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Ferns and lycophytes from a forest associated with quartzitic rocky outcrops in southern Espírito Santo, Brazil

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ABSTRACT: This study presents a checklist of ferns and lycophytes from a forest associated with quartzitic rocky outcrops in southern Espírito Santo state, Brazil. We recorded 52 species and one hybrid (six lycophytes and 47 ferns) belonging to 15 families and 30 genera. Polypodiaceae, Blechnaceae, Cyatheaceae, and Selaginellaceae are the main representative families. *Selaginella, Cyathea*, *Serpocaulon*, and *Trichomanes* are the main representative genera. Most species are terrestrial (34.6%) and lithophytes (32.6%); epiphytes (14.4%) and species with more than one habit (19%) are scarce. We did not record any hemiepiphytic or scandent species. The region is subject to an intense quartzite mining activity, which poses serious threats to the local biodiversity. Morro Branco (Morro de Sal) was recently the site of new taxonomic discoveries in ferns (*Oleandra quartziticola*) and angiosperms (*Paepalanthus capixaba*), demonstrating the biological relevance of forest fragments associated with quartzitic rocky outcrops in Espírito Santo, and reinforcing the need for the effective protection of these areas.

Key words: floristic inventories, Morro Branco, Morro de Sal, Neotropics, pteridophytes.

RESUMO (Samambaias e licófitas de uma floresta associada a afloramentos rochosos quartzíticos no sul do Espírito Santo, Brasil): Este estudo apresenta uma lista de samambaias e licófitas de uma floresta associada a afloramentos rochosos de quartzito no sul do Espírito Santo, Brasil. Foram registradas 52 espécies e um híbrido (seis licófitas e 47 samambaias) pertencentes a 15 famílias e 30 gêneros. Polypodiaceae, Blechnaceae, Cyatheaceae e Selaginellaceae são as principais famílias, enquanto que *Selaginella, Cyathea* e *Trichomanes* são os principais gêneros. A maioria das espécies são terrestres (34.6%) e litófitas (32.6%). As epífitas (14.4%) e as espécies com mais de um hábito (19%) são escassas. Não foram registradas nenhuma espécie hemiepífita ou escandente. A região está sujeita à uma intensa atividade mineradora de quartzito, a qual apresenta sérios riscos para a biodiversidade local. Morro Branco (Morro de Sal) foi recentemente o local de novas descobertas taxonômicas para samambaias (*Oleandra quartziticola*) e angiospermas (*Paepalanthus capixaba*), demonstrando a relevância biológica dos fragmentos florestais associados aos afloramentos rochosos de quartzito no Espírito Santo e reforçando a necessidade de uma proteção efetiva dessas áreas.

Palavras-chave: inventários florísticos, Morro Branco, Morro de Sal, Neotrópicos, pteridófitas.

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INTRODUCTION

Espírito Santo is a southeastern Brazilian state that harbors a great diversity of plants, including ca. 513 species of pteridophytes (ferns and lycophytes) and more than 5780 species of angiosperms (BFG 2015, Dutra *et al.* 2015, Prado *et al.* 2015). The state is also a center of endemism for certain groups of plants (Prance 1982, Werneck *et al.* 2011), comprising 13 endemic species of pteridophytes and 564 endemic species of angiosperms (BFG 2015, Prado *et al*, 2015).

In the last 10 years, several studies have focused on the cryptogamic flora (e.g., Silva & Piasi 2010, Silva & Bastos 2012, Andrade *et al.* 2016, Sylvestre *et al.* 2016, Schwartsburd *et al.* 2017, Pena *et al.* 2019) and on the phanerogamic flora (e.g., Luber *et al.* 2016, Souza *et al.* 2016, Pena & Alves-Araújo 2017) of Espírito Santo. Although most of these studies were conducted in protected areas (Natural Reserves), there are also unprotected areas that have yielded valuable information about the floristic diversity of the state (Ribeiro *et al.* 2009, Pena *et al.* 2017). According to the Brazilian Ministry of Environment (MMA 2020), the study of unprotected areas is extremely important in the process of recognizing new priority areas for biodiversity conservation.

The landscape of Espírito Santo is often characterized by the presence of large granitic or gneissic rock outcrops (also known as *inselbergs*) that support a peculiar flora (e.g., Esgario *et al.* 2008, 2009, Pena & Alves-Araújo 2017). From the Municipality of Vargem Alta, Brade (1956) described some unique landscapes of quartzitic soil and xeric vegetation that have recently become the site of taxonomic novelties in ferns (*Oleandra quartziticola* Schwartsb. & J.Prado) and angiosperms (*Paepalanthus capixaba* Trovó, Fraga & Sano). In a recent paper describing a new species of Eriocaulaceae, Trovó *et al*. (2016) pointed out that the quartizitic patches in Vargem Alta are now under intense mining activity, with the surrounding forests being quickly replaced by pastures or managed forests. They also highlighted the lack of a conservation unit in this region.

