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Inventory

Vascular plant checklist in an area of extreme biological importance: filling gaps in the Caparaó National Park-ES, Brazil

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Abstract: Regional floristic lists are essential for defining biodiversity conservation strategies and are key to assist in filling knowledge gaps. They aim to provide a data source for applying tools to reduce extinction rates and to conserve ecosystems. Herein we present the results of an inventory of vascular plants in a rainforest in the Caparaó National Park (CNP) and approach their implications for conservation and management of this protected area and the surrounding communities. We conducted botanical expeditions between the years 2012 and 2017 in a montane and upper-montane forest of the CNP. We found 361 species distributed in 78 families and 181 genera. The study area is home to new species for science that have recently been described in other publications outside that location, and 4 new records for Espírito Santo State; also 43 species listed in different extinction threat categories (VU, EN and CR) and another 190 categorized with lesser concerns (LC and NT). The families with the highest species richness were: Melastomataceae (41 spp.), Lauraceae and Myrtaceae (30), Orchidaceae (26), Rubiaceae (24), and Asteraceae (20). Our results contribute to greater knowledge of the CNP flora, of the montane environments in Brazil and the vegetation of Espírito Santo state, in addition to demonstrate the importance of this protected area to the conservation Atlantic Forest biodiversity.
Keywords: *Neotropical region, Atlantic Forest, nature conservation, endangered species, regional flora.*

Checklist de plantas vasculares em uma área de extrema importância biológica: preenchendo lacunas no Parque Nacional do Caparaó-ES, Brasil

Resumo: As listas florísticas regionais são essenciais para definir estratégias de conservação da biodiversidade e importantes instrumentos para preencher lacunas de conhecimento. O objetivo foi fornecer uma base de dados a partir de uma listagem de espécies como ferramenta para conservação e manejo do ecossistema. Apresentamos aqui os resultados de um inventário de plantas vasculares em uma Floresta Ombrófila Densa no Parque Nacional Caparaó e abordamos suas implicações para a conservação e manejo desta área protegida e das comunidades do entorno. Realizamos expedições botânicas entre os anos de 2012 e 2017 na vertente capixaba dessa floresta ombrófila no parque. Foram encontradas 361 espécies distribuídas em 78 famílias e 181 gêneros. A área de estudo abriga novas espécies para ciência que foram recentemente descritas em outras publicações fora dessa localidade, e 4 novos registros para o Espírito Santo; também 43 espécies listadas em diferentes categorias de ameaça de extinção (VU, EN, CR) e outras 190 categorizadas com menores preocupações (LC e NT). As famílias com maior riqueza de espécies foram: Melastomataceae (41 spp.), Lauraceae e Myrtaceae (30), Orchidaceae (26), Rubiaceae (24) e Asteraceae (20). Nossos resultados contribuem para um maior conhecimento da flora do Parque, dos ambientes montanos no Brasil e da vegetação do Espírito Santo, além de demonstrar a importância dessa área protegida para a conservação da biodiversidade da Mata Atlântica.
Palavras-chave: *Região neotropical, Floresta Atlântica, conservação da natureza, espécies ameaçadas.*

Introduction

Regional floristic listings consist of important tools for designing conservation plans and actions for different ecosystems, and forms the essential basis for biodiversity management, developing of regional flora projects, supporting knowledge expansion. Despite the need for cataloguing biological diversity globally, especially in biodiversity hotspots (Myers et al. 2000, Mittermeier et al. 2004), the number of large expeditions like those carried out in the past by great naturalists, for instance, von Martius, Saint Hilaire and more recently A.C. Brade, were considerably reduced (Christenhusz & Byng 2016) and there are no more. However, regional floristic surveys have been growing in the tropical region, enabling estimation of plant species richness in these tropical regions (Slik et al. 2015).

Brazil is the country that has the greatest plant richness in the world, with an estimated 34,459 species of vascular plants (BFG 2018). However, the state of knowledge on flora is still incipient in many regions of the country, as occurs in the Atlantic Forest, including protected areas (Lima et al. 2015, Zappi et al. 2016, Oliveira et al. 2017), which have the conservation of plant species among their goals. Despite this, many species of vascular plants are listed as "data deficient" (Sousa-Baena et al. 2014), compromising actions for their conservation.

The lack of floristic studies in forest remnants in Brazil, especially those in which the access is difficult higher, such as mountain areas, leads to a lack of data in estimating the richness, as well as the occurrence of species (Giulietti et al. 2009). Thus, the restricted knowledge on the distribution of species due to the low number of floristic inventories in some regions creates gaps and makes it harder to make decisions of public politics, since these studies work as tools for identifying potential places for the conservation, or even for establishing new strategies in areas already under protection regimes (IUCN 2017). Floristic inventories, in addition to generating information about the species composition of a certain area, also enable the feed a database that will serve as the basis for other taxonomic and ecologic studies, as well as studies on the restoration of degraded areas (Souza et al. 2009).

Given these justifications and for being recognized as an important Atlantic Forest remnant, as well as being in a priority area for conservation and having extremely high biological importance (Ministério do Meio Ambiente - MMA 2007), the efforts to know the flora in the Caparaó National Park (CNP) has started with the pioneering study by Brade (1942) has been expanding over the last decade (Mazine & Souza 2008; Forster & Souza 2013, Couto et al. 2016, Machado et al. 2016, Zorzanelli et al 2016, Araujo et al. 2018, Campos et al. 2018), beyond fascicles published by the herbarium "Guido Pabst" (GFJP). Recently, the list of plants from CNP was made available on the digital platform "Catálogo de Plantas das Unidades de Conservação do Brasil" (https://catalogo-ucs-brasil.jbrj.gov.br/), where there are 1,789 species of 714 genera and 198 botanical families, of these, 1,292 are angiosperms, 37 lycophytes, 262 ferns and 198 are avascular plants (Carrijo et al. 2020).

Therefore, herein we present the results of a floristic inventory of vascular plants in a rainforest in the CNP and approach its implications for the handling and conservation of this protected area. Moreover, we collaborate to fill the knowledge gaps for mountain environments in Brazil. Our intent is to show that floristic listings of plant species are indispensable tools for biodiversity conservation and that they should be encouraged.

Materials and methods

1. Study area

The Caparaó National Park (CNP) is a protected area located between Espírito Santo and Minas Gerais states (Figure 1), within the Serra da Mantiqueira mountain range (20º18' - 20º37'S and 41º42' - 41º52'W). The park has 31,853.12 ha area, with 79% of being within the state of Espírito Santo (ICMBio 2015). It is located in the Atlantic Forest domain and protects different vegetation formations, such as montane forests (Dense Ombrophilous Forest and Semi-deciduous Seasonal Forest), high-altitude grasslands, and inselbergs (IBGE 2012, ICMBIO 2015, Couto et al. 2016, Campos et al. 2018). The Dense Ombrophilous Forest are exclusive to the Espírito Santo state side of the Park.

The CNP surrounding areas consist mostly of agricultural and cattle ranching, with emphasis on coffee and cattle farming, as well as a recent growth in areas destined to silviculture. Activities with potential negative impacts for the CNP are performed in surrounding areas, i.e. the use of pesticides, irregular deforestation for expanding agricultural areas (ICMBIO 2015). We also highlight anthropogenic pressures that may cause ecological unbalance in the park, such as unauthorized hunting, illegal extraction of palm hearts (*Euterpe edulis* Mart.), and the occurrence of forest fires (personal observation).

