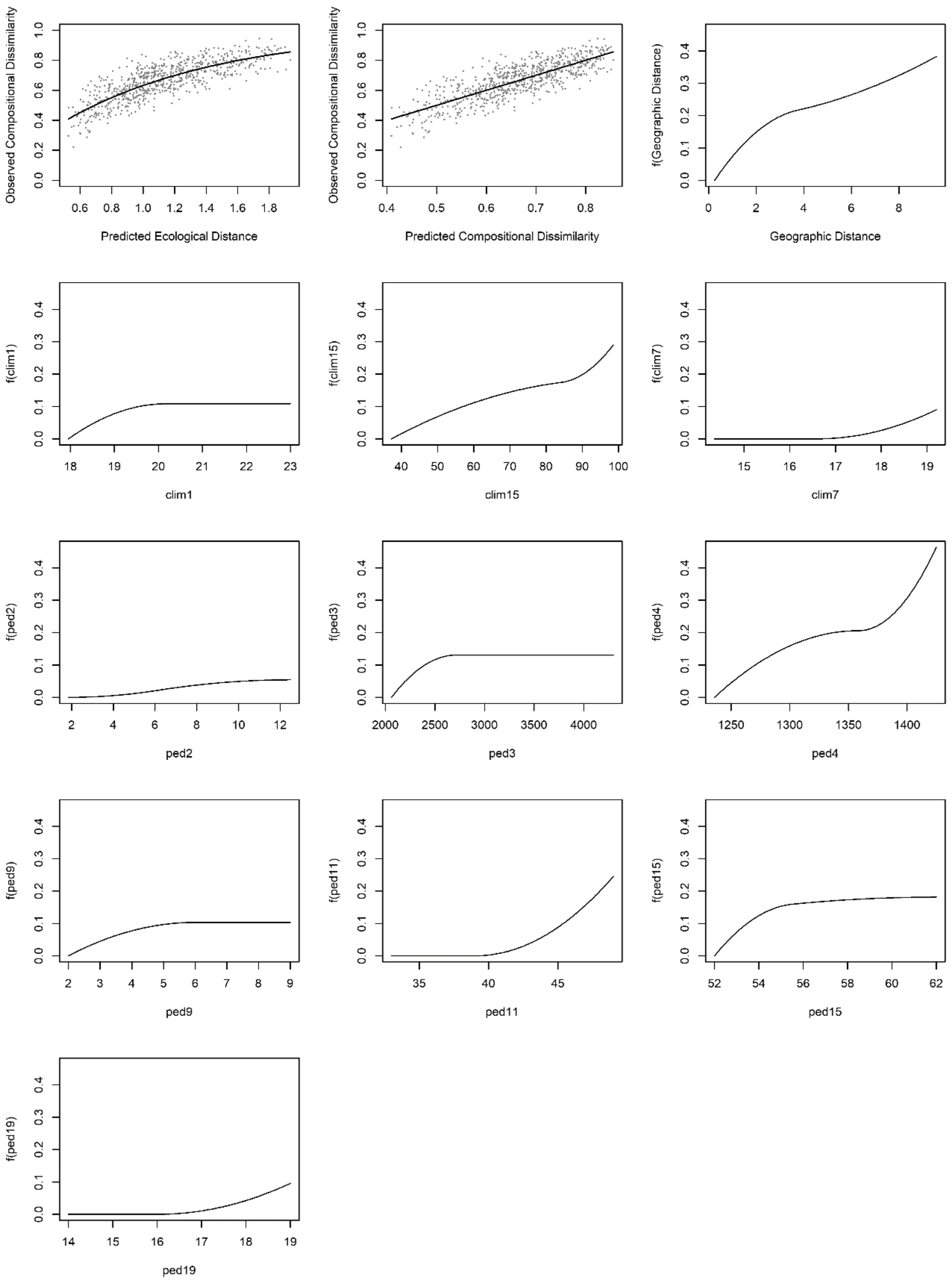

Figure S2. Partial unfragmented dataset (UDp) diagnostic graphics and relationship between relevant predictors and species turnover.