From 2010 to 2020, the number of known ferns and lycophytes ocurring in Espírito Santo has increased from 331 to 513 species (Prado & Sylvestre 2010, Prado *et al.*, 2015). However, there still is a significant gap of knowledge regarding the ferns and lycophytes of quartzitic formations in the state. With the goal of filling this gap, we present a checklist of the ferns and lycophytes occurring in Morro Branco (a.k.a. Morro de Sal), Vargem Alta, Espírito Santo, Brazil.

MATERIAL AND METHODS

The study area is located on the outskirts of Sítio Morro Branco (20°39'31"S and 41°00'34"W), Vargem Alta city, Espírito Santo, Brazil (Figure 1, 2), to which features quartzite rocky outcrops and a mosaic of sandy soils associated by weathering. It is locally known as Morro Branco or Morro de Sal (i.e., White Hill or Salt Hill), due to its white sandy soil that resembles salt. It has about 14 ha, at 600–800 m above sea level. According to the Climate-Data (2020), the climate is humid and mesothermic with average annual rainfall of 1,237 mm and average annual temperature of 20.7°C. Following Köppen & Geiger (1936), the region is classified as Cfa-Cfb, a humid temperate climate with cold and dry winter and hot and wet summer.

Field trips were carried out between 2018–2019, and the collected specimens were deposited at VIC and VIES, which are Brazilian herbaria of Universidade Federal de Viçosa and Universidade

Federal do Espírito Santo, respectively (Thiers 2020). All collected samples were prepared according to the methods proposed by Windisch (1992). For the determination of specimens, we consulted taxonomic monographs (e.g., Tryon 1942, Brade 1964, Tryon & Tryon 1982, Lellinger 1988, Moran 1995a, 1995b, 2000, Sylvestre 2001, Salino & Semir 2002, 2004a, 2004b, Mickel & Smith 2004, Labiak & Prado 2008, Moran *et al*. 2010, Windisch 2014, Dittrich *et al*. 2015, 2018, Viveros & Salino 2015, Heringer *et al*. 2016, Mickel 2016, Schwartsburd *et al.* 2018), and used the herbarium collections of VIC and MBML. The classification system adopted was PPG I (2016), and the names of authors and species were confirmed through IPNI (2020). Species not found in our field trips, but with confirmed occurrence in the area were also included in our checklist (CRIA 2020, Reflora 2020). For verification of the threat status of each species, we followed Sylvestre *et al.* (2019) and IUCN (2020). The final checklist contains information about the habit of each species (epiphytes, lithophytes, terrestrial), and their respective vouchers.