Floristic expeditions were concentrated in the Santa Marta valley (central point in the sampling area: 20º29'27,7"S 41º45'15,6W), located in the municipality of Ibitirama - ES. The valley has an elevation range from 870 and 2480 m (Figure 1). Vegetation types reported to the area are Montane and Upper Montane Dense Ombrophilous Forests, according to the classification by IBGE (2012). The weather in the Ibitirama municipality is defined as Cwb according to the Köppen classification, adapted to Brazil by Alvares et al. (2013), being characterized as humid subtropical with dry winters and mild summers, and the region has annual precipitation of 1,284 mm and average annual temperatures of 16.8 ºC.

The vegetation in the beginning of the valley at lower elevation has different forest succession stages due to its wood extraction past, also presenting exotic/invading species (i.e. *Eriobotrya japonica* (Thunb.) Lindl.), representing one of the exotic species that exist inside the protected area (Field observation; not collected). The signs of anthropogenic activity are reduced throughout the valley, given that the vegetation is extremely preserved in the highest areas and with an observed great presence of epiphytes (personal observation).

1.2 Data collection

We performed botanic expeditions between 2012 and 2017 to collect specimens comprising all life forms in order to compose the floristic listing to the Santa Marta valley (CNP). We collected fertile plant samples along trails using the walk-over survey method (Filgueiras et al. 1994), as well as samples in plots, covering an elevation gradient of around 700 m (900-1,600 m). We identified the species through pertinent literature as dichotomous keys of regional floras (*e.g.*, Wanderley et al. 2005, 2012, Melhem et al. 2007, Martins et al. 2009) and compared our materials to images available in virtual herbaria such as the Herbário Virtual - Reflora (http://reflora.jbrj.gov.br/reflora/herbarioVirtual/) and the Jabot (http://jabot.jbrj.gov.br/v2/consulta.php). Duplicates were sent to group experts at BHCB, CEPEC, HUFSJ, RB, SPSF, and UPCB

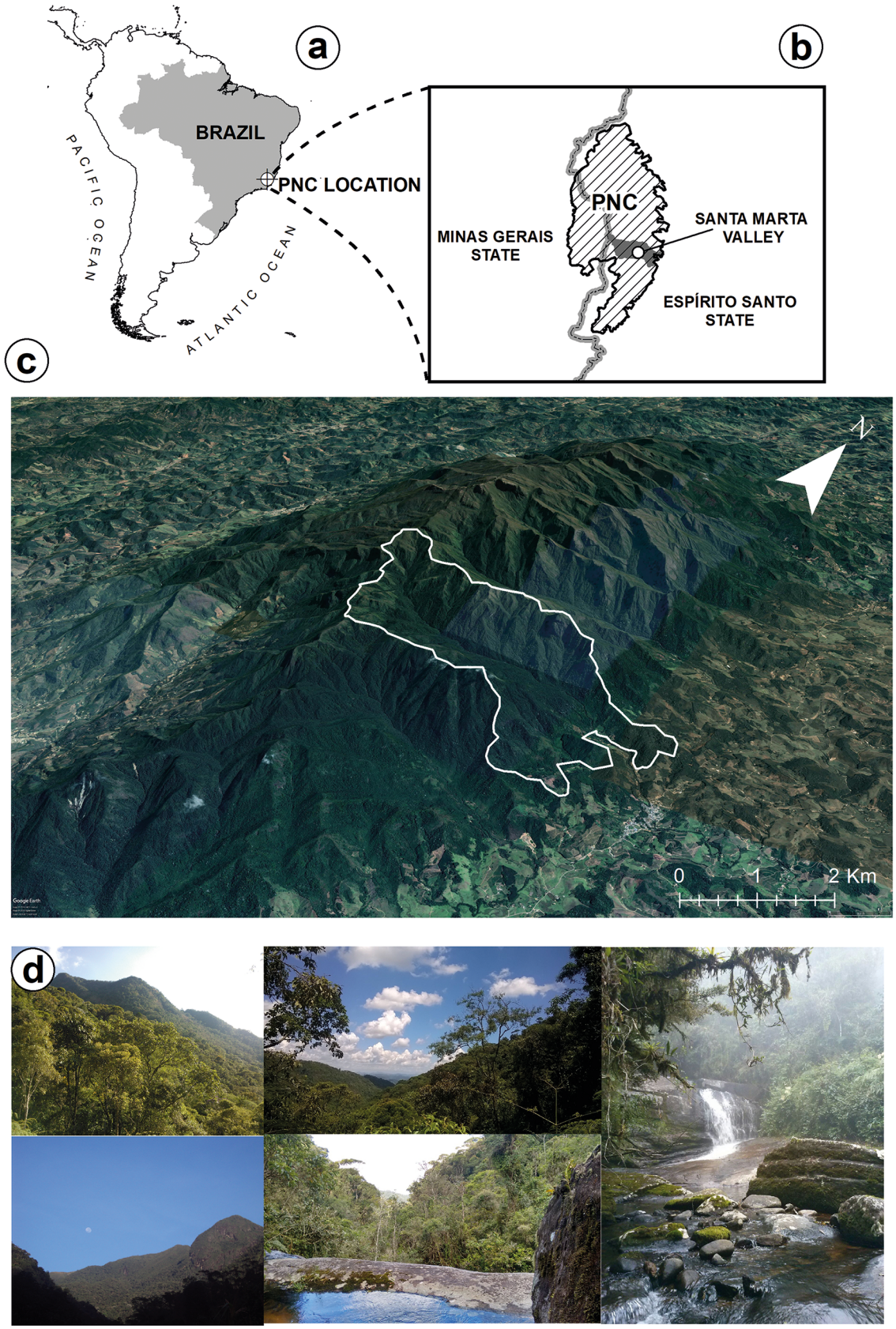

Figure 1. Location map (a; b), relief representation (c), and pictures (d) of the Santa Marta valley, Caparaó National Park (PNC), Brazil. Photo: Araujo, E.A.

herbaria – acronyms according to Thiers (2019) – for confirmation of the species. We have incorporated the specimens in the collection of the VIES and CAP Herbaria. In addition, sterile materials from plot sampling were included in the listing. These were reviewed by experts in their respective families and deposited in a didactic collection of CAP Herbaria. The exotic / invasive species were disregarded in this study. We try to keep a distance from the collection points of any area of human interference and therefore we prioritize including only native species.

Botanical families were classified according to the system proposed by the Angiosperm Phylogeny Group (APG IV 2016) for angiosperms, The Pteridophyte Phylogeny Group (2016) for ferns and lycophytes, and Christenhusz et al. (2011) for gymnosperms. We confirmed name orthography, authorship and synonyms through consulting "Flora do Brasil" 2020 online (<http://floradobrasil.jbrj.gov.br/>), complementing it with data from the online platform of the Missouri Botanical Garden (http://www.tropicos.org) and The Plant List (http://www.theplantlist.org/).

Potentially threatened species were verified in the following lists: a) Red List of Espirito Santo state (Fraga et al. 2019); b) Red List of Flora of Brazil/CNC Flora (Martinelli & Moraes 2013; CNCFlora 2018); and c) The IUCN Red List of Threatened Species (IUCN 2017). New records of species from Espírito Santo state were compiled after the confirmation of group experts, as well as its verification in the database of the "Flora do Brasil" 2020 online (<http://floradobrasil.jbrj.gov.br/>) and Carrijo et al. (2020).

Results

We catalogued 361 species of vascular plants (Figure 2, Table 1) in the Santa Marta river valley, belonging to 78 botanical families (70 angiosperms and eight ferns and lycophytes), and 181 genera. The families with highest species richness were Melastomataceae (41 spp.) Lauraceae and Myrtaceae (30), Orchidaceae (26), Rubiaceae (24), Asteraceae (20), Piperaceae (15), Solanaceae (15) and Bromeliaceae (12), which altogether sum 59% of all compiled species. The most well represented genera regarding number of species were: *Miconia* (23 spp.), *Ocotea* (18), *Myrcia* (12), *Psychotria* (9), and *Eugenia, Mikania*, *Peperomia* and *Leandra* (8).