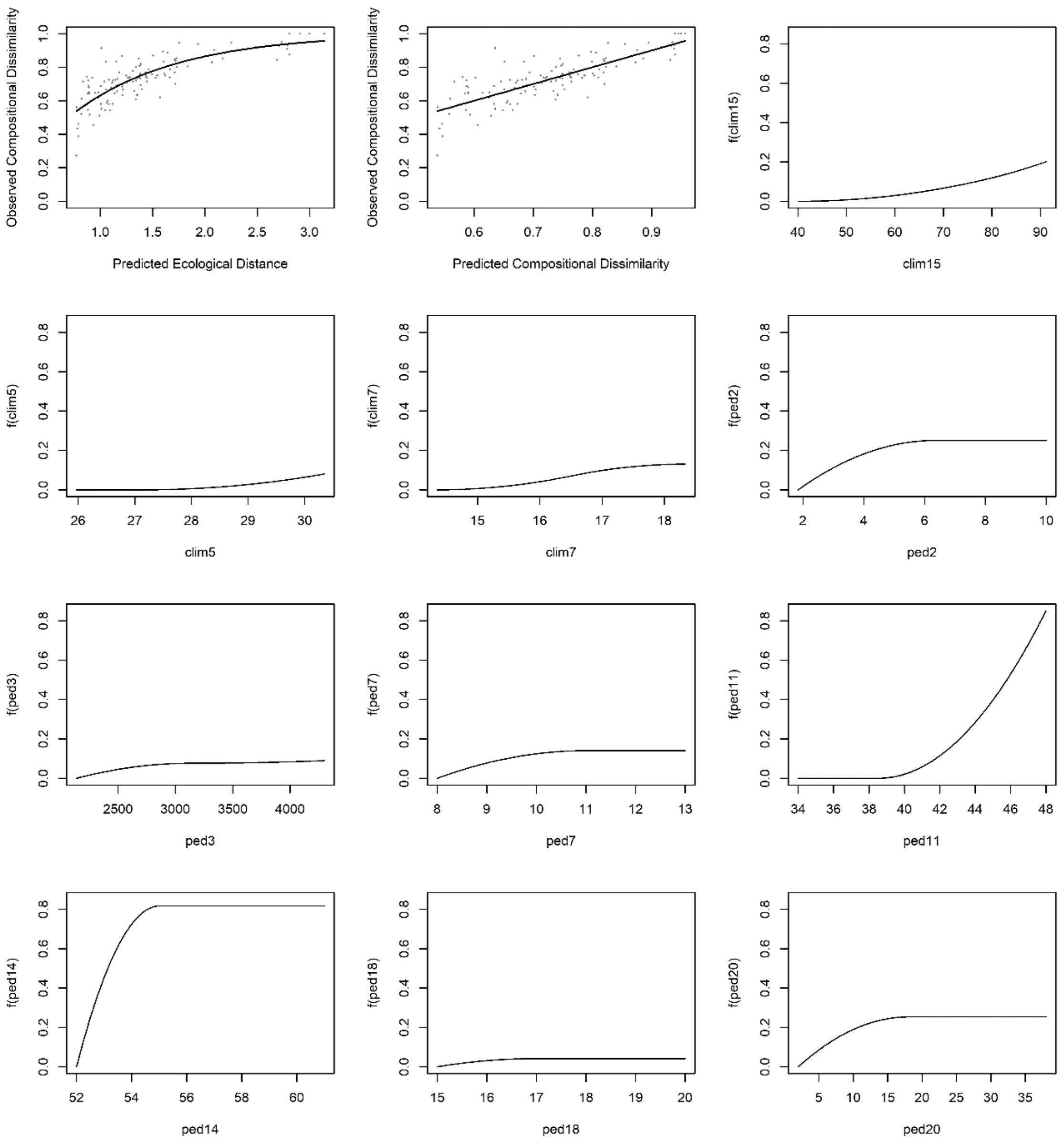

Figure S3. Campo rupestre (CR) dataset diagnostic graphics and relation between relevant predictors and species turnover.