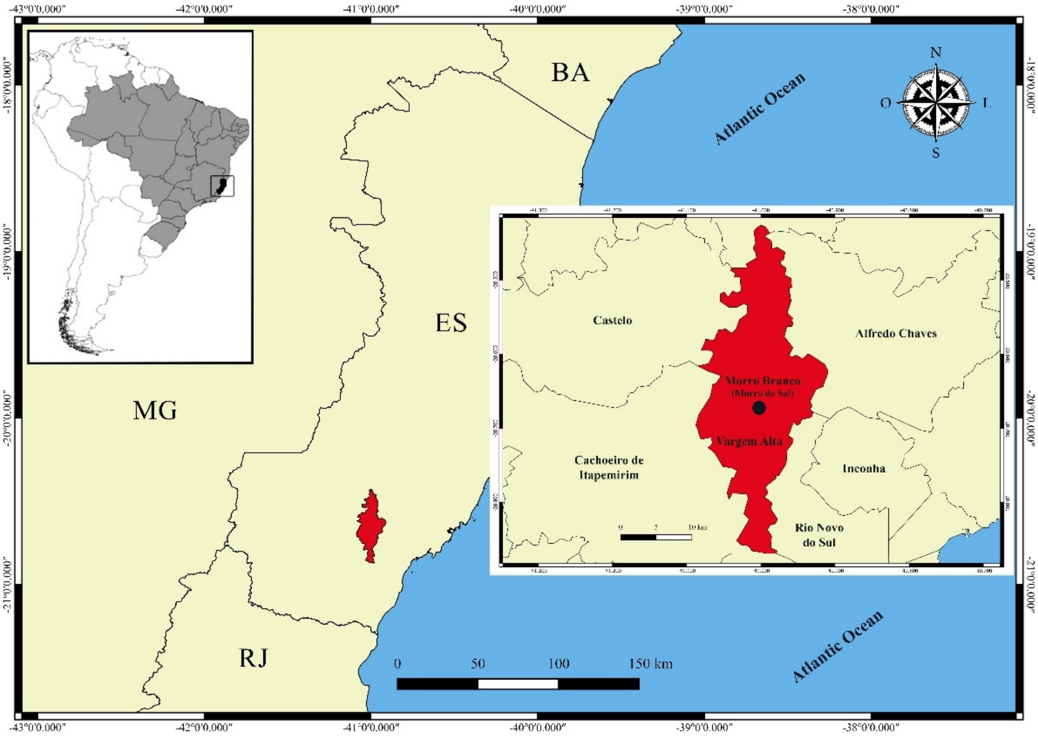

Figure 1. Location map of Morro Branco (Morro de Sal) in Vargem Alta, southern Espírito Santo state, Brazil.

RESULTS AND DISCUSSION

In Morro Branco, we found 52 species and one hybrid, distributed in 30 genera and 15 families of ferns (47 species) and lycophytes (six species) (Table 1; Figures 3, 4). The most representative families are Polypodiaceae J.Presl & C.Presl (12 species), Blechnaceae Newman. (5 spp. and 1 hybrid), Cyatheaceae Kaulf. (5 spp.), and Selaginellaceae Willk (5 spp.). The most representative genera are *Selaginella* P.Beauv. (5 spp.), *Cyathea* Sm., *Serpocaulon* A.R. Sm., and *Trichomanes* L. (4 spp. each).

Among the 53 taxa, 18 spp. (34.6%) are terrestrial, and 17 spp. (32.6%) are litophytic – being these the most representative life forms. Only 8 spp. (14.4%) are epiphyte. Other taxa showed two or more life forms, being terrestrial/lithophytic (17% - 9 spp.) and terrestrial/lithophytic/epiphytic (2% - *Serpocaulon triseriale* (Sw.) A.R.Sm. [Polypodiaceae]).

Figure 2. Images from Morro Branco (Morro de Sal). A. Forest fragment associated with rocks. B. Forest fragment associated with temporary river. C. Forest fragment interior. D. Quartzite soil fragment.

According to Prado *et al.* (2015), *Serpocaulon hirsutulum* (T. Moore) Schwartsb. & A.R. Sm. (Polypodiaceae) had no confirmed occurrence for Espírito Santo. Therefore, we present here the first record of this specie in the state. *Oleandra quartziticola* Schwartsb. & J.Prado is a recently described species (Schwartsburd *et al*. 2016) known only from the type locality. It is therefore a narrow endemic. According to the Flora Ameaçada do Espírito Santo (Sylvestre *et al*. 2019), *Oleandra quartziticola* is critically endangered (CR). Seventeen species are endemic to the Atlantic Forest, and *Macrothelypteris torresiana* (Gaudich.) Ching is the only invasive species recorded there (Table 1; Figure 5).

Asplenium auritum Wall. [*Fontana 7311*, MBML], *Cyathea corcovadensis* Domin [*Assis 4593*, VIES], *Selaginella decomposita* Spring [*Brade 19360*, RB], *Serpocaulon menisciifolium* (Langsd. & Fisch.) A.R.Sm. [*Fiaschi 3557*, MBML] and *Pteris decurrens* C.Presl [*Fontana 7332*, MBML] were incorporated into the checklist based on herbarium specimens that were previously collected at Morro Branco (Morro de Sal).

The landscapes that feature rocky outcrops are very interesting areas. According to Porembski *et al.* (1997a), two or more types of floristic environments can be observed in this kind of formation. Particularly at Morro Branco (Morro de Sal), two types of floristic environments were observed: I. the area of forest surrounding the