We found 3 new records for the State of Espírito Santo: *Alsophila salvinii* Hook. (Cyatheaceae); *Pleroma foveolatum* (Naudin) Triana; (Melastomataceae); *Pilea hilariana* Wedd. (Urticaceae), and three possible new species that are under investigation *(Psychotria* sp., *Sloanea* sp. and *Solanum* sp.*)*, which are recent taxonomic discoveries and are being described.

Our results have also pointed out the existence of 43 species (12%) listed as threatened of extinction on The IUCN Red List of Threatened Species, in the Red Book of Brazilian Flora, and on the list of endangered flora species in the State of Espírito Santo (Table 1). The families that have the highest number of species categorized as threatened of extinction were: Myrtaceae (7 spp.), Lauraceae (6), Melastomataceae and Orchidaceae (5), Begoniaceae and Monimiaceae (4).

Based on our field observations during the inventory process, it was possible to notice a gradual change in the plant community throughout the valley (data on the ecology of plant communities are being published). To exemplify this differentiation, we observed some species occurring restrictedly at certain elevation, such as *Alsophila setosa* Kaulf., *Cupania ludowigii* Somner & Ferrucci, *Euterpe edulis* Mart. and *Sorocea bonplandii* (Baill.). W. C. Burger et al. that were only observed between approximately 1,100 m and 1,400 m of altitude, while species such as *Baccharis oblongifolia* (Ruiz & Pav.) Pers., *Miconia longicuspis* Cogn., *M. molesta* Cogn., and *Weinmannia pinnata* L. only occurred in elevations above 1,400 m. Some species were observed throughout the whole sampled altitude range, e.g., *Alchornea triplinervia* (Spreng.) Müll.Arg., *Cyathea atrocastanea* Labiack P.E. et Matos F.B., *Dendropanax cuneatus* (DC.) Decne. & Planch., *Myrcia splendens* (Sw.) DC., and *Myrsine gardneriana* A.DC. Species such as *Bathysa australis* (A.St-Hil.) K.Schum. and *Leandra melastomoides* Raddi mainly occurred in low elevations (1,000 m), especially in areas close to water streams. *Maxillaria caparaoensis* Brade is an endemic species to the CNP, with few sheets deposited in herbaria. *Cyathea atrocastanea* Labiack P.E. et Matos F.B. and *Vochysia santaluciae* M.C. Vianna & Fontella are endemic species of Espírito Santo, originally described for the Estação Biológica de Santa Lúcia in the Santa Teresa region.

Discussion

The new records for the state of Espírito Santo revealed in our study reflects the history of research efforts in certain places regarding the flora of the state (Carrijo et al. 2020, Dutra et al. 2015, Araújo et al. 2018), especially for montane environments. Our data show that the Santa Marta Valley houses 20.2% (361 species) of the vascular plants from CNP (Carrijo et al. 2020), in addition our list includes 88 species of local flora not yet documented, representing an increase of approximately 1%. These knowledge gaps make it harder to map the species and biodiversity distribution correctly, and makes delimitation of endemic areas imprecise, being one of the main obstacles to obtain actual understanding and to establish proper plans for biodiversity conservation (Hopkins 2007, Oliveira et al. 2016). Our findings are relevant for contributing to filling this knowledge gap about the flora in the state, in addition to helping to reduce the current lack of knowledge on the biodiversity in certain locations within Brazilian protected areas (Oliveira et al. 2017).

We have also registered the third known occurrence of *Freziera atlantica* Zorzanelli & Amorim (Pentaphylacaceae). This specie was described in 2016 with samples collected in the Papuã Mountains-BA and in the Valentim Mountains-ES (Zorzanelli et al. 2016), given that these mountains belong to the surrounding areas of the Caparaó Mountains. We have also included a species for the recently described science, *Myrcia altomontana* Sobral & Zorzanelli (Myrtaceae) (Sobral et al. 2017) in our list.

Plant communities of montane ecosystems usually present higher rates of endemism than ecosystems of lower elevations (Gentry 1995), which makes the diversity in these places more vulnerable to climate change due to the specialization degree developed by the species colonizing these environments (Eller et al. 2015, 2016). Expanding knowledge on montane environments has been increasingly important as a support to avoid species loss (Bertoncello et al. 2011).

This list was performed in an area defined by the Brazilian government as priority for the conservation and with extremely high biological importance (MMA 2007). It is one of the first listings for vascular plants in forests above 1000 m in Espírito Santo state. Our

