Rodriguésia 72: e01142020. 2021
http://rodriguesia.jbrj.gov.br
DOI: http://dx.doi.org/10.1590/2175-7860202172106

Original Paper

Too many floristic inventories? New records in seasonal semi-deciduous forest in the Serra da Mantiqueira in Minas Gerais state answer this question

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Abstract

The importance of continuously conducting botanical inventories has been questioned in recent decades, generating a lack of investment and interest in this area. However, several applied studies are only possible after obtaining the primary data from such surveys. Despite having the greatest richness of plants known in Brazil, several areas with knowledge gaps remain in Minas Gerais (MG) state. This is the case for the Serra da Mantiqueira, an important area for biodiversity conservation in the country. In this scenario, the phytophysiognomy of Seasonal Semi-deciduous Forest (SSF) deserves attention, as it is broadly distributed and has great relevance in the state, although subsampled. Therefore, this study aimed to present records of species for the flora of MG and discuss the need for floristic surveys in Brazil. These species were recorded in three of 10 studied remnants along expeditions performed between the years of 2012 and 2019 as part of a wide study performed in SSF remnants in the Serra da Mantiqueira which have a deficit of floristic data. Three species are recorded for the first time in MG, one species was rediscovered after more than two centuries from the last collection (which represents its nomenclatural type), in addition to nine other species which must be considered rare in the state. This study contributed to filling gaps in knowledge on Brazilian flora and also demonstrated the relevance of continuing new collections, mainly in specific subsampled areas in the interior of the country such as in SSF remnants.

Key words: Atlantic forest, first records, gaps of knowledge, priority areas for conservation, rediscovery.

Resumo

A importância da realização de inventários botânicos, de forma contínua, vem sendo questionada nas últimas décadas, gerando falta de investimento e desinteresse de pesquisadores por esta área. No entanto, vale ressaltar que os demais estudos aplicados à conservação são possíveis apenas com a disponibilidade de dados primários obtidos nestas pesquisas. Embora Minas Gerais (MG) apresente a maior riqueza de espécies cientificamente conhecidas no Brasil, ainda possui várias lacunas de conhecimento, como é o caso da Serra da Mantiqueira (SM), uma importante área para a conservação da biodiversidade no país. Neste cenário, a fitofisionomia Floresta Estacional Semidecidual (FES) merece destaque, por possuir ampla extensão e importância no estado, porém permanecer subamostrada. O estudo teve como objetivos apresentar importantes registros de espécies para a flora de MG e discutir sobre a necessidade de inventários florísticos no Brasil. Os registros foram feitos em três de 10 áreas estudadas, durante coletas realizadas entre os anos de 2012 e 2019, e são parte de um amplo estudo que está sendo realizado em fragmentos de FES, deficitários de dados florísticos, localizados na SM. Foram registradas três espécies pela primeira vez em MG, uma espécie foi redescoberta após mais de

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dois séculos após sua última coleta, além de nove espécies consideradas raras no estado. O presente estudo contribuiu com o preenchimento de lacunas de conhecimento sobre a flora do Brasil e também demonstrou a importância da realização de novas coletas, principalmente em áreas específicas e subamostradas no interior do país, como as FES.

Palavras-chave: Floresta Atlântica, primeiros registros, lacunas de amostragem, áreas prioritárias para conservação, redescoberta.

Introduction

There is continuous discussion about the importance of collections deposited in herbarium, as well as the need for new plant surveys, and it is often considered that there are sufficient studies in Brazil. Such thought results in a reduced investment and uninterest of researchers in this area (Ertter 2000; Prather *et al*. 2004; Sousa-Baena *et al*. 2014a). However, as already highlighted by Prance (1977), due to the high diversity of habitats and species in tropical regions and their fast destruction, the vegetation is often suppressed before adequate surveys are conducted, being a true affirmative for more than 40 years.

Therefore, it is important to stress that studies of this nature and the resulting collections deposited in the herbaria are a source for several other studies: evaluations of rare and/or threatened species (red lists), the discovery of new species and new localities of occurrence, the introduction of exotic plants and their implications, identification of priority areas for biodiversity conservation, alterations in the distribution of taxons and eventual relationships with climatic global changes, modeling of ecological niches, and studies on biogeography, among other possibilities. These studies are only possible when there is primary data available and the results represent important tools for studies applied to conservation (Nualart *et al*. 2017).

Although Minas Gerais presents the greatest richness of plants in Brazil (Stehmann & Sobral 2009; BFG 2018), there is still much to know due to its territorial extension and diversity of ecosystems distributed in three Brazilian phytogeographical domains (Atlantic forest, Caatinga, and Cerrado) (Stehmann & Sobral 2009). Such diversity is exemplified by the Serra da Mantiqueira (mainly distributed in the Atlantic forest and partly located at the transition with the Cerrado, with the greatest area in the state of Minas Gerais), being composed of several phytophysiognomies, in addition to a rich abiotic component and several endemic species. This mountainous complex lies across the four states of the Southeastern Region of Brazil (Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo), being considered an area of special importance for biodiversity conservation (Drummond *et al*. 2005; Saout *et al*. 2013).

In this scenario, the phytophysiognomy of Seasonal Semi-deciduous Forest (SSF) (IBGE 2012) deserves attention, as it previously occupied the largest extension of the state, but is currently highly fragmented due to several anthropogenic activities such as agriculture, cattle breeding, and urban expansion (Stehmann & Sobral 2009). This phytophysiognomy is the second richest in species and endemism (Stehmann *et al*. 2009), however, it is much less studied in comparison to dense rainforests (Werneck *et al*. 2011), hence influencing the conservation of their ecosystems.