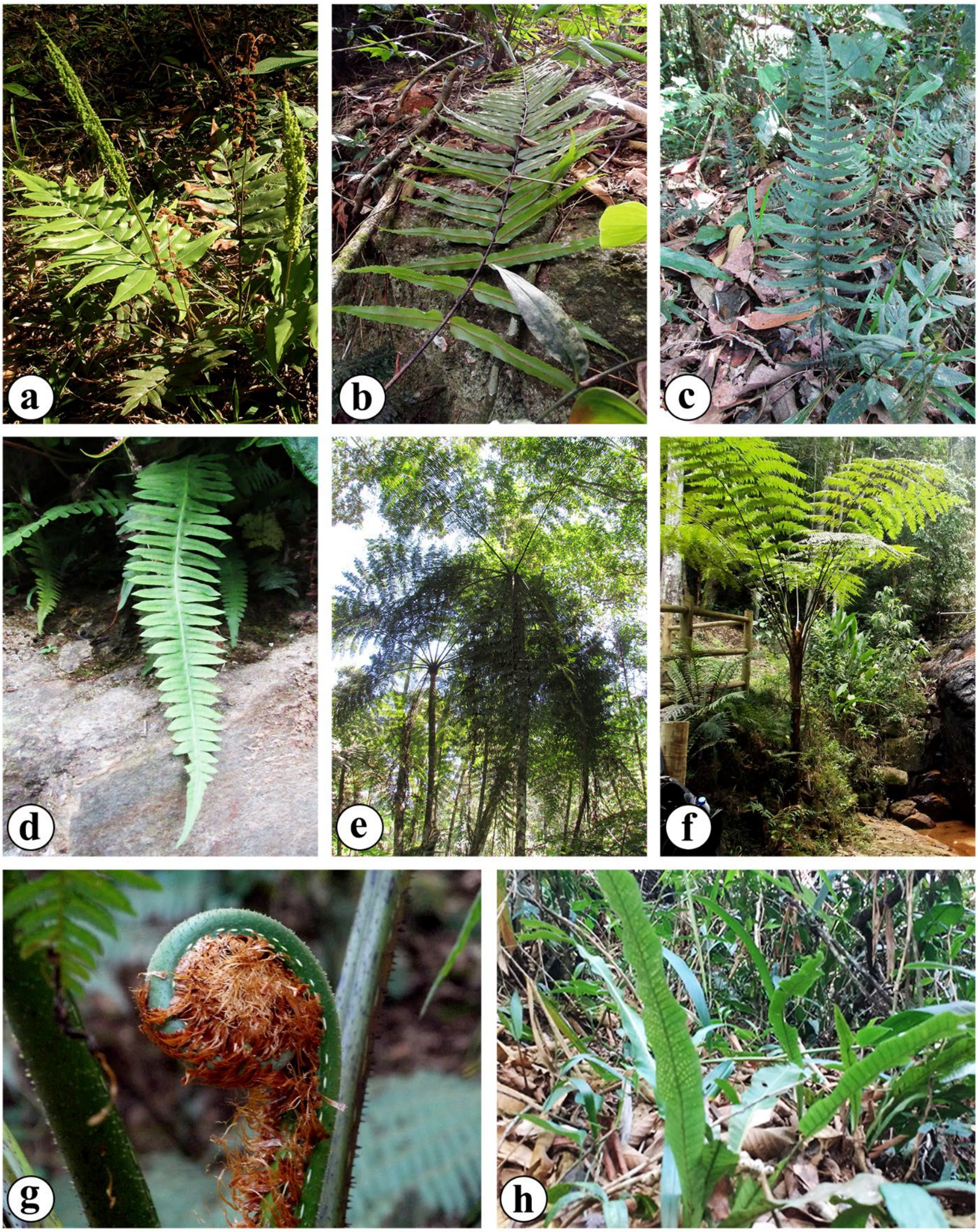

Figure 3. Some fern species collected at Morro Branco (Morro de Sal) in Vargem Alta, southern Espírito Santo, Brazil. A. *Anemia phyllitidis* (Anemiaceae). B. *Asplenium serra* (Aspleniaceae). C. *Blechnum occidentale* (Blechnaceae). D. *Blechnum polypodioides* (Blechnaceae). E. *Cyathea delgadii* (Cyatheaceae). F. *Cyathea phalerata* (Cyatheaceae). G. Crozier of *Cyathea phalerata* (Cyatheaceae). H. *Campyloneurum nitidum* (Polypodiaceae).

quartzitic outcrops is wetter, shaded, and with deep soils that favor the growth of tree ferns and assosiated epiphytes; II. the quartzitic outcrops have islands of vegetation that are formed from crevices in the rock and have lithophytes as the more abundant life form. This last pattern was also found in other studies that investigated the flora of rocky outcrops (e.g., França *et al.* 1997, Caiafa &

Silva 2005, Santos & Sylvestre 2006, Araújo *et al*. 2008, Porembski 2007). Those species that are exclusively terrestrial, along those exclusively lithophytic, represent more than 50% of the ferns and lycophytes in the area. Curiously, some epiphytic