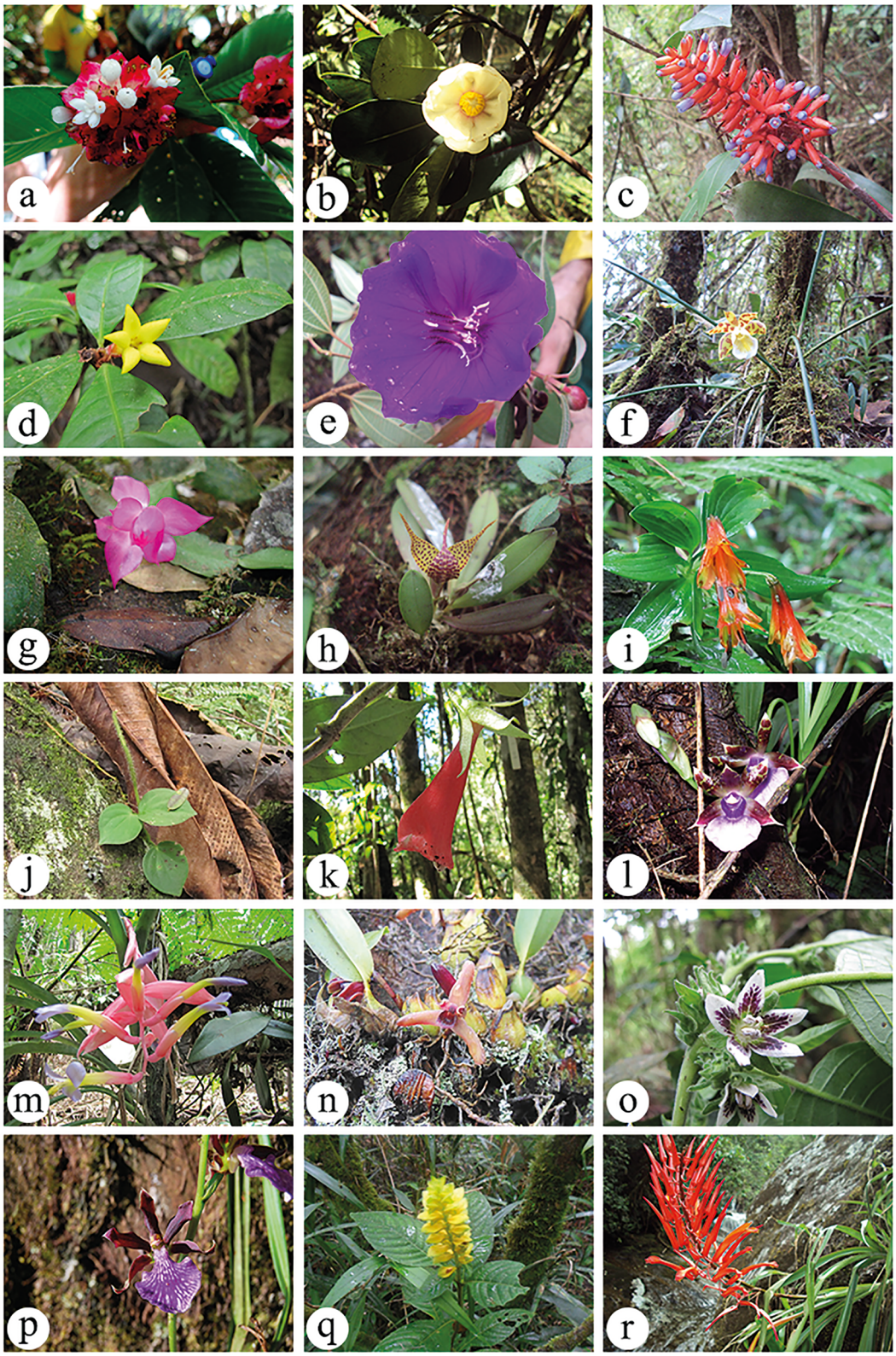

Figure 2. Sample of the vascular plants diversity collected in the Santa Marta valley, Caparaó National Park. (a) *Psychotria bracteocardia* (DC.) Müll.Arg. (Rubiaceae); (b) *Clusia criuva* Cambess. (Clusiaceae); (c) *Aechmea coelestis* (K.Koch) E.Morren (Bormeliaceae); (d) *Psychotria nuda* (Cham. & Schltdl.) Wawra (Rubiaceae); (e) *Pleroma foveolatum* (Naudin) Triana (Melastomataceae); (f) *Scuticaria hadwenii* (Lindl.) Planch. (Orchidaceae); (g) *Schlumbergera* cf. *kautskyi* (Horobin & McMillan) N.P.Taylor (Cactaceae); (h) *Dryadella crenulata* (Pabst) Luer (Orchidaceae); (i) *Alstroemeria cunha* Vell. (Alstroemeriaceae); (j) *Peperomia urocarpa* Fisch. & C.A.Mey. (Piperaceae); (k) *Nematanthus crassifolius* (Schott) Wiehler (Gesneriaceae); (l) *Zygopetalum maxillare* Lodd. (Orchidaceae); (m) *Billbergia euphemiae* E.Morren (Bromeliaceae); (n) *Maxillaria caparaoensis* Brade (Orchidaceae); (o) *Athenaea martiana* Sendtn. (Solanaceae); (p) *Zygopetalum mackayi* Hook. (Orchidaceae); (q) *Staurogyne anigozanthus* (Nees) Kuntze (Acanthaceae); (r) *Pitcairnia flammea* Lindl. (Bromeliaceae). Photos: Araujo, E.A.

Table 1. List of vascular plant species collected in the Santa Marta valley Caparaó National Park, organized by group and plant family, scored for category of threat (DD = Data Deficient; LC = Least Concern; NT = Near Threatened; VU = Vulnerable; EN = Endangered; CR = Critically Endangered). * New records for the State of Espírito Santo; ** Possible new species that are under investigation. The acronym CAP (Herbarium "Capixaba"), where sterile specimens were deposited in a didactic collection, does not have a voucher number. The other with voucher were all deposited in herbaria VIES and CAP.

		Red lists		
GROUP / Family / *Species*	**Voucher**	**IUCN**	**CNCFlora**	**ES Red List**
ANGIOSPERMS				
Acanthaceae				
Aphelandra longiflora (Lindl.) Profice	Dias 666; Zorzanelli 25		LC	LC
Mendoncia velloziana Mart.	Dias 612			LC
Staurogyne anigozanthus (Nees) Kuntze	Araújo 154; Dias 747		NT	EN
Alstroemeriaceae				
Alstroemeria cf. cunha Vell.	Dias 589, 720, 765			
Amaryllidaceae				
Hippeastrum aulicum (Ker Gawl.) Herb.	Dias 727			NT
Annonaceae				
Guatteria pohliana Schltdl.	Araújo 119, 202, 204, 221		NT	
Aquifoliaceae				
Ilex cf. *chamaedryfolia* Reissek	Araújo 254, 272			
Ilex cf. *dumosa* Reissek	Araújo 265, 275			
Ilex cf. theezans Mart. ex Reissek	Araújo 267			
Araceae				
Anthurium gladiifolium Schott	Dias 706			
Anthurium scandens (Aubl.) Engl. *subsp*. scandens	Araújo 525			LC
Araliaceae				
Dendropanax cuneatus (DC.) Decne. & Planch.	Araújo 73; Campanharo 28		LC	
Schefflera calva (Cham.) Frodin & Fiaschi	Araújo 264, 488		LC	LC
Arecaceae				
Euterpe edulis Mart.	CAP		VU	VU
Geonoma schottiana Mart.	Araújo 28; Dias 762		LC	LC
Asteraceae				
Austroeupatorium inulaefolium (Kunth) R.M.King & H.Rob.	Araújo 144; Zorzanelli 557			
Baccharis oblongifolia (Ruiz & Pav.) Pers.	Araújo 490, 491			LC
Bidens cf. *segetum* Mart. ex Colla	Dias 616			
Cyrtocymura cf. scorpioides (Lam.) H.Rob.	Dias 755			
Exostigma rivulare (Gardner) G.Sancho	Araújo 148			
Mikania argyreiae DC.	Araújo 497		VU	LC
Mikania conferta Gardner	Dias 723			LC
Mikania cf. *hoffmanniana* Dusén	Araújo 499			
Mikania hirsutissima DC.	Araújo 146, 151			LC
Mikania lanuginosa DC.	Araújo 205			LC
Mikania lindbergii Baker	Dias 700		LC	LC
Mikania stylosa Gardner	Dias 702			
Mikania trinervis Hook. & Arn.	Araújo 489		LC	LC

continuation...

Piptocarpha leprosa (Less.) Baker	Araújo 173, 485			LC
Piptocarpha macropoda (DC.) Baker	Araújo 174, 492; Campanharo 13			LC
Piptocarpha ramiflora (Spreng.) Baker	Araújo 500, 501			LC
Verbesina cf. *glabrata* Hook. & Arn.	Araújo 362			
Vernonanthura discolor (Spreng.) H.Rob.	Araújo 494, 555; Pinto-Júnior 85			LC
Vernonanthura divaricata (Spreng.) H.Rob.	Araújo 161, 560			LC
Vernonanthura phaeoneura (Toledo) H.Rob.	Araújo 493			
Begoniaceae				
Begonia altamiroi Brade	Araújo 283		EN	DD
Begonia angularis Raddi	Araújo 147		LC	LC
Begonia convolvulacea (Klotzsch) A.DC.	Zorzanelli 525			LC
Begonia digitata Raddi	Dias 673; Zorzanelli 542			LC
Begonia cf. huegelii (Klotzsch) A.DC.	Zorzanelli 524			
Begonia integerrima Spreng.	Araújo 145, 156; Zorzanelli 735		LC	LC
Begonia valdensium A.DC.	Zorzanelli 717		LC	LC
Bromeliaceae				
Aechmea coelestis (K.Koch) E.Morren	Dias 619; Araújo 239, 523			LC
Aechmea lamarchei Mez	Zorzanelli 740			LC
Billbergia euphemiae E.Morren	Araújo 517; Zorzanelli 830			LC
Neoregelia farinosa (Ule) L.B.Sm.	Araújo 518			VU
Nidularium antoineanum Wawra	Zorzanelli 707			EN
Pitcairnia flammea Lindl.	Araújo 573			LC
Quesnelia kautskyi C.M.Vieira	Dias 771; Zorzanelli 556, 726		VU	LC
Tillandsia gardneri Lindl.	Araújo 550		LC	LC
Vriesea carinata Wawra	Araújo 524		LC	LC
Vriesea heterostachys (Baker) L.B.Sm.	Araújo 106; Dias 618, 732; Zorzanelli 706			LC
Vriesea paraibica Wawra	Dias 617			VU
Vriesea ruschii L.B. Sm.	Araújo 40			LC
Cactaceae				
Rhipsalis elliptica G.Lindb. ex K.Schum.	Zorzanelli 720	LC	LC	VU
Schlumbergera cf. *kautskyi* (Horobin & McMillan) N.P.Taylor	Araújo 569			
Campanulaceae				
Lobelia thapsoidea Schott	Araújo 143			LC
Siphocampylus aff. *longipedunculatus* Pohl	Araújo 155; Zorzanelli 725			
Cannaceae				
Canna cf. *paniculata* Ruiz & Pav.	Zorzanelli 722			
Celastraceae				
Maytenus longifolia Reiss. ex Loes.	Araújo 69			LC
Monteverdia cestrifolia (Reissek) Biral	Araújo 76, 135			

continuation...