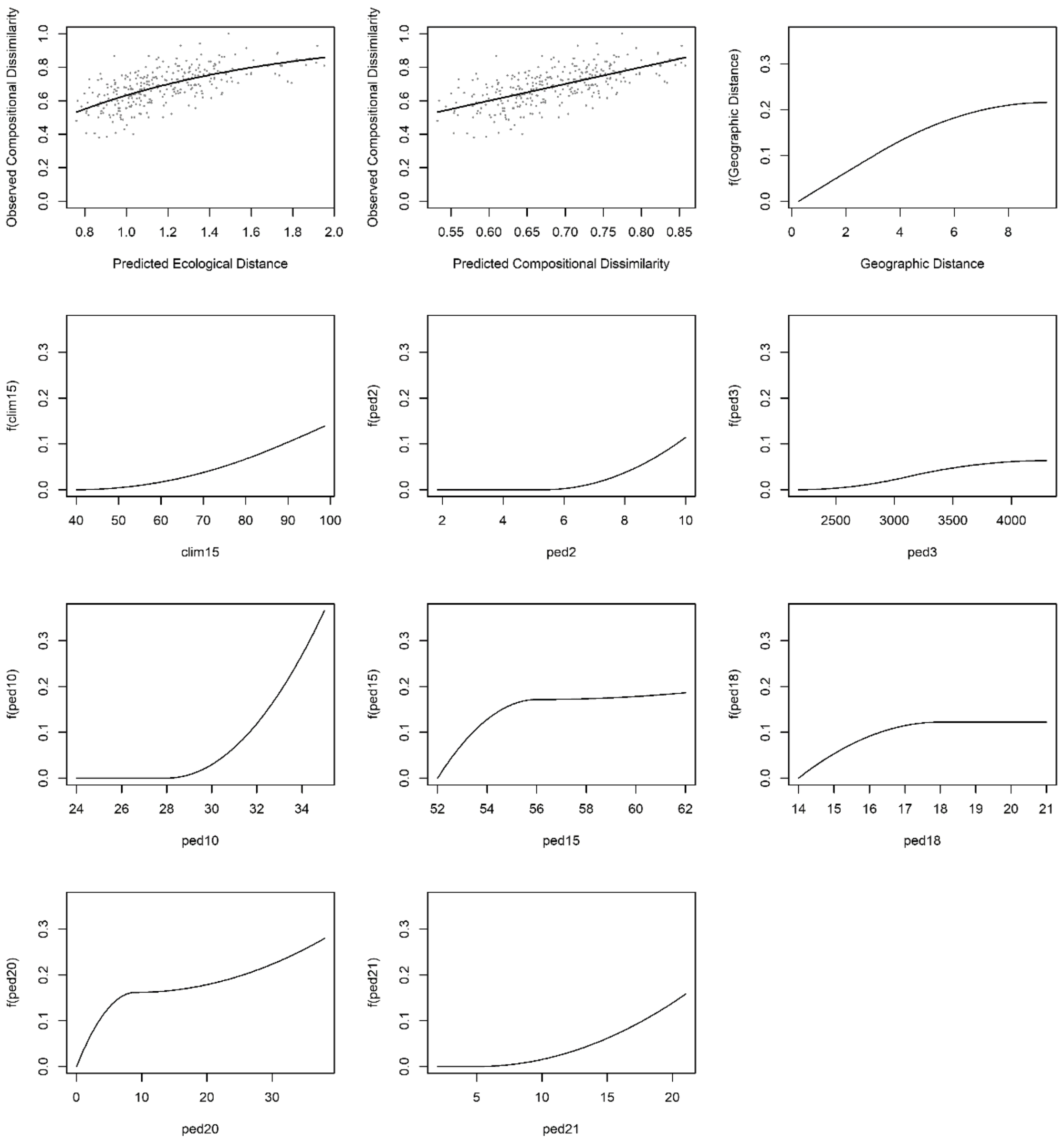

Figure S4. Cerrado (CE) dataset diagnostic graphics and relation between relevant predictors and species turnover.