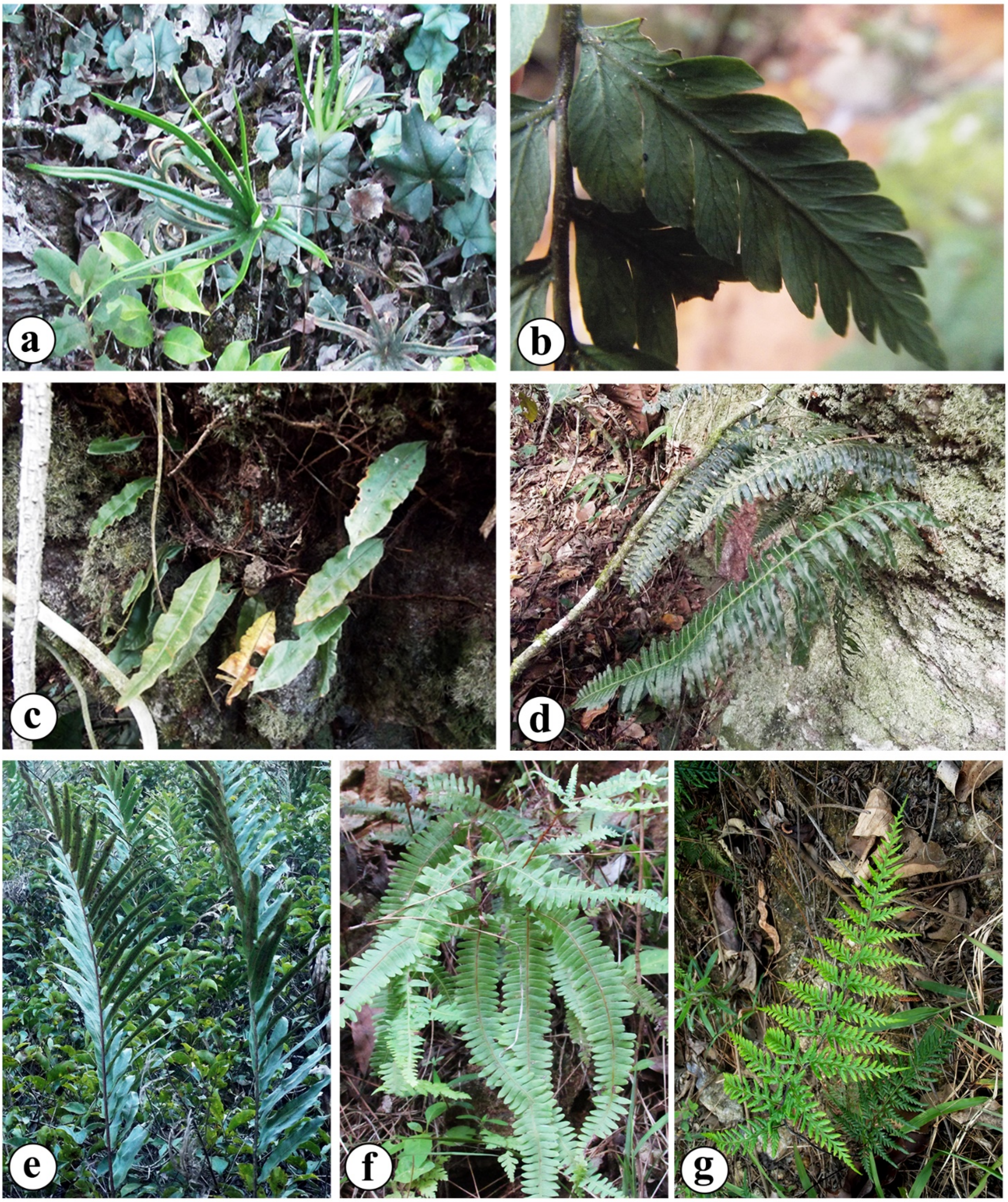

Figure 4. Some fern species collected in Morro Branco (Morro de Sal) in Vargem Alta, southern Espírito Santo, Brazil. A. *Lytoneuron ornithopus* (Pteridaceae). B. *Polybotrya osmundacea* (Dryopteridaceae). C. *Oleandra quartziticola* (Oleandraceae). D. *Pecluma chnoophora* (Polypodiaceae). E. *Serpocaulon triseriale* (Polypodicaeae). F. *Sticherus bifidus* (Gleicheniaceae). G. *Pityrogramma calomelanos* var. *calomelanos* (Pteridaceae).

ferns were found on the trunks of tree ferns (Cyatheaecae Kaulf.), in the vegetation surrounding the quartzitic outcrops. The tree ferns are: *Alsophila sternbergii* (Sternb.) D.S.Conant, *Cyathea corcovadensis* Domin, *C. dichromatolepis* Domin, *C. delgadii* Sternb., *C. phalerata* Mart., and their trunks are substrate to *Asplenium mucronatum* C.Presl (Aspleniaceae), *Trichomanes pilosum* Raddi and *T. polypodioides* L. (Hymenophyllaceae), and *Pecluma filicula* (Kaulf.) M.G.Price (Polypodiaceae). The studies performed by Moran *et al.* (2003) also showed this interesting relationship between epiphytic ferns living on tree fern trunks and two important points are highlighted for this occurrence: I. the root mantle on tree ferns that has the characteristic of being coarse with many interstices provides favorable microhabitats (higher humidity) for the establishment of fern. II. chemistry of the root mantle substance, such as pH and presence of tannins, favors the fern spores germination by inhibiting development of algae and fungi-organisms that compete with fern gametophytes for light, nutrients, and space.