Monteverdia schummaniana (Loes.) Biral	Araújo 33			
Salacia elliptica (Mart.) G.Don	Araújo 112			LC
Chloranthaceae				
Hedyosmum brasiliense Mart. ex Miq.	Araújo 51, 509; Campanharo 22			LC
Clethraceae				
Clethra scabra Pers.	Campanharo 21; Dias 879		LC	LC
Clusiaceae				
Clusia arrudea Planch. & Triana ex Engl.	Araújo 215			
Clusia organensis Planch. & Triana	Araújo 130, 531; Dias 697		LC	LC
Tovomitopsis saldanhae Engl.	Dias 770			CR
Commelinaceae				
Dichorisandra hexandra (Aubl.) C.B.Clarke	Araújo 60			LC
Cunoniaceae				
Lamanonia ternata Vell.	Araújo 164, 563; Campanharo 16			LC
Cyperaceae				
Scleria cf. *panicoides* Kunth	Zorzanelli 520			
Dichapetalaceae				
Stephanopodium organense (Rizzini) Prance	Araújo 541; Zorzanelli 554			
Elaeocarpaceae				
Sloanea hirsuta (Schott) Planch. ex Benth.	Araújo 111, 570; Dias 842		LC	LC
Sloanea sp.**	Araújo 213			
Ericaceae				
Gaylussacia cf. *martii* Meisn.	Araújo 564			
Euphorbiaceae				
Alchornea triplinervia (Spreng.) Müll. Arg.	Campanharo 14, 25			LC
Croton salutaris Casar.	Araújo 31, 32; Campanharo 15			LC
Tetrorchidium parvulum Müll. Arg.	Araújo 511; Zorzanelli 549			DD
Fabaceae				
Chaetocalyx scandens (L.) Urb.	Araújo 61	LC		
Copaifera trapezifolia Hayne	Campanharo 18			LC
Inga marginata Willd.	Dias 668	LC		LC
Inga platyptera Benth.	Araújo 559	EN	VU	EN
Inga schinifolia Benth.	Araújo 263, 466, 558			
Machaerium declinatum (Vell.) Stellfeld	Araújo 131			LC
Senna multijuga (Rich.) H.S.Irwin & Barneby	Araújo 15; Dias 667			LC
Gentianaceae				
Macrocarpaea glaziovii Gilg	Araújo 136; Zorzanelli 823			VU
Senaea janeirensis Brade	Araújo 522		EN	
Gesneriaceae				

continuation...

Nematanthus crassifolius (Schott) Wiehler	Dias 748, 836; Zorzanelli 739, 821		LC	LC
Paliavana prasinata (Ker Gawl.) Benth.	Araújo 138; Dias 691			LC
Sinningia cooperi (Paxton) Wiehler	Araújo 568		LC	EN
Sinningia magnifica (Otto & A.Dietr.) Wiehler	Dias 589B		LC	LC
Heliconiaceae				
Heliconia angusta Vell.	Zorzanelli 1587		LC	LC
Hypoxidaceae				
Hypoxis decumbens L.	Dias 677			LC
Lauraceae				
Aiouea saligna Meisn.	CAP			LC
Cinnamomum glaziovii (Mez) Kosterm.	Dias 662			
Cinnamomum triplinerve (Ruiz & Pav.) Kosterm.	CAP		LC	
Endlicheria paniculata (Spreng.) J.F.Macbr.	CAP			LC
Licaria bahiana Kurz	Araújo 376			LC
Nectandra aff. *barbellata* Coe-Teix.	CAP			
Nectandra aff. *debilis* Mez	CAP			
Nectandra oppositifolia Nees	CAP			LC
Nectandra psammophila Nees	CAP	EN		LC
Ocotea aciphylla (Nees & Mart.) Mez	Araújo 433	LC		LC
Ocotea aff. *bicolor* Vattimo-Gil	CAP			
Ocotea cernua (Nees) Mez	CAP			LC
Ocotea corymbosa (Meisn.) Mez	Araújo 217, 399			DD
Ocotea dispersa (Nees & Mart.) Mez	Araújo 424			LC
Ocotea aff. *floribunda* (Sw.) Mez	CAP			
Ocotea glaziovii Mez	CAP			LC
Ocotea indecora (Schott) Mez	CAP			LC
Ocotea leucoxylon (Sw.) Laness.	Araújo 428			LC
Ocotea longifolia Kunth	CAP			
Ocotea aff. *notata* (Nees & Mart.) Mez	CAP			
Ocotea aff. *nunesiana* (Vattimo-Gil) J.B. Baitello	CAP			
Ocotea aff. *nutans* (Nees) Mez	CAP			
Ocotea odorifera (Vell.) Rohwer	CAP		EN	EN
Ocotea silvestris Vattimo-Gil	CAP		LC	LC
Ocotea aff. *spixiana* (Nees) Mez	CAP			
Ocotea sulcata Vattimo-Gil	CAP			
Ocotea vaccinioides (Meisn.) Mez	Araújo 383			LC
Persea aff. *fusca* Mez	CAP			
Persea aff. *willdenovii* Kosterm.	CAP			
Rhodostemonodaphne macrocalyx (Meisn.) Rohwer ex Madriñán	Araújo 389, 415			LC
Loranthaceae				
Struthanthus salicifolius (Mart.) Mart.	Araújo 253			DD
Malpighiaceae				
Heteropterys aff. *rubiginosa* A.Juss.	Araújo 135			

continuation...

Malvaceae			
Triumfetta semitriloba Jacq.	Araújo 546; Zorzanelli 743		LC
Marcgraviaceae			
Marcgravia polyantha Delpino	Araújo 547		LC
Melastomataceae			
Henriettea cf. *glabra* (Vell.) Penneys, F.A. Michelangeli, Judd et Almeda	CAP		
Leandra acutiflora (Naudin) Cogn.	Dias 670		DD
Leandra amplexicaulis DC.	Araújo 288		LC
Leandra barbinervis (Cham. ex Triana) Cogn.	Araújo 317		DD
Leandra fallax (Cham.) Cogn.	Araújo 42		LC
Leandra melastomoides Raddi	Araújo 18; Dias 592, 699		LC
Leandra multiplinervis (Naudin) Cogn.	Araújo 20		DD
Leandra quinquedentata (DC.) Cogn.	Araújo 233, 256, 350		
Leandra xanthostachya Cogn.	Araújo 289		DD
Meriania tetramera Wurdack	Araújo 346; Campanharo 8	NT	LC
Miconia cf. *atlantica* Caddah & R. Goldenb.	CAP		
Miconia budlejoides Triana	Araújo 349		LC
Miconia chartacea Triana	Dias 739		LC
Miconia fasciculata Gardner	Araújo 327, 359; Dias 761	LC	LC
Miconia flammea Casar.	Araújo 234, 247, 250		LC
Miconia formosa Cogn.	Araújo 331		LC
Miconia goldenbergiana Caddah	CAP		
Miconia cf. *hirtella* Cogn.	Araújo 304		
Miconia ibaguensis (Bonpl.) Triana	Araújo 59; Zorzanelli 518		LC
Miconia laevigata (L.) D.Don	Zorzanelli 1591		
Miconia latecrenata (DC.) Naudin	Araújo 340		LC
Miconia aff. *lepidota* DC.	Araújo 123, 179		
Miconia cf. *paniculata* (DC.) Naudin	Araújo 13, 231		
Miconia ligustroides (DC.) Naudin	Araújo 291		DD
Miconia longicuspis Cogn.	Araújo 77, 85, 229, 310	NT	LC
Miconia molesta Cogn.	Araújo 196, 218, 259		
Miconia aff. *petroniana* Cogn. & Saldanha	CAP		
Miconia cf. *polyandra* Gardner	CAP		
Miconia pusilliflora (DC.) Naudin	Araújo 258, 352; Dias 675		LC
Miconia sellowiana Naudin	Araújo 158, 167, 187, 341, 356		LC
Miconia setosociliata Cogn.	Araújo 357, 372	VU	VU
Miconia tristis Spring	Araújo 128; Zorzanelli 550		
Miconia aff. *valentinensis* Bacci & R.Goldenb.	Araújo 292		
Ossaea angustifolia (DC.) Triana	Araújo 290		LC
Pleiochiton blepharodes (DC.) Reginato et al.	Dias 593	LC	LC
Pleroma arboreum Gardner	Campanharo 24		LC
Pleroma fissinervium Schrank et Mart. ex DC.	CAP		LC