Efforts have been made for mapping the priority areas for conservation of the flora of Minas Gerais (Drummond *et al*. 2005). However, several areas are not sufficiently surveyed or are entirely unknown, and this deficit of studies is consequently hindering actions for biodiversity conservation in the state (Stehmann & Sobral 2009).

The majority of studies performed in the SSF of Minas Gerais have focused on the tree component and only a few have been dedicated to performing more thorough surveys, including herbs (*e.g*., Forzza *et al*. 2014). Such broad floristic studies are more common in vegetation mosaics with grasslands and forest areas (often rainforests) (*e.g*., Rezende *et al*. 2013; Meireles *et al*. 2014). Some examples regarding the importance of floristic surveys are the new records for the flora of Minas Gerais published in the last decade (*e.g.*, Menini Neto *et al*. 2013; Gonzaga *et al*. 2015, 2016; Justino *et al*. 2018), as well as the description of new species (*e.g.*, Bernacci *et al*. 2014; Cardoso *et al*. 2019; Hammes *et al*. 2020), which contribute to enhancing the knowledge on the richness and distribution of species, including those threatened with extinction.

This study is part of a research that aims to investigate priority areas for conservation of the flora of Minas Gerais, some of them with a deficit of floristic data, highlighting patterns of the

geographic distribution of vascular epiphytes. This article aimed to highlight the need to increase the floristic surveys, mainly for non-tree species, even in relatively well-sampled areas, such as the Serra da Mantiqueira, not evenly studied and presenting several gaps of sampling and knowledge. We present for the first time occurrence records and the rediscovery of a species in SSF fragments in Minas Gerais, in addition to species that are seldom collected in this state.

Material and Methods

This study is part of wide research performed in 10 SSF fragments located in the Serra da Mantiqueira complex, in the state of Minas Gerais: the Área de Proteção Ambiental (APA) of Mata do Krambeck and the UFJF campus (Juiz de Fora), Fazenda Fortaleza de Sant'Anna (Chácara), Serra da Bandeira (Bom Jardim de Minas), Parque Estadual (PE) Serra do Brigadeiro, Parque Nacional (PN) do Caparaó, Fazenda do Tanque (Lima Duarte, district of Conceição do Ibitipoca), Reserva Biológica (ReBio) da Represa do Grama, and Reserva Particular do Patrimônio Natural (RPPN) Alto da Boa Vista (Descoberto), and the RPPN Usina Maurício (Itamarati de Minas).

The collections were performed between the years of 2012 and 2019. The herbaceous plants were photographed, collected, herborized, and deposited at the Herbarium CESJ of the Universidade Federal de Juiz de Fora (acronyms according to Thiers, continuously updated). The plants were identified by consulting specialized bibliography and specialists in some families. Online databases (<http://reflora.jbrj.gov.br/>, <https://www.gbif.org/>, <http://www.jbrj.gov.br/jabot/>, <http://splink.cria.org.br/>) were consulted to evaluate the new occurrences and confirmed the inexistence of collections in Minas Gerais, including a search for synonyms of the current valid names. The status of species recorded for the first time in Minas Gerais is according to the criteria of the International Union for Conservation of Nature (IUCN) (2019), and take into account observation and annotations taken during the expeditions to the study areas and the results obtained from GeoCAT (Geospatial Conservation Assessment Tool, <http://geocat.kew.org/>). Species treated as rare represent those with only a few records (four or less) in the state of Minas Gerais, often with fragmented distribution and a great time interval between collections, and in some cases threatened with extinction at the state (MG) and/or national (BR) levels (Drummond *et al*. 2008; Martinelli & Moraes 2013). The coordinates were omitted due to conservation questions.

Results and Discussion

New records

We recorded new occurrences for species of Minas Gerais in three of the 10 studied SSF remnants (Fig. 1): *Codonanthe gracilis* (Mart.) Hanst. (1854: 209) (Gesneriaceae) (in RPPN Usina Maurício, municipality of Itamarati de Minas), *Rhipsalis crispata* (Haw.) Pfeiff. (1837: 130) (Cactaceae) (found in RPPN Usina Maurício and Fazenda Fortaleza de Sant'Anna) and *Vriesea flava* A.F.Costa, H.Luther & Wand. (2004: 36) (Bromeliaceae) (in Fazenda do Tanque, Serra do Ibitipoca in Lima Duarte).

Codonanthe gracilis (Mart.) Hanst., Linnaea 26(2): 209. 1854. (Gesneriaceae). Fig. 2a,b
Examined material: Itamarati de Minas, 20.XII.2017, fl. and fr., *D.E.F. Barbosa* & *B.F. Barbosa 509* (CESJ). BR (Least Concern - LC).

Codonanthe is an endemic genus to the Atlantic Domain represented by eight species, of which four were recorded for Minas Gerais (Chautems & Perret 2013; BFG 2018; (Chautems & Rossini 2020)).

Codonanthe gracilis has previous records for dense rainforest and *restinga*, between 20 m and 900 m above sea level (a.s.l.) in the states of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Rio de Janeiro, Espírito Santo, and Bahia (BFG 2018). The species was collected in a secondary SSF remnant of the RPPN Usina Maurício, constituted by 280 ha neighboring the Rio Novo (Novo River), between 250 m and 300 m a.s.l. It occurs as an epiphyte on a few trees on the fragment edge. The occurrence of *C. gracilis* in a seasonal phytophysiognomy is probably due to the proximity to the river, which provides frequent moisture and can decrease the seasonality effects, as observed in other studies (Rogalski & Zanin 2003; Giongo & Waechter 2004; Barbosa *et al*. 2015).