According to Benzing (1987), even though epiphytic species are typically found growing on terrestrial plants, some of these species may have adaptive strategies that make them able to colonize rocks. This is likely the case of *Serpocaulon triseriale* (Sw.) A.R.Sm. (Polypodiaceae), a species with more than one life form. This may also explain the low number of epiphyte species, after all, in the field expeditions, some of these species may have been found only as lithophytes. However, the scarcity of epiphyte species in our checklist may represent negative effect of disturbances on the local diversity of plants, mainly due to habitat loss due to the extraction of quartzite rocks, resulting in secondary forest fragments still in the process of regeneration, and low humidity due to quartzite soils fragments with white sand presenting in the studied area.

The biology of plants growing on quatzitic rock outcrops is still poorly understood. According to Silva (2016), even with the increase of studies in Brazil in the 90's, most studies are focused on granitic-gneissic outcrops, and the botanical groups studied were mainly angiosperms and bryophytes. Regarding ferns and lycophytes, there are few floristic studies focusing on rocky outcrops within the Atlantic Rainforest, and the existing ones were also conducted on granitic-gneissic outcrops (e.g., Santos & Silvestre 2006, Nettesheim *et al*. 2014, Pena *et al.* 2019). Other works like as Schwartsburd & Labiak (2007) and Michelon & Labiak (2013), present occurrence of ferns and lycophytes in sandstone rock formations in their study areas in southern Brazil. Comparing the species of the present study in relation to the studies presented above, the following species have common occurrence:

I. Santos & Silvestre (2006): *Anemia villosa, Macrothelypteris torresiana*, *Microgramma vacciniifolia*, *Palhinhaea cernua, Pityrogramma calomelanos* var. *calomelanos, Pteridium esculentum* subsp. *arachnoideum, Selaginella muscosa,* and *Serpocaulon triseriale*.

II. Nettesheim *et al*. (2014): *Anemia phyllitidis*, *Cyathea corcovadensis, Macrothelypteris torresiana, Neoblechnum brasiliense,* and *Selaginella muscosa*.

III. Pena *et al*. (2019): *Blechnum occidentale*, *Campyloneurum nitidum*, *Macrothelypteris torresiana, Microgramma crispata, Microgramma vacciniifolia, Pityrogramma calomelanos* var. *calomelanos, Selaginella flexuosa* and *Serpocaulon triseriale*.

IV. Schwartsburd & Labiak (2007): *Amauropelta rivularioides*, *Anemia phyllitidis, Blechnum polypodioides, Campyloneurum nitidum, Christella conspersa, Cyathea corcovadensis, C. delgadii, C. phalerata, Macrothelypteris torresiana, Microgramma vacciniifolia, Neoblechnum brasiliense, Palhinhaea cernua, Parablechnum cordatum, Pteridium esculentum* subsp. *arachnoideum, Pteris decurrens, Selaginella decomposita, S. flexuosa, S. muscosa, Sticherus lanuginosus* and *Trichomanes pilosum*.

V. Michelon & Labiak (2013): *Anemia phyllitidis, Amauropelta rivularioides, Asplenium auritum, A. mucronatum, Blechnum occidentale, Blechnum polypodioides, Campyloneurum nitidum, Christella conspersa, Cyathea corcovadensis, C. delgadii, C. phalerata, Lytoneuron ornithopus, Microgramma vacciniifolia, Neoblechnum brasiliense, Palhinhaea cernua, Parablechnum cordatum, Pecluma filicula, Pityrogramma calomelanos* var *calomelanos, Pteridium esculentum* subsp. *arachnoideum, Pteris decurrens, Selaginella flexuosa, Sticherus lanuginosus, Trichomanes pilosum* and *Trichomanes polypodioides.*

Unfortunatelly, there are no studies of ferns and lycophytes from quartzitic formations in the state of Espírito Santo. For this reason, the floristic comparisons made above, contemplate areas with granitic-gneissic and sandstone outcrops, formations that are distinct from the studied area. For areas with granitic-gneissic the floristic similarity was lower and may be related to the characteristics of the rocks. In granitic-gneiss rocks outcrops, boulders associated with deep weathering mantles are observed and most tree species are found among large rocky outcrops. Quartzitic outcrops, on the other hand, are often found with cracks and full soil depressions, those are important features that control soil and vegetation development. In addition, soils developed on granitic rocks are more acidic due to the large amounts of aluminum and iron, and have a slightly higher silt and clay content than soils developed on quartzite (e.g., Porembski *et al.* 1997b, Benites *et al.* 2007).