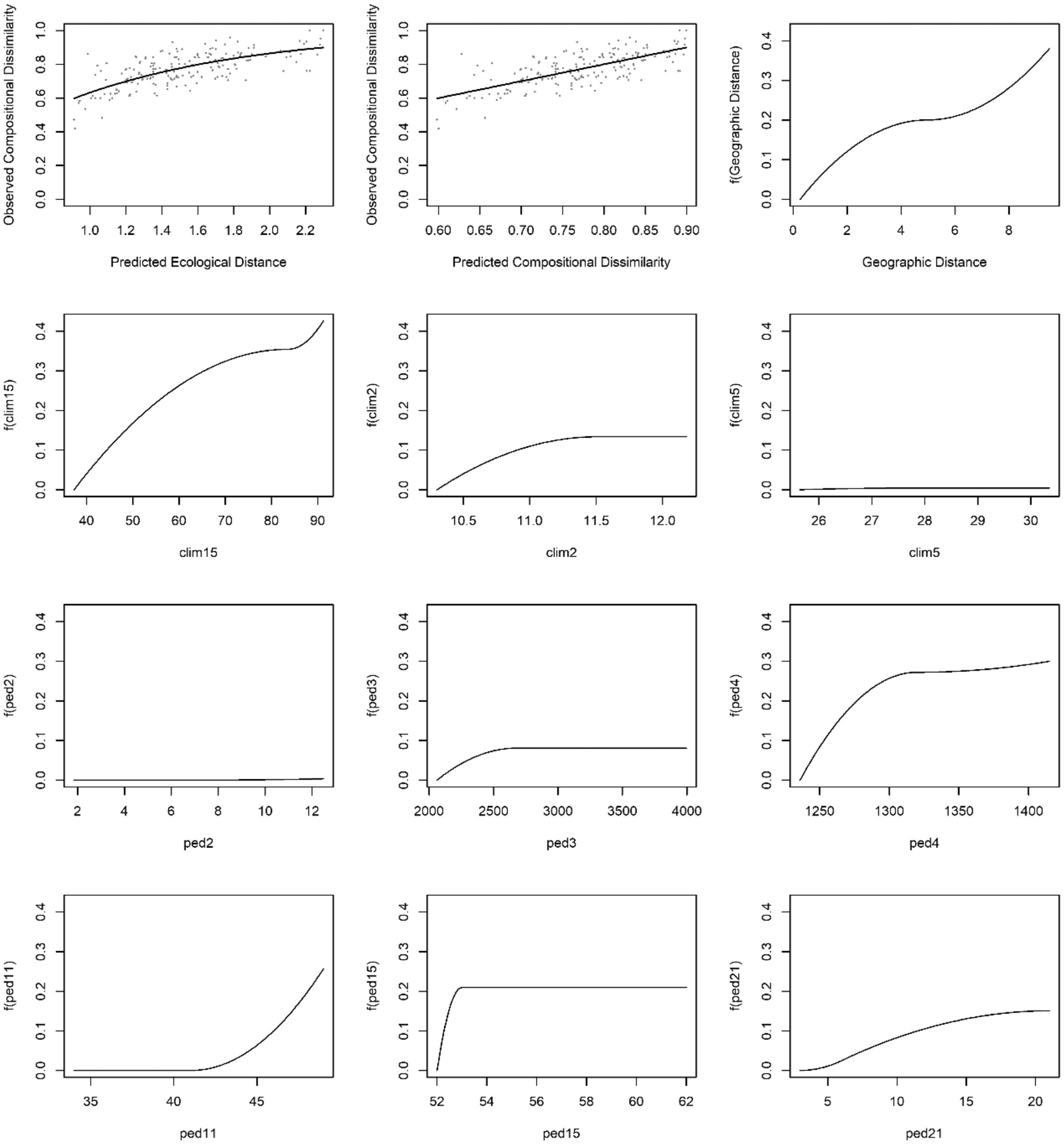

Figure S5. Forest (FL) dataset diagnostic graphics and relation between relevant predictors and species turnover.

## General Conclusions

The present work contributed with the knowledge of Myrtaceae species distribution in the Espinhaço Mountain Range (EMR) by refining and exploring historical data. Combining multiple sources of information and analyzing the full extension of the mountain range allowed a better comprehension of large-scale endemism and distribution patterns: While previous investigations described Myrtaceae as an endemic group in the EMR, according to the dataset most species are also distributed in the adjacent morphoclimatic domains, especially the Atlantic Rainforest. These results not only contributed to the biodiversity knowledge in the EMR, but also sparked new questions for future investigations regarding the uneven distribution of endemism within Myrtaceae clades.

Previously surveyed areas presented the highest number of records and species, reinforcing that local floristic surveys are essential towards building a database that can be used to assess overall species diversity and distribution. Nonetheless, the accumulation curves and number of new species occurrences reported in this investigation (57 spp.; 20.5%) reinforces how the sampling effort is still insufficient to fully assess the mountain range diversity. In that regard, the present work also highlights areas with knowledge gaps for Myrtaceae and therefore suggests locations that should be included in future assessments. In addition, the compilation of species and specimens vegetation of occurrence – and the rarefaction curves from each vegetation type – suggests sampling effort is strongly targeted in open habitats while forest diversity is still overlooked.

The present work also contributed with an assessment of species turnover in the EMR using a new model organism. Previous investigations on environmental drivers of species distribution in the EMR have mainly focused in campos rupestres and specific organisms that possess wildly different biological and ecological characteristics. In this regard, Myrtaceae was the first model in which distribution patterns were mostly driven by edaphic predictors rather than variables related to temperature and precipitation. These results possibly indicate that patterns in beta diversity are more intrinsically linked to the biological group rather than the investigated environment. The present work is also the first evidence of a higher geographical isolation among forests, contradicting the well-documented pattern of endemic distribution among campos rupestre. It is interesting to note, however, that this investigation is one of the few focusing on an animal-dispersed plant model, which could indicate that zoochoric species present a different and yet underexplored pattern of distribution in mountaintops – reinforcing the need to investigate distinct biological models in the EMR and explore the combination of different methods to fully comprehend species distribution patterns.