This species must be considered Critically Endangered in Minas Gerais (CR: B1ab [iii] B2ab [iii]) due to the existence of only a small population distributed in a few trees, presenting an Extension of Occurrence (EOO) less than 100 km² and estimated Area of Occupancy less than 10 km². Despite the occurrence of the taxon inside a conservation unit (a RPPN), this category permits a more flexible use and the area is used by local

people for recreation. In addition, the economical activities of the municipality of Itamarati de Minas include bauxite mining, cattle breeding, and agriculture, which are responsible for the deforestation of large areas of SSF in the region (Henriques & Porto 2015).

Rhipsalis crispata (Haw.) Pfeiff., Enum. Diagn. Cact. 130. 1837. (Cactaceae). Fig. 2c,d
Examined material: Chácara, 31.III.2012, fl. and fr. *D.E.F. Barbosa* & *F.R. Silva 58* (CESJ). Itamarati de Minas, 21.X.2018, fl., *D.E.F. Barbosa* & *G.A. Basílio 573* (CESJ). BR (Data Deficient - DD).

Rhipsalis is mainly distributed along the Tropical and Subtropical America. This is the richest genus of Cactaceae in Brazilian flora, with 37 species and presenting a diversity and endemism center in the Atlantic forest. Minas Gerais is the fifth richest state for this genus, in which 15 species have been recorded (Hunt *et al*. 2006; BFG 2018).

Rhipsalis crispata is endemic to Brazil and previously registered in Bahia, Pernambuco, Rio de Janeiro, São Paulo, and Santa Catarina in SSF, dense rainforest, and *restinga* (BFG 2018). It was recorded in Minas Gerais in two SSF fragments in Zona da Mata, approximately 50 km distant from each other. The first fragment lies in Serra da Babilônia in the municipality of Chácara, and the species was collected in a study on vascular epiphytes at an altitude of 800 m a.s.l. It was misidentified as *R. oblonga* Loefgr. (Barbosa *et al*. 2015), and is corrected herein. The second fragment is the RPPN Usina Maurício in Itamarati de Minas, at an altitude of 250 m a.s.l. The individuals were found as an epiphyte along the edge of the fragments near watercourses in both locations.

Rhipsalis crispata is considered as Data Deficient (DD) at a national level because there is not sufficient information about its populations, and despite the wide distribution, the species occurs in areas which are highly affected by deforestation in the Atlantic forest. We only observed one large individual in both locations in Minas Gerais, and the species must be considered Critically

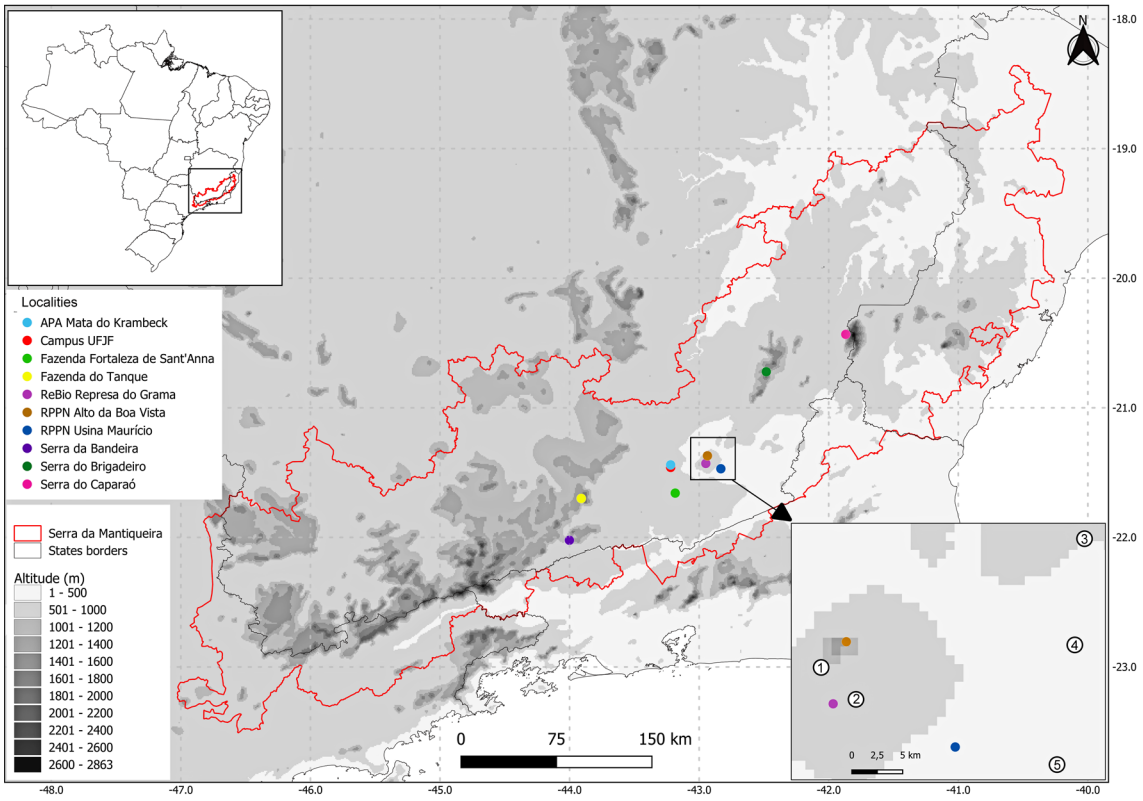

Figure 1 – Location of the studied areas in the Serra da Mantiqueira and conservation units with potential to compose ecological corridors in the region of Itamarati de Minas. In detail (right corner): 1 = RPPN Jurerê; 2 = RPPN Sítio Sannyasim; 3 = APA Serra da Neblina; 4 = Estação Ecológica de Água Limpa; 5 = ReBio da Lapinha.