In relation to studies focused on sandstone formations, there was greater floristic similarity. According to Auler & Piló (2019), quartzites and sandstones are rocks similar in composition (mainly silica), is that quartzites are basically sandstones that have undergone metamorphism, that is, have been subjected to high temperature and pressure. The greater number of similar species among the studied areas with quartzite and sandstone rock formations, may be strongly related to the existing geological similarities, since the soil characteristics influence the floristic composition.

Another important point is that the flora surrounding the rocky outcrops receives the nutrients and water from the outcrop flow, creating a specific feature that houses species different from those at the top of the rock formation (e.g., Sarthou *et al*. 2003, Silva 2016). In this way, floristic studies focused on forest areas covered by rocky outcrops are important for better knowledge of biodiversity, which suffer strong anthropic pressure, and which may reveal new species for science (e.g., Leme *et al.* 2010, Viveros & Salino 2015, Mickel 2016, Schwartsburd *et al.* 2016, Trovó *et al.* 2016).

Table 1. Lycophytes and ferns recorded in Morro Branco (Morro de Sal), Vargem Alta, southern Espírito Santo, Brazil. Life forms: LT = lithophytes; TR = terrestrial; EP = epiphytes. Species endemic to the Atlantic Forest (*).

Taxa	Life form	Voucher	Herbarium
Lycopodiaceae P.Beauv. ex Mirb.			
Palhinhaea cernua (L.) Franco & Vasc.	LT	N.T.L.Pena 699	VIC
Selaginellaceae Willk			
Selaginella contigua Baker*	LT	N.T.L.Pena 695	VIC
Selaginella decomposita Spring*	LT	A.C.Brade 19360	RB
Selaginella flexuosa Spring	LT	N.T.L.Pena 725	VIC
Selaginella muscosa Spring*	LT	N.T.L.Pena 706	VIC
Selaginella producta Baker	LT	N.T.L.Pena 690	VIC
Anemiaceae Link.			
Anemia phyllitidis (L.) Sw.	TR	N.T.L.Pena 714	VIC
Anemia villosa Humb. & Bonpl. ex Willd.	TR	C.V.Miranda 68	VIC
Aspleniaceae Newman.			
Asplenium auritum Wall.	LT	A.P.Fontana 7311	MBML
Asplenium mucronatum C.Presl*	EP	N.T.L.Pena 727	VIC
Asplenium serra Langsd. & Fisch.	LT	C.V.Miranda 72	VIC
Athyriaceae Alston			
Diplazium asplenioides (Kunze) C.Presl*	TR	C.V.Miranda 49	VIC
Blechnaceae Newman.			
Blechnum × confluens Schltdl. & Cham.	TR/LT	N.T.L.Pena 700	VIC
Blechnum occidentale L.	TR/LT	C.V.Miranda 53	VIC
Blechnum polypodioides Raddi	TR/LT	N.T.L.Pena 721	VIC
Lomaridium plumieri (Desv.) C.Presl*	TR	C.V.Miranda 95	VIC
Neoblechnum brasiliense (Desv.) Gasper & V.A.O.Dittrich*	TR	N.T.L.Pena 702	VIC
Parablechnum cordatum (Desv.) Gasper & Salino	TR	N.T.L.Pena 704	VIC
Cyatheaceae kaulf.			
Alsophila sternbergii (Sternb.) D.S.Conant	TR	C.V.Miranda 71	VIC
Cyathea corcovadensis Domin	TR	A.M.Assis 4593	VIES
Cyathea dichromatolepis Domin	TR	C.V.Miranda 71	VIC
Cyathea delgadii Sternb.	TR	N.T.L.Pena 723	VIC
Cyathea phalerata Mart.	TR	C.V.Miranda 76	VIC
Dennstaedtiaceae Lotsy			
Pteridium esculentum subsp. *arachnoideum* (Kaulf.) Thomson	TR	N.T.L.Pena 717	VIC
Dryopteridaceae Herter			
Elaphoglossum hymenodiastrum (Fée) Brade*	LT	N.T.L.Pena 741	VIC
Megalastrum grande (C.Presl) A.R.Sm. & R.C.Moran*	TR	CVMirada 77	VIC