continuation...

Pleroma fothergillii (Schrank et Mat. ex DC.) Triana	Araújo 293			LC
Pleroma foveolatum (Naudin) Triana*	Araújo 262			
Pleroma heteromallum D. Don (D.Don)	Araújo 62			LC
Tibouchina estrellensis (Raddi) Cogn.	Dias 682			LC
Meliaceae				
Trichilia elegans A.Juss.	Araújo 539			
Trichilia hirta L.	Araújo 540		LC	
Monimiaceae				
Macropeplus schwackeanus (Perkins) I.Santos & Peixoto	Araújo 199, 444, 445		VU	
Mollinedia argyrogyna Perkins	CAP	NT	LC	VU
Mollinedia gilgiana Perkins	Araújo 38, 440, 446; Dias 603, 760	CR	LC	LC
Mollinedia cf. *heteranthera* Perkins	CAP			
Mollinedia oligantha Perkins	Araújo 227; Dias 815			CR
Mollinedia puberula Perkins	CAP			VU
Mollinedia salicifolia Perkins	Araújo 562		NT	VU
Mollinedia schottiana (Spreng.) Perkins	Araújo 183; Dias676; Zorzanelli 527			LC
Moraceae				
Sorocea bonplandii (Baill.) W.C.Burger et al.	Araújo 17			LC
Myrtaceae				
Blepharocalyx salicifolius (Kunth) O.Berg	CAP		LC	LC
Calyptranthes brasiliensis Spreng.	CAP			LC
Calyptranthes pulchella DC.	CAP			LC
Campomanesia cf. *phaea* (O.Berg) Landrum	CAP			
Eugenia cf. *candolleana* DC.	CAP			
Eugenia cf. *capitulifera* O.Berg	CAP			
Eugenia involucrata DC.	CAP			LC
Eugenia leonorae Mattos	CAP		EN	
Eugenia nutans O.Berg	CAP		LC	LC
Eugenia cf. *pisiformis* Cambess.	CAP			
Eugenia ramboi D.Legrand	CAP			
Eugenia cf. *rostrata* O.Berg	CAP			
Marlierea cf. *regeliana* O.Berg	CAP			
Myrceugenia miersiana (Gardner) D.Legrand & Kausel	Dias 724	NT	LC	LC
Myrcia altomontana Sobral & Zorzanelli	Dias 710			
Myrcia bergiana O.Berg	Campanharo 12			LC
Myrcia cf. *bicolor* Kiaersk.	CAP			
Myrcia cf. *coelosepala* Kiaersk.	CAP			
Myrcia guianensis (Aubl.) DC.	Dias 751		LC	LC
Myrcia hartwegiana (O.Berg) Kiaersk.	Dias 754			LC
Myrcia lineata (O.Berg) Nied.	Araújo 375; Dias , 753; Zorzanelli 727	VU	EN	LC
Myrcia cf. *oligantha* O.Berg	CAP			

continuation...

Myrcia pubipetala Miq.	CAP	LC	
Myrcia retorta Cambess.	CAP		
Myrcia splendens (Sw.) DC.	Araújo 89, 557; Zorzanelli 552		LC
Myrcia subcordata DC.	Araújo 121, 201		
Myrciaria cf. *floribunda* (H.West ex Willd.) O.Berg	CAP		
Pimenta pseudocaryophyllus (Gomes) Landrum	Araújo 556		
Plinia rivularis (Cambess.) Rotman	Araújo 505		LC
Siphoneugena dussii (Krug & Urb.) Proença	CAP		LC
Nyctaginaceae			
Guapira graciliflora (Mart. ex Schmidt) Lundell	Dias 841		
Ochnaceae			
Ouratea grandiflora (A.DC.) Engl.	Araújo 214		
Ouratea parviflora (A.DC.) Baill.	Araújo 190		
Ouratea vaccinioides (A.St.-Hil. & Tul.) Engl.	Araújo 513		
Onagraceae			
Fuchsia regia (Vell.) Munz	Dias 590	LC	LC
Orchidaceae			
Anathallis sclerophylla (Lindl.) Pridgeon & M.W.Chase	Araújo 549		LC
Brasiliorchis cf. *picta* (Hook.) R.B.Singer et al.	Dias 768		
Brasiliorchis ubatubana (Hoehne) R.B.Singer et al.	Zorzanelli 532		LC
Cattleya cf. *coccinea* Lindl.	Dias 766		
Dryadella crenulata (Pabst) Luer	Araújo 207		
Elleanthus brasiliensis (Lindl.) Rchb.f.	Dias 826		LC
Epidendrum paranaense Barb.Rodr.	Araújo 84	LC	EN
Epidendrum saxatile Lindl.	Dias 813	LC	LC
Eurystyles actinosophila (Barb.Rodr.) Schltr.	Dias 686		LC
Gomesa forbesii (Hook.) M.W.Chase & N.H.Williams	Dias 820		LC
Gomesa cf. *recurva* R.Br.	Araújo 574		
Isochilus linearis (Jacq.) R.Br.	Zorzanelli 523		LC
Maxillaria caparaoensis Brade	Zorzanelli 546		VU
Pabstiella fusca (Lindl.) Chiron & Xim. Bols.	Zorzanelli 834		LC
Pabstiella pseudotrifida L. Kollmann & D. R. Couto	Dias 827		EN
Pabstiella punctatifolia (Barb.Rodr.) Luer	Dias 821		LC
Pogoniopsis nidus-avis Rchb.f. & Warm.	Dias 811		VU
Pogoniopsis schenckii Cogn.	Araújo 193	LC	VU
Prescottia stachyodes (Sw.) Lindl.	Dias 764		LC
Promenaea cf. *xanthina* (Lindl.) Lindl.	Araújo 191; Dias 854		

continuation...