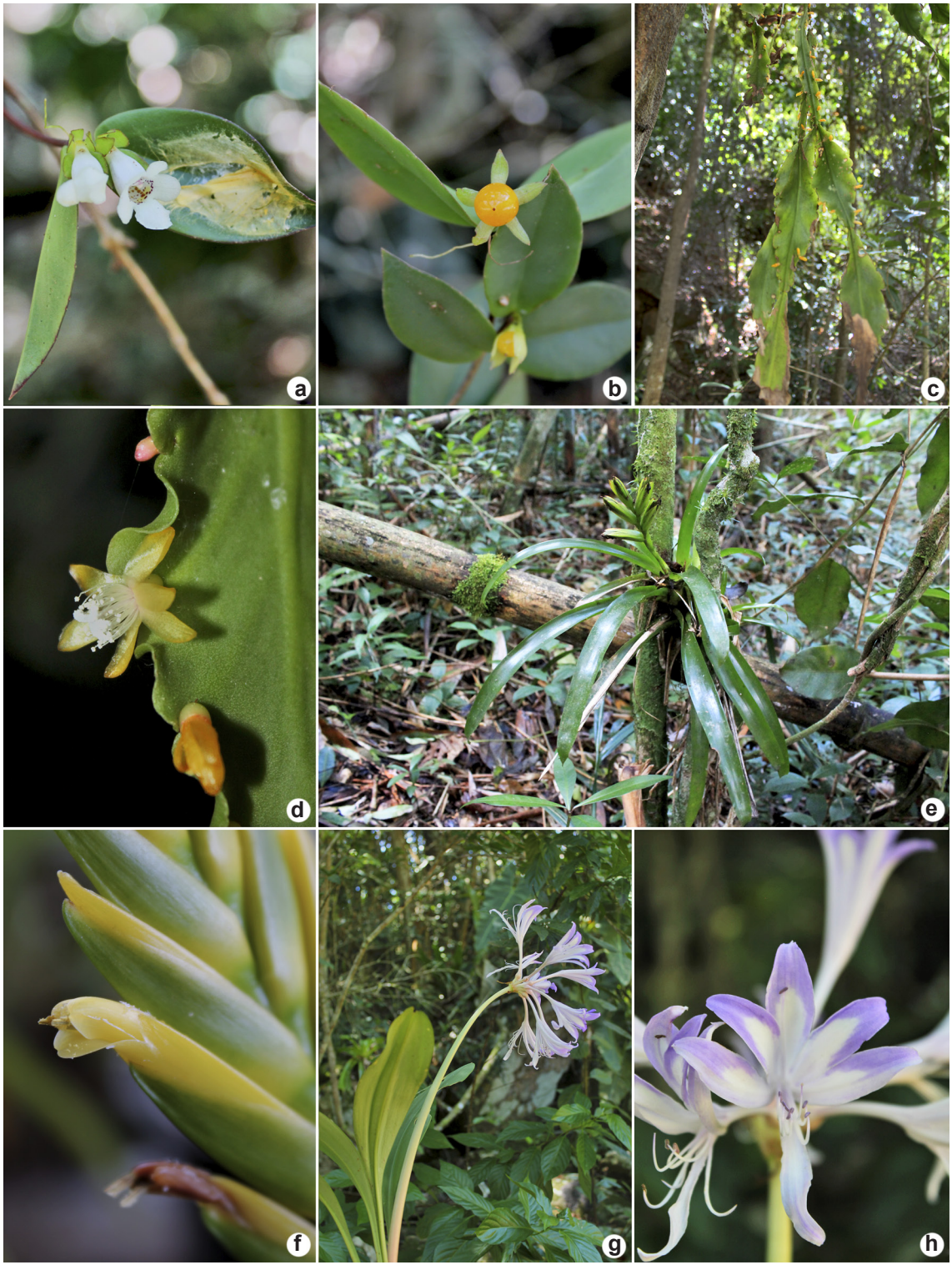

Figure 2 – a-h. Species recorded for the first time in the state of Minas Gerais – a-b. *Codonanthe gracilis*; c-d. *Rhipsalis crispata*; e-f. *Vriesea flava*; g-h. *Griffinia concinna* (rediscovered species after 200 years in the state of Minas Gerais). (Photos: D.E.F. Barbosa).

Endangered in this state (CR: B2ab [ii][iii] D) since it presents small populations and an estimated AOO of less than 10 km². The individual found in the RPPN Usina Maurício is under the same pressure presented for *Codonanthe gracilis*, and the specimen recorded in Chácara is in an area with historical occupation related to agriculture and pasture formation outside the conservation unit (Barbosa *et al*. 2015).

Vriesea flava A.F.Costa, H.Luther & Wand., Novon 14(1): 36. 2004. (Bromeliaceae).

Fig. 2e,f

Examined material: Conceição do Ibitipoca, 20.VI.2015, fr., *D.E.F. Barbosa* & *G.A. Basílio 246* (CESJ); 24.IX.2017, fl., *D.E.F. Barbosa* & *G.A. Basílio 503* (CESJ). BR (Near Threatened - NT).

Vriesea is the richest Bromeliaceae genus in Brazil and Minas Gerais, presenting 201 and 60 species, respectively (Versieux & Wendt 2007; Gomes-da-Silva & Souza-Chies 2017; BFG 2018), and has the Atlantic Domain as a diversity center (Martinelli *et al*. 2008).