Taxa	Life form	Voucher	Herbarium
Polybotrya osmundacea Humb. & Bonpl. ex Willd.	TR	N.T.L.Pena 731	VIC
Gleicheniaceae C.Presl			
Sticherus lanuginosus (Moric. ex Fée) Nakai	TR/LT	C.V.Miranda 48	VIC
Sticherus bifidus (Willd.) Ching	TR/LT	C.V.Miranda 52	VIC
Sticherus nigropaleaceus (J.W.Sturm) J.Prado & Lellinger*	TR/LT	P.B.Schwartsburd	VIC
Hymenophyllaceae Mart.			
Trichomanes cristatum Kaulf	LT	P.B.Schwartsburd 3523	VIC
Trichomanes elegans Rich.	LT	C.V.Miranda 44	VIC
Trichomanes pilosum Raddi	EP	N.T.L.Pena 708	VIC
Trichomanes polypodioides L.	EP	N.T.L.Pena 693	VIC
Oleandraceae Ching ex Pic.Serm.			
Oleandra quartziticola Schwartsb. & J.Prado*	LT	C.V.Miranda 59	VIC
Polypodiaceae J.Presl & C.Presl			
Campyloneurum atlanticum R.C.Moran & Labiak	LT	N.T.L.Pena 735	VIC
Campyloneurum nitidum C.Presl*	LT	N.T.L.Pena 732	VIC
Microgramma crispata (Fée) R.M.Tryon & A.F.Tryon*	EP	P.B.Schwartsburd 3519	VIC
Microgramma vacciniifolia (Langsd. & Fisch.) Copel.	EP	C.V.Miranda 86	VIC
Pecluma filicula (Kaulf.) M.G.Price*	EP	C.V.Miranda 75	VIC
Pecluma chnoophora (Kunze) Salino & Costa Assis*	LT	N.T.L.Pena 730	VIC
Pleopeltis astrolepis (Liebm.) E.Fourn.	EP	C.V.Miranda 42	VIC
Phlebodium pseudoaureum (Cav.) Lellinger	TR/LT	P.B.Schwartsburd 3520	VIC
Serpocaulon hirsutulum (T.Moore) Schwartsb. & A.R.Sm.*	TR/LT	P.B.Schwartsburd 3527	VIC
Serpocaulon fraxinifolium (Jacq.) A.R.Sm.	EP	N.T.L.Pena 737	VIC
Serpocaulon menisciifolium (Langsd. & Fisch.) A.R.Sm.*	TR/LT	P.Fiaschi 3557	MBML
Serpocaulon triseriale (Sw.) A.R.Sm.	TR/LT/EP	N.T.L.Pena 716	VIC
Pteridaceae Ching			
Lytoneuron ornithopus (Mett. ex Hook. & Baker) Yesilyurt	LT	N.T.L.Pena 711	VIC
Pityrogramma calomelanos (L.) Link var. *calomelanos*	LT	C.V.Miranda 64	VIC
Pteris decurrens C.Presl	TR	A.P.Fontana 7332	MBML
Thelypteridaceae Pic.Serm.			
Amauropelta rivularioides (Fée) Salino & T.E.Almeida	TR	C.V.Miranda 69	VIC
Christella conspersa (Schrad.) Á.Löve & D.Löve	TR	N.T.L.Pena 712	VIC
Macrothelypteris torresiana (Gaudich.) Ching	TR	N.T.L.Pena 697	VIC

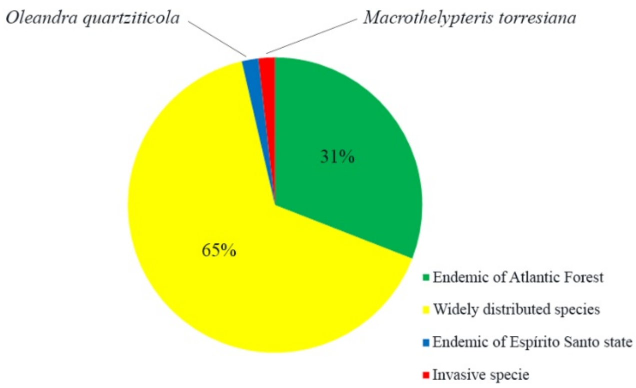

Figure 5. Graph of species occurring in Morro Branco (Morro de Sal) in Vargem Alta, southern Espírito Santo, Brazil.

CONCLUSION

The pteridophytic flora of Morro Branco is considerably different from the flora of the granitic-gneissic inselbergs that have been studied in Espírito Santo. The ongoing mining activities taking place in the area may result in the destruction of the local vegetation, causing the extinction of narrow endemic species, such as *Oleandra quartziticola.* This highlights the relevance of floristic studies, specially outside conservation units, as the one presented here. Such studies may increase the knowledge on the distribution of certain species of ferns and lycophytes, providing subsidies for the creation of priority conservation areas.

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