Prosthechea cf. *bulbosa* (Vell.) W.E.Higgins	Dias 672		
Prosthechea pygmaea (Hook.) W.E.Higgins	Zorzanelli 541		LC
Scaphyglottis modesta (Rchb.f.) Schltr.	Zorzanelli 540		LC
Scuticaria hadwenii (Lindl.) Planch.	Araújo 244		VU
Zygopetalum maculatum (Kunth) Garay	Dias 767	LC	LC
Zygopetalum maxillare Lodd.	Araújo 575	LC	EN
Passifloraceae			
Passiflora mediterranea Vell.	Araújo 63		LC
Passiflora aff. *porophylla* Vell.	Dias 828		
Passiflora speciosa Gardner	Araújo 512, 551; Zorzanelli 544		LC
Pentaphylacaceae			
Freziera atlantica Zorzanelli & Amorim	CAP		CR
Peraceae			
Pera glabrata (Schott) Poepp. ex Baill.	Araújo 280, 545		LC
Pera heteranthera (Schrank) I.M.Johnst.	Araújo 544		LC
Phyllanthaceae			
Hyeronima alchorneoides Allemão	Campanharo 29		LC
Piperaceae			
Peperomia alata Ruiz & Pav.	Dias 615, 685; Zorzanelli 521		LC
Peperomia corcovadensis Gardner	Araújo 361; Zorzanelli 729		LC
Peperomia choroniana C.DC.	Araújo 514		EN
Peperomia mandioccana Miq.	Dias 728	LC	VU
Peperomia martiana Miq.	Dias 684		LC
Peperomia tetraphylla (G.Forst.) Hook. & Arn.	Araújo 195, 237; Dias 824		LC
Peperomia tetraphylla var. valantoides (Miq.) Yunck.	Dias 729		LC
Peperomia urocarpa Fisch. & C.A.Mey.	Araújo 37; Dias 611; Zorzanelli 517		LC
Piper aduncum L.	Zorzanelli 829		LC
Piper eucalyptophyllum C.DC.	Dias 604		LC
Piper cf. *lhotzkyanum* Kunth	Araújo 58		
Piper mollicomum Kunth	Araújo 516		LC
Piper richardiifolium Kunth	Araújo 515; Dias 607		LC
Piper strictifolium D.Monteiro & E.F.Guim.	Araújo 565		VU
Piper tectoniifolium Kunth	Araújo 21	LC	LC
Polygalaceae			
Polygala campestris Gardner	Araújo 576		
Primulaceae			
Cybianthus fuscus Mart.	CAP		LC
Cybianthus cf. *obovatus* (Mart.) Mart. ex Miq.	CAP		
Cybianthus peruvianus (A.DC.) Miq.	Araújo 118, 192, 487		LC
Myrsine gardneriana A.DC.	Araújo 109, 159		LC

continuation...

Myrsine hermogenesii (Jung-Mend. & Bernacci) M.F.Freitas & Kin.-Gouv.	CAP		LC
Myrsine lancifolia Mart.	Araújo 278, 278-B		LC
Myrsine umbellata Mart.	Zorzanelli 728		LC
Myrsine villosissima Mart.	CAP	EN	EN
Stylogyne warmingii Mez	CAP		LC
Proteaceae			
Roupala consimilis Mez ex Taub.	Araújo 178, 530		EN
Quiinaceae			
Lacunaria crenata (Tul.) A.C.Sm.	Araújo 521		DD
Rhamnaceae			
Reissekia smilacina (Sm.) Steud.	Araújo 64	LC	LC
Rhamnus sphaerosperma Sw.	Araújo 228, 486, 498	LC	LC
Rubiaceae			
*Amaioua intermedia Mart. ex Schult. & Sc*hult.f.	CAP		LC
Bathysa australis (A.St.-Hil.) K.Schum.	Araújo 98, 482; Dias 605	LC	LC
Bathysa cf. *nicholsonii* K.Schum.	Araújo 481		
Coccocypselum lanceolatum (Ruiz & Pav.) Pers.	Dias 703		
Cordiera cf. *longiflora* (K.Schum.) Kuntze	Araújo 273, 484		
Coussarea cf. *congestiflora* Müll.Arg.	CAP		
Coussarea cf. *nodosa* (Benth.) Müll.Arg.	CAP		
Emmeorhiza umbellata (Spreng.) K.Schum.	Araújo 152		LC
Hillia parasitica Jacq.	Araújo 39; Dias 743	LC	LC
Palicourea longipedunculata Gardner	Araújo 480; Campanharo 1		
Posoqueria cf. *acutifolia* Mart.	CAP		
Posoqueria cf. *latifolia* (Rudge) Schult.	Dias 878		
Psychotria bahiensis DC.	Araújo 81, 225, 242, 266, 475		LC
Psychotria bracteocardia (DC.) Müll. Arg.	Araújo 47		
Psychotria leiocarpa Cham. & Schltdl.	Araújo 474		LC
Psychotria nuda (Cham. & Schltdl.) Wawra	Araújo 12; Dias 595, 694; Zorzanelli 537		
Psychotria pallens Gardner	Araújo 71; Zorzanelli 522		
Psychotria ruelliifolia (Cham. & Schltdl.) Müll.Arg.	Araújo 82; Zorzanelli 745		
Psychotria suterella Müll.Arg.	Dias 610		LC
Psychotria vellosiana Benth.	Araújo 75, 78, 169, 170, 483		LC
Psychotria sp.**	Araújo 19		
Rudgea cf. *coronata* (Vell.) Müll.Arg.	CAP		
Rudgea cf. *jasminoides* (Cham.) Müll. Arg.	CAP		
Rudgea cf. *triflora* Benth.	Araújo 133		
Sabiaceae			
Meliosma sellowii Urb.	Araújo 548		LC
Salicaceae			

continuation...

Casearia arborea (Rich.) Urb.	Araújo 542, 543			LC
Sapindaceae				
Allophylus edulis (A.St.-Hil. et al.) Hieron. ex Niederl.	Araújo 72, 536, 537			LC
Allophylus racemosus Sw.	Araújo 538			LC
Cupania ludowigii Somner & Ferrucci	Araújo 535			LC
Paullinia carpopoda Cambess.	Araújo 125			LC
Thinouia mucronata Radlk.	Araújo 561			LC
Sapotaceae				
Micropholis crassipedicellata (Mart. & Eichler) Pierre	Araújo 211, 216	NT	LC	LC
Siparunaceae				
Siparuna brasiliensis (Spreng.) A.DC.	Zorzanelli 828		LC	LC
Smilacaceae				
Smilax staminea Griseb.	Araújo 571			
Solanaceae				
Athenaeae cuspidata (Witasek) I.M.C.Rodrigues & Stehmann	Dias 750			
Athenaeae martiana (Sendtn.) I.M.C.Rodrigues & Stehmann	Araújo 97, 120; Dias 749; Zorzanelli 831			
Athenaeae picta (Mart.) I.M.C.Rodrigues & Stehmann.	Zorzanelli 719			
Brunfelsia brasiliensis (Spreng.) L.B.Sm. & Downs	Araújo 189; Campanharo 27			LC
Capsicum mirabile Mart.	Dias 713			
Cestrum bracteatum Link & Otto	Dias 614, 692, 846; Zorzanelli 543			LC
Cestrum strigilatum Ruiz & Pav.	Dias 769			LC
Cestrum subpulverulentum Mart.	Dias 688			LC
Solanum campaniforme Roem. & Schult.	Dias 663			LC
Solanum cinnamomeum Sendtn.	Araújo 168,528; Campanharo 4; Dias 690	NT	LC	LC
Solanum didymum Dunal	Zorzanelli 528			LC
Solanum leucodendron Sendtn.	Araújo 163, 175, 529	NT	LC	LC
Solanum pseudoquina A.St.-Hil.	Campanharo 26		LC	LC
Solanum swartzianum Roem. & Schult.	Dias 722			LC
Solanum sp.**	Araújo 200			
Symplocaceae				
Symplocos estrellensis Casar.	Araújo 70, 132			
Theaceae				
Laplacea fruticosa (Schrad.) Kobuski	Araújo 532, 533	LC		LC
Thymelaeaceae				
Daphnopsis fasciculata (Meisn.) Nevling	Araújo 124			LC
Urticaceae				
Pilea hilariana Wedd.*	Araújo 235		NT	
Verbenaceae				
Lantana camara L.	Zorzanelli 545			LC
Vitaceae				

continuation...