Vriesea flava was previously registered in São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul, occurring along the Serra do Mar Corridor in dense rainforests of the Atlantic forest (BFG 2018). It was collected in Minas Gerais on a private property, Fazenda do Tanque in Serra do Ibitipoca, neighboring the PE do Ibitipoca during a study about vascular epiphytes (Barbosa *et al*. 2020), but was treated as an undetermined taxon. This property has remnants of secondary montane SSF, surrounded by pasture and crop areas at altitudes between 1,200 m a.s.l. and 1,430 m a.s.l., and the specimen was collected at approximately 1,300 m a.s.l. The occurrence of this species in a seasonal phytophysiognomy is probably due to the high altitude which is responsible for a higher relative air humidity, attenuating the effects of the seasonality (Rahbek 1995; Ding *et al*. 2016; Barbosa *et al*. 2020).

This species is widely distributed in other states, but it is considered Near Threatened (NT) in Brazil according to the IUCN criteria due to a decline in habitat quality and its collection for ornamental purposes. We observed approximately 10 individuals in a remnant of 3 ha, outside the conservation unit. Thus, *V. flava* must be considered Critically Endangered in Minas Gerais (CR: B1ab [iii] B2ab [iii] D) since only one population is known, with an EOO of less than 100 km² and an estimated AOO of less than 10 km².

Rediscovered species

The rediscovery of *Griffinia concinna* (Mart.) Ravenna (1971: 84) (Amaryllidaceae) was recorded in RPPN Usina Maurício after more than two centuries since the collection of this type of specimen (representing the only collection of this species in Minas Gerais).

Griffinia concinna (Mart.) Ravenna, Pl. Life (Stanford) 27: 84. 1971. (Amaryllidaceae).

Fig. 2g,h

Type: BRAZIL. MINAS GERAIS: "Habitat in campis montanis prope Villa Ricca", April 1818, *C.F.P. Martius* (holotype M [barcode] M-0243801!).

Examined material: Itamarati de Minas, 6.III.2019, fl., *D.E.F. Barbosa* & *G.A. Basílio 602* (CESJ). MG (Not Evaluated - NE); BR (Not Evaluated - NE).

Amaryllidaceae is represented in Brazil by approximately 150 species and 19 genera, of which five are endemic, such as *Griffinia*, with 23 species distributed in Caatinga, Cerrado and Atlantic forest domains. This genus is represented by six species in Minas Gerais, with the majority being threatened with extinction (BFG 2018).

Griffinia concinna occurs in the region comprised by the north of Rio de Janeiro and the south of Espírito Santo in shaded, rocky, and moist sites of deciduous and semideciduous forests, often near watercourses. The type of this species was collected for the first time in Minas Gerais about 200 years ago and deposited in the Herbarium M (Martius *ex* Schultes & Schultes 1830: 857), but has not been registered in this state since its initial collection (Campos-Rocha *et al*. 2017; BFG 2018). We found this species in Itamarati de Minas as terricolous in a rocky and shaded environment near the river, corroborating the existing data in the literature as its typical habitat.

This species is presented as Not Evaluated (NE) for both the state and country. Since we only observed four individuals in this study and estimated the AOO as less than 10 km², it must be considered as Critically Endangered in Minas Gerais (CR: B2ab [iii] D). In addition to the comments for *C. gracilis* (also valid for this species), we highlight that *G. concinna* is a species with strong ornamental value, and similar to several other species of this family, it can suffer from predatory/illegal collection, making it more threatened.

Rare species

All the rare species were collected in RPPN Usina Maurício: *Anthurium santaritense* Nadruz & Croat (2005: 65) (Araceae), *Billbergia tweedieana* Baker (1889: 73) (Bromeliaceae), *Cycnoches pentadactylon* Lindl. (1843: 18) (Orchidaceae), *Hillia illustris* (Vell.) K.Schum. (1889: 202) (Rubiaceae), *Oncidium baueri* Lindl. (1833: 7) (Orchidaceae), *Prosthechea fragrans* (Sw.) W.E.Higgins (1997: 377) (Orchidaceae), *Quesnelia arvensis* (Vell.) Mez (1892: 381) (Bromeliaceae), *Saranthe leptostachya* (Regel & Körn.) Eichler (1884: 86) (Marantaceae), and *Vriesea barilletii* E.Morren (1883: 33) (Bromeliaceae).

Anthurium santaritense Nadruz & Croat, Aroideana 28: 65, f. 1,2. 2005. (Araceae). Fig. 3a

Examined material: Itamarati de Minas, 29.IV.2018, fl., *D.E.F. Barbosa* & *G.A. Basílio 539* (CESJ). MG (Critically Endangered - CR); BR (Not Evaluated - NE).

Anthurium santaritense is a terricolous and epiphytic species of the Atlantic forest, occurring in the SSF of Rio de Janeiro and Minas Gerais, while in Espírito Santo it is restricted to the *restingas* of the Parque Estadual Paulo César Vinha, and considered Endangered (EN) in this state (Valadares & Sakuragui 2016; BGF 2018). Although this species is distributed in three states, there are few records in databanks and only one in Minas Gerais, where it was collected in 2001 in the municipality of Faria Lemos (herbarium RB 736369). We found this species as an epiphyte with less than 10 individuals in the present study.

Billbergia tweedieana Baker, Handb. Bromel. 73. 1889. (Bromeliaceae). Fig. 3b

Examined material: Itamarati de Minas, 21.X.2018, fl., *D.E.F. Barbosa* & *G.A. Basílio 572* (CESJ). MG (Vulnerable - VU); BR (Not Evaluated - NE).

Billbergia tweediana is an endemic species of the Atlantic forest, known to be present in the states of Minas Gerais, Espírito Santo, and Rio de Janeiro, occurring in dense rainforest, *restinga*, and rocky outcrops (BFG 2018). There are three records in Minas Gerais in different municipalities and with a great time gap between the collections: Viçosa in 1935 (herbarium RB 506200), Carangola in 1988 (herbarium RB 284565), and Descoberto in 2004 (herbarium CESJ 35031). This species was found as an epiphyte in this study, and we observed less than 10 individuals.

Cycnoches pentadactylon Lindl., Edwards's Bot. Reg. 29: Misc. 18. 1843 (Orchidaceae). Fig. 3c

Examined material: Itamarati de Minas, 6.III.2019, fl., *D.E.F. Barbosa* & *G.A. Basílio 599* (CESJ). MG (Not Evaluated - NE); BR (Endangered - EN).

Cycnoches pentadactylon presents wide and highly fragmented distribution, cited by BFG (2018) in the states of Amazonas, Tocantins, Espírito Santo, as well as the Distrito Federal. Despite this reference, there are three collections of this species in Minas Gerais not cited: Carangola in 2009 (herbarium RB 681177), Sem-Peixe (herbarium MBM 421028), and Bugre (herbarium MBM 421142), both in 2019. It is probably an undersampled species with a great deficit in knowledge, despite the relatively large size and showy ornamental flowers. It was found as epiphyte in the present study, and we observed less than 10 individuals.

Hillia illustris (Vell.) K.Schum., *Fl. bras.* 6(6): 202. 1889. (Rubiaceae). Fig. 3d

Examined material: Itamarati de Minas, 21.X.2018, fl., *D.E.F. Barbosa* & *G.A. Basilio 574* (CESJ). 28.XI.2018, fr., *D.E.F. Barbosa* & *E.O. Barbosa 578* (CESJ). MG (Not Evaluated - NE); BR (Not Evaluated - NE).

Hillia illustris is widely distributed occurring in the Northern, Northeastern, Southeastern, and Southern regions of Brazil. BFG (2018) did not indicate its occurrence for the Minas Gerais state, despite the record for the municipality of Viçosa (herbarium VIC 20549) (Meira Neto & Martins 2002) without a collection date, being identified as one of its synonyms (*H. tubiflora* Cham.). It was found as an epiphyte in the present study, and we observed less than 10 individuals.

Oncidium baueri Lindl., Ill. Orch. Pl. t. 7. 1833. (Orchidaceae). Fig. 3e

Examined material: Itamarati de Minas, 18.VIII.2017, fr., *D.E.F. Barbosa* & *H.R. Pereira Filho 460* (CESJ). 25.IX.2018, fl., *D.E.F. Barbosa* & *A.L. Barbosa 564* (CESJ). MG (Not Evaluated - NE); BR (Not Evaluated - NE).

Oncidium baueri has its occurrence confirmed by BFG (2018) for the Northern, Center-Western, and Southeastern regions, but it is potentially distributed throughout the country. There are two specimens deposited in herbaria in Minas Gerais, but only one indicated the origin, Caratinga (herbarium SP 41749), without a collection date. The French naturalist Auguste de Saint-Hilaire also collected a specimen in 1816, deposited in herbarium P (437100), but without the location.