Cissus cf. *tinctoria* Mart.	Araújo 65		
Vochysiaceae			
Vochysia angelica M.C.Vianna & Fontella	Araújo 53	EN	EN
Vochysia bifalcata Warm.	CAP		DD
Vochysia glazioviana Warm.	Araújo 519		
Vochysia cf. *oppugnata* (Vell.) Warm.	CAP		
Vochysia santaluciae M.C.Vianna & Fontella	Araújo 520	EN	EN
Winteraceae			
Drimys brasiliensis Miers	Araújo 203, 223; Dias 736	LC	LC
FERNS AND LYCOPHYTES			
Anemiaceae			
Anemia mandioccana Raddi	Araújo 27, 188; Dias 599; Zorzanelli 536		LC
Anemia phyllitidis (L.) Sw.	Araújo 26		LC
Aspleniaceae			
Asplenium gastonis Fée	Zorzanelli 733		
Asplenium cf. *harpeodes* Kunze	Zorzanelli 515		
Asplenium scandicinum Kaulf.	Araújo 572		
Blechnaceae			
Neoblechnum brasiliense (Desv.) Gasper & V.A.O. Dittrich	Zorzanelli 736		LC
Cyatheaceae			
Alsophila salvinii Hook.*	Araújo 502		DD
Alsophila setosa Kaulf.	Araújo 534, 552, 553		LC
Cyathea atrocastanea Labiack P.E. et Matos F.B.	Araújo 94, 96, 186		EN
Cyathea corcovadensis (Raddi) Domin	Araújo 29; Zorzanelli 553	LC	LC
Cyathea delgadii Sternb.	Araújo 90, 100, 113		LC
Cyathea dichromatolepis (Fée) Domin	Araújo 23, 25		LC
Cyathea phalerata Mart.	Araújo 114, 116, 186B		LC
Cyathea rufa (Fée) Lellinger	Araújo 171, 503, 504		LC
Dennstaedtiaceae			
Blotiella lindeniana (Hook.) R.M.Tryon	Araújo 209	LC	EN
Marattiaceae			
Eupodium kaulfussii (J.Sm.) J.Sm.	Araújo 22, 554; Zorzanelli 832		LC
Polypodiaceae			
Campyloneurum repens (Aubl.) C.Presl	Zorzanelli 519		
Cochlidium punctatum (Raddi) L.E.Bishop	Zorzanelli 715		LC
Microgramma percussa (Cav.) de la Sota	Zorzanelli 530		LC
Niphidium crassifolium (L.) Lellinger	Araújo 16		LC
Pleopeltis hirsutissima (Raddi) de la Sota	Zorzanelli 822		LC
Serpocaulon fraxinifolium (Jacq.) A.R. Sm.	Araújo 137		
Pteridaceae			
Pteris splendens Kaulf.	Zorzanelli 534		LC

results may thus contribute to real actions for the conservation of biodiversity in the park, given that listings are an important source of basic information for scientists and decision-makers (Ulloa Ulloa et al. 2017), in addition to providing relevant data for the "Flora do Espírito Santo" and "Catálogo de Plantas das Unidades de Conservação do Brasil" Projects (Dutra et al. 2015, Carrijo et al. 2020).

The CNP is one of the few large remnants in the Atlantic Forest, which thereby confers larger potential to keep high rates of biodiversity in relation to other smaller remnants, making it extremely important for species conservation (Oliveira et al. 2017). In a scenario in which protected areas within the Atlantic Forest are mostly small and disconnected (Joppa et al. 2008), our list demonstrates the importance of CNP for the conservation of species, since one of the great challenges for biodiversity conservation in Brazil is to create matrices of protected areas which are large enough for the actual conservation of biological diversity (Rylands & Brandon 2005).

We highlight herein the role played by the CNP in protecting species in montane environments of the Atlantic Forest, as shown in our study (Table 1). Protected areas are indeed the best strategy to reduce deforestation and the extinction of species in tropical regions (Joppa et al. 2008). For example, a recent study in Brazil has demonstrated that protected areas preserve a considerable share of known Brazilian biodiversity (Oliveira et al. 2017).

However, we have mentioned the need for conservation actions that can surpass the CNP limits and to which the importance of local communities, should be recognized to protect forest remnants and maintain the biodiversity in these areas. It is important to have a positive interaction between the protected area and its surrounding areas, since the maintenance of native vegetation close to it contributes to maintaining ecological processes and species richness in protected areas (DeFries et al. 2005). In certain occasions, pressure within the protected area's limits reflect the ones happening in its surrounding areas (Laurance et al. 2012). Thus, affirmative actions taken with surrounding communities of the CNP are essential, aiming to reduce treats such illegal hunting and extraction of native species, especially endangered ones (e.g. *E. edulis*).

The botanical families that have presented the highest richness in our study are also the most rich ones across the Atlantic Forest mountains (Amorim et al. 2009, Pifano et al. 2010, Coelho & Amorim 2014, Meireles et al. 2014, BFG 2018, Dutra et al. 2015, Zorzanelli et al. 2017). In addition to these families, the most representative genera (*Miconia*) in our research usually present high numbers of species in montane and upper montane forests, being the main taxa in these formations (Oliveira-Filho & Fontes 2000). For example, Melastomataceae species are common to the Atlantic Forest, rainforests and more elevated forests (Goldenberg et al. 2012). We highlight the *Miconia* genus, represented in the Santa Marta Valley by almost half of known *Miconia* species known to Espírito Santo (23/55 spp. - 42%) (Bacci et al. 2016). This number shows the significance of the elevation gradient for the wealth and abundance of plant groups, and also reinforces the need to consider it when proposing biodiversity conservation measures for mountains in the Atlantic Forest as center of diversity.

The occurrence of species classified into different endangered degrees enables a basis for conservation actions for these species. According to Moraes et al. (2014), the conservation process of a species categorized as endangered begins with its inclusion on a Red List, and after that moment collective efforts must be made to protect these species. We suggest the adoption of the list of threatened species created by this study as a possibility to guide a better zoning of the park, subsidizing protection actions for the area as a whole.

Our results have indicated high diversity of vascular plants in the Santa Marta valley, municipality of Ibitirama, with presence of species threatened, new records, occurrence of possible new species and the presence of recently described species. These data contribute to the knowledge of the Caparaó National Park Flora, mainly for the Capixaba portion where further research to prospect biological data should be encouraged. Moreover, these results highlight the role played by protected areas, showing that they are an essential strategy for protecting diversity from to extinction threats. As such, the CNP plays an important role for species preservation in montane and upper montane forests in the Brazilian southeast and for biodiversity in the Atlantic rainforest, and efforts must be maintained to mitigate existing conflicts within the territorial limit of the protected area.

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Author Contributions

Eduardo Alves Araújo: Contribution to data collection; Contribution to data analysis and interpretation; Contribution to manuscript preparation.

Sustanis Horn Kunz: Substantial contribution in the concept and design of the study; Contribution to data collection; Contribution to critical revision, adding intellectual content.

Henrique Machado Dias: Substantial contribution in the concept and design of the study; Contribution to data collection; Contribution to critical revision, adding intellectual content.

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Conflicts of interest

The authors declares that they have no conflict of interest related to the publication of this manuscript.

Ethics

The authors declares that the research did not involve humans or clinical trials in this manuscript.

Data availability

The authors inform that all data are available in the SISBIO Database because it was carried out within a federal protected area (National Park).

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