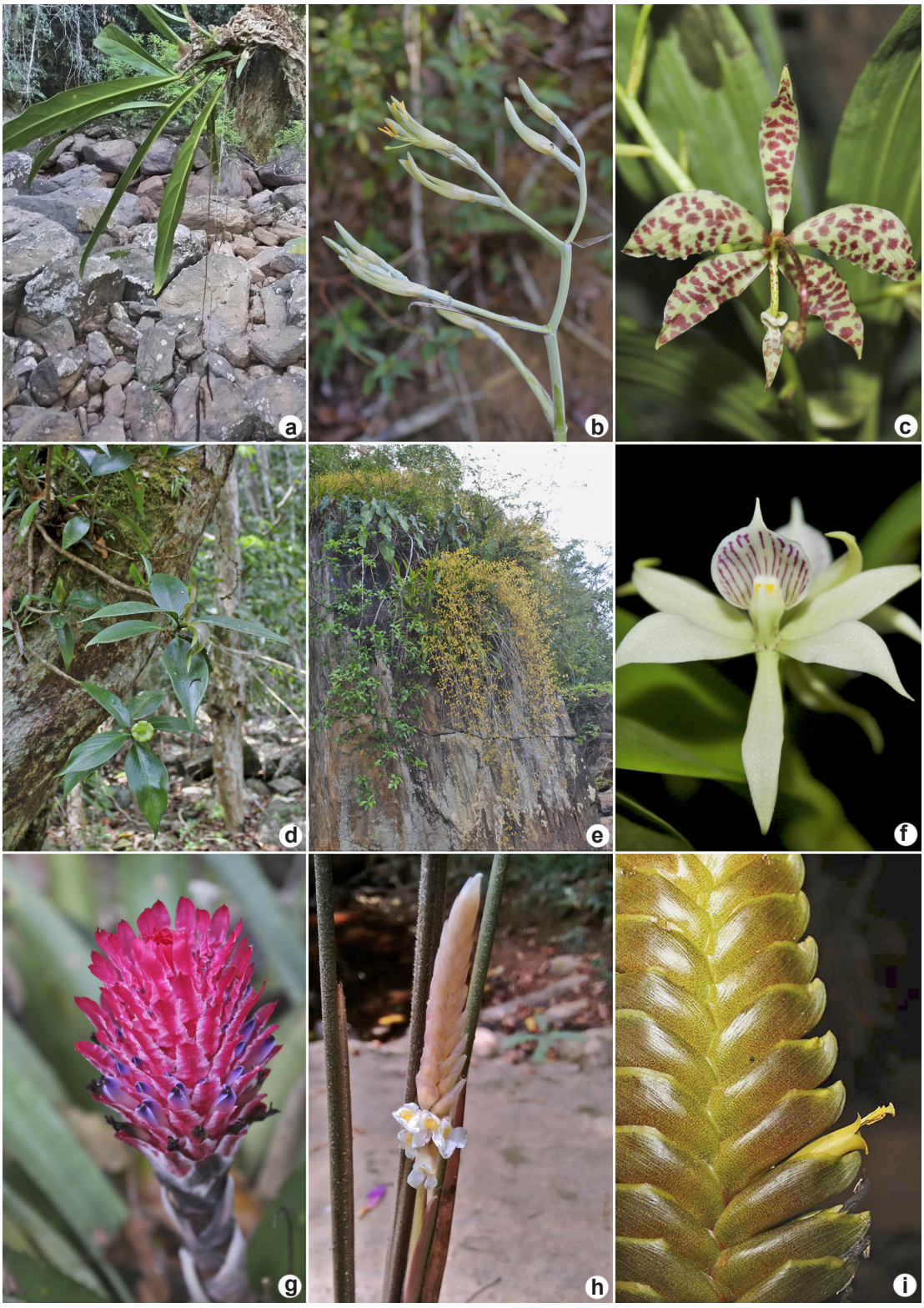

Figure 3 – a-i. Species seldom collected in the state of Minas Gerais, treated in this study as rare species – a. *Anthurium santaritense*; b. *Billbergia tweedieana*; c. *Cycnoches pentadactylum*; d. *Hillia illustris*; e. *Oncidium baueri*; f. *Prosthechea fragrans*; g. *Quesnelia arvensis*; h. *Saranthe leptostachya*; i. *Vriesea barilletii*. (Photos: D.E.F. Barbosa).

Despite being a common species in Brazil, it must be considered rare in Minas Gerais. It was found as terricolous, rupicolous, and epiphyte in the present study, with an estimated population of fewer than 250 individuals.

Prosthechea fragrans (Sw.) W.E.Higgins, Phytologia 82(5): 377. 1997 (1998). (Orchidaceae). Fig. 3f
Examined material: Itamarati de Minas, 31.I.2019, fl., *D.E.F. Barbosa* & *B.F. Barbosa 591* (CESJ). MG (Not Evaluated - NE); BR (Not Evaluated - NE).

Prosthechea fragrans is registered in BFG (2018) for all five Brazilian regions and almost all states of the country, occurring in a wide range of vegetational formations. There are four collections for this species in different locations and with a great time gap between them: Caldas in 1863 (herbarium R 2782), no location in 1877 (herbarium US 209451), Carangola in 1986 (herbarium RB 674829), and Braúnas in 1993 (herbarium BHCB 29770). It was found as an epiphyte in the present study, and we observed less than 10 individuals.

Quesnelia arvensis (Vell.) Mez, *Fl. bras.* 3(3): 381. 1892. (Bromeliaceae). Fig. 3g
Examined material: Itamarati de Minas, 26.VIII.2018, fl., *D.E.F. Barbosa* & *G.A. Basilio 559* (CESJ). MG (Not Evaluated - NE); BR (Not Evaluated - NE).

Quesnelia arvensis is an endemic species to Brazil and occurs in dense rainforests, mangroves, and *restingas* of the Atlantic forest in the Southeastern Region. Although the BFG (2018) did not indicate the occurrence of the species for Minas Gerais, there are records for the municipalities of Rio Preto (herbarium CESJ 46795) and Descoberto (herbarium CESJ 34139, 71836). It was found as rupicolous and epiphyte in the present study, and we observed less than 50 individuals near watercourses.

Saranthe leptostachya (Regel & Körn.) Eichler, Abh. Königl. Akad. Wiss. Berlin 1883: 86. 1822. (Marantaceae). Fig. 3h
Examined material: Itamarati de Minas, 23.XII.2018, fl., *D.E.F. Barbosa* & *G.A. Basílio 587* (CESJ). MG (Not Evaluated - NE); BR (Not Evaluated - NE).

Saranthe leptostachya presents wide distribution in Brazil, occurring in the Northeastern, Southeastern, and Southern regions, in addition to Bolivia, Peru, and Paraguay. This species is found in shade and moist habitats, often near watercourses (Vieira *et al*. 2012; BFG 2018). It is restricted to the Atlantic forest in Brazil, but taking into account its occurrence in other countries, it is possible that it also occurs in other phytogeographic domains or phytophysiognomies. It was registered in the municipalities of Carangola in 2006 (herbarium RB 437942, 437944) and Teófilo Otoni in 2011 (BHCB 163445) in Minas Gerais. It was found as terricolous in the present study, and we observed less than 10 individuals in environmental conditions which corroborate the literature for the species.

Vriesea barilletii E.Morren, Belgique Hort. 33: 33, t. 3. 1883. (Bromeliaceae). Fig. 3i
Examined material: Itamarati de Minas, 18.VIII.2017, fl., *D.E.F. Barbosa* & *H.R. Pereira Filho 461* (CESJ). 28.XI.2018, fr., *D.E.F. Barbosa* & *E.O. Barbosa 584* (CESJ). MG (Not Evaluated - NE); BR (Not Evaluated - NE).

Vriesea barilletii is endemic to the Atlantic forest, occurring in dense rainforest, and according to the BFG (2018), is restricted to the state of Espírito Santo. It is a species with few records and with a deficit of information in the literature, whose real geographical distribution is unknown (Martinelli *et al*. 2008). Only one record was found for Minas Gerais, in the municipality of Pedra Dourada in 2007 (RB 481334). It was found as terricolous and epiphyte in the present study, and we observed less than 10 individuals.

Remarkably, the species recorded in Itamarati de Minas are relatively large and have decorative flowers and/or inflorescences, which would facilitate their observation in the field. Furthermore, several species present wide distribution in the Atlantic forest, and therefore we must expect they would be recorded in floristic inventories when present in the studied fragments. Thus, the few records of these species in Minas Gerais may be related to the absence of collections in some municipalities of the state, thus representing relevant gaps of knowledge for better understanding of the distribution of Brazilian flora (Werneck *et al*. 2011; Menini Neto *et al*. 2016; Gonzaga *et al*. 2019).

The first record of conspicuous species such as *C. gracilis*, *R. crispata* and *V. flava*, among other species, which in addition to being threatened can also be considered rare in Minas Gerais, and therefore highlight the deficit in the knowledge about the flora of Minas Gerais, which is also the state with the richest flora in Brazil. This is particularly true in the areas of the interior of the country, especially the neglected remnants of SSF,

resulting in a knowledge bias of the Brazilian flora. Moreover, previous records of rare species were mainly in municipalities near research institutions performing botanical studies, *i.e.* the Universidade Federal de Juiz de Fora and Universidade Federal de Viçosa, which contribute to this bias (Werneck *et al*. 2011; Menini Neto *et al*. 2016). An example of this issue is the fact that there were no systematic collections in the municipality of Itamarati de Minas before this study, only a few records of trees in an área of the Companhia Brasileira de Alumínio (CBA).

The Southeastern Region is one of the most studied in the country, but several gaps need to be filled and probably new species and occurrences to be discovered (Pimm *et al.* 2010). This situation can be evidenced in the floristic survey carried out by Forzza *et al*. (2014) at ReBio da Represa do Grama, where six species of angiosperms were described as new to science, in addition to the record of new occurrences and rare species in Minas Gerais. In this context, regional and local studies driven to specific sites are very important, and we highlight the SSF which are between the undersampled areas and must be the target of intensive collections (Giulietti *et al*. 2009; Nualart *et al*. 2017). For example, despite decades of studies performed in the Serra do Ibitipoca and wide knowledge about the flora of PE do Ibitipoca and surroundings (Forzza *et al*. 2013), we still found a new occurrence (*Vriesea flava*) for the state in this region, corroborating the need for collections in specific sites of the country (Barbosa *et al*. 2019). In a megadiverse country like Brazil, primary biodiversity data from these types of works are fundamental for correct and adequate management of natural resources (Sousa-Baena *et al*. 2014b).

The need for further studies can be evidenced by the fact that the majority of species considered rare in this study are not assessed regarding the threats, either at the state or country levels. The deficit of knowledge about the distribution and/or abundance is one of the responsible factors for the high number of species considered Data Deficient (DD) in Brazil, according to the criteria of the IUCN (Martinelli & Moraes 2013). If these species were included in an evaluation (at the state or national level), they could be the target of some biodiversity conservation projects (Sousa-Baena *et al*. 2014b). The availability of more data and with better quality tends to enhance the precision of information about the status of each species, facilitating communication and increasing the reliability in the relationship between researchers and decision-makers (Scarano & Martinelli 2010). Once evaluated, these species would integrate the lists used for creating environmental policies and conservation plans (MMA 2018).

More than narrowing the relationship between science and politics, this type of study would also widely reach the population as environmental education, so that each individual has a dimension of their responsibility in maintaining ecosystems and can better understand the importance of allocating resources to conservation research as a benefit for the future of the planet. Studies of public interest must stop giving priority to the academic environment and reach other members of society through schools and communication vehicles, among other social segments. The population's understanding of the importance of conserving natural environments for maintaining ecosystem services will certainly be an important step to initiate interest in research of this nature and reestablish the connection between people and nature.

Based on the information presented in this study, we recommend that the Itamarati de Minas region be part of the priority areas for conservation of the flora in Minas Gerais, forming ecological corridors with other forest remnants in neighboring municipalities such as: ReBio da Lapinha (municipality of Leopoldina); APA Serra da Neblina and Estação Ecológica de Água Limpa (municipality of Cataguases); ReBio da Represa do Grama, RPPN Alto da Boa Vista, RPPN Jurerê, and RPPN Sítio Sannyasim, all located in the municipality of Descoberto (Fig. 1), in addition to other fragments not inserted in these CUs.

The present study increased the knowledge about the flora of Minas Gerais, with an emphasis on the Serra da Mantiqueira, and filled a gap in the geographical distribution of three species in Brazil, presented the rediscovery of a taxon without records for the past 200 years in the state, in addition to highlighting the need for performing botanical expeditions for a better and more complete sampling of Brazilian biodiversity. Such studies can contribute to the knowledge of the real threatened status of Brazilian flora species and provide subsidies for making decisions about the conservation of forest remnants in the country, such as the SSF, which has been the target of degradation from activities such as agriculture, livestock, and mining for centuries.

Acknowledgments

We wish to thank Mr. Waltemberg Sales de Carvalho and Mr. Natanael Claudino Ferreira, for allowing us to conduct the study in the Serra do Ibitipoca and Itamarati de Minas respectively; Helvécio Rodrigues Pereira Filho, who helped and accompanied us on the field expeditions. We also thank the Programa de Pós-graduação em Biodiversidade of the Universidade Federal de Juiz de Fora, for logistic support; and the specialists Antonio Campos Rocha Neto (Amaryllidaceae), Marcus Nadruz, Mel de Castro Camelo (Araceae), Andrea Ferreira da Costa, Igor Kessous, Márcio de Melo Leodegário (Bromeliaceae), Daniela Cristina Zappi (Rubiaceae), João Marcelo Alvarenga Braga (Marantaceae), who helped identify/confirm the species. This study was financed in part by the Coordenação de Aperfeiçoamento e Pessoal de Nível Superior - Brasil (CAPES) (finance code 001).

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Area Editor: Dr. Pedro Viana
Received in June 19, 2020. Accepted in November 05, 2020.

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