Piera Ostroski Bellani

DISTRIBUIÇÃO E ANÁLISE BIOGEOGRÁFICA DAS ANGIOSPERMAS ENDÊMICAS DA FLORESTA COSTEIRA DA BAHIA

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Dissertação julgada e aprovada adequada para obtenção do Título de "Mestre" e aprovada em sua forma final pelo Programa de Pós-Graduação em Biologia de Fungos, Algas e Plantas

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Este trabalho é dedicado à minha família

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“Isso é viver, é aprender...
Hakuna Matata!”
(Timão and Pumba, 1994)

RESUMO

A Mata Atlântica é um *hotspot* mundial da biodiversidade devido ao seu alto grau de endemismo e ameaça. Dentro da Mata Atlantica a região mais biodiversa se encontra na região costeira da Bahia, com espécies novas e endêmicas da região sendo frequentemente descritas. A partir da lista de espécies de angiospermas com ocorrência na Bahia, foi determinado quais são aquelas endêmicas da Floresta Costeira da Bahia – uma região que compreende uma faixa de aproximadamente 100 km de extensão ao longo do litoral da Bahia, além do extremo norte do Espírito Santo e alguns municípios do estado de Minas Gerais. Através de registros de herbários, estudo taxonômicos recentes e consultas a especialistas foi compilada uma lista com 547 táxons de angiospermas endêmicos da Floresta Costeira da Bahia. Foi então realizada uma análise de endemismo com todos os registros dessas espécies, que mostrou a presença de diversas áreas de endemismo na região central da Floresta Costeira da Bahia, e algumas áreas de endemismo localizadas ao norte e ao sul da região estudada. Essa concentração de áreas e espécies endêmicas na região central é provavelmente um reflexo não apenas de uma maior presença de espécies endêmicas, mas também de um maior esforço de coleta. Com a finalidade de avaliar se essas áreas de endemismo são devidas a esforço de coleta enviesado e se há outras áreas possivelmente ricas em espécies endêmicas na região, foram elencadas as 41 espécies com mais registros de ocorrência para modelar sua distribuição geográfica potencial. A modelagem apontou regiões com um maior potencial para abrigar espécies endêmicas, especialmente em áreas mais interioranas e ao noroeste da região central, algumas das quais possuem uma demanda urgente de medidas conservacionistas. Esses dados servirão de base para futuros estudos na região, auxiliando na determinação de áreas para futuras expedições científicas, e na determinação de áreas prioritárias para conservação.

Palavras-chave: Áreas de endemismo. Biodiversidade. Conservação. Hotspot. Mata Atlântica. Modelagem de distribuição de espécies. NDM/VNDM.

ABSTRACT

The Atlantic Forest is considered a biodiversity hotspot due to the occurrence of a high number of endemic and threatened species. Within the Atlantic Forest the most biodiverse region lies in coastal Bahia, with new endemic species often being described. Based on a list of angiosperms that occur in Bahia we determined which are endemic to Bahia Coastal Forests – a region that encompasses almost the entire coast of Bahia, including also northern Espírito Santo and a few municipalities from northeastern Minas Gerais. Through herbaria records, recent taxonomic reviews and contact with experts, the final checklist consisted in 547 taxa of angiosperms endemic to Bahia Coastal Forests. Endemicity analyses were carried out with all of these records, revealing the presence of numerous areas of endemism in the central region of Bahia Coastal Forests, and some at northern and southern areas of the study region. This concentration of areas and endemic species is probably a reflex not only of the presence of more endemic species, but also of a higher sampling effort. In order to evaluate if these areas of endemism are due to biased sampling effort, and if there are other likely angiosperm-rich areas in this region, we chose the 41 angiosperms species with more records to model their potential geographic distribution. The model indicated regions with a higher potential to harbor endemic species, like areas that are more inland and northeast of the central region, some of which need conservation actions immediately. Those data can base future studies in the region, helping the selection of areas for future expeditions and deciding priority areas for conservation.

Keywords: Areas of endemism. Atlantic Forest. Biodiversity. Conservation. Hotspot. NDM/VNDM. Species distribution modeling.

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LISTA DE ABREVIATURAS E SIGLAS

AoE: Area of Endemism
BCF: Bahia Coastal Forests
IE: Index of Endemism

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1 INTRODUÇÃO GERAL

A Mata Atlântica é considerada um *hotspot* mundial de biodiversidade, por possuir uma grande riqueza de espécies endêmicas e se encontrar extremamente ameaçada (Myers et al. 2000). É a segunda maior floresta tropical pluvial das Américas, sendo menor apenas que a Floresta Amazônica. A extensão original da Mata Atlântica se dava de forma contínua ao longo da costa brasileira, abarcando também a província de Missiones na Argentina e a parte Leste do Paraguai (Fundação SOS Mata Atlântica 2017). A Mata Atlântica é um dos 8 *hotspots* de biodiversidade mais criticamente ameaçados, já que apenas 11,73% da sua cobertura original está preservada (Ribeiro et al. 2009). Além disso, abriga entre suas espécies de plantas endêmicas 2,7% de todas as espécies de plantas vasculares do mundo (Myers et al. 2000).

Um táxon é considerado endêmico de um local se tem sua ocorrência distribuída apenas no perímetro daquele local (Anderson 1994). Já áreas de endemismo são definidas como limites de distribuição congruente entre diferentes táxons (Morrone 1994) e, por essas áreas abrigarem uma biota singular e exclusiva, são prioritárias para a conservação da biodiversidade (Silva et al. 2004). Há diversas espécies endêmicas da Mata Atlântica, mas elas não se distribuem uniformemente ao longo de sua extensão. Diferentes autores identificaram áreas de endemismo na Mata Atlântica (Thomas et al. 1998; Pinto-da-Rocha et al. 2005; Hoffmeister and Ferrari 2016) e a determinação dessas áreas varia de acordo com os organismos levados em consideração, variando, portanto, de autor a autor (Fiaschi and Pirani 2009). Essas diferenças são devidas não apenas às diferenças entre os grupos estudados, mas também entre as diferentes metodologias empregadas (e.g. análise de endemismo, análise parcimoniosa de endemicidade) e a escala espacial empregada (Hoffmeister and Ferrari 2016).

Um estudo realizado na região central da Mata Atlântica (Saiter et al. 2016) subdividiu esta grande área em função da distribuição geográfica de suas espécies arbóreas e de variáveis ambientais que explicam essa distribuição. Nesse estudo foi proposta uma divisão em três subáreas, a Floresta Krenák-Waitaká (situada no norte do Rio de Janeiro, grande parte do Espírito Santo e uma porção leste de Minas Gerais), a Floresta do Interior da Bahia, e a Floresta Costeira da Bahia. A região compreendida pela Floresta Costeira da Bahia é extremamente rica em sua flora, sendo também reconhecida como área de endemismo para outros grupos de organismos, como anuros (Carnaval et al. 2009), aves (Silva et al. 2004) mirtáceas (Murray-Smith et al. 2009) e espécies arbóreas de angiospermas (Thomas et al. 2003). Nesta área são observadas várias fisionomias de floresta ombrófila, além de florestas semidecíduas, vegetação de restingas e manguezais ao longo dos estuários. Nessa mesma região, em uma amostra de 0,1 ha, foram encontradas 144 espécies arbóreas, a segunda maior riqueza de árvores por área registrada no mundo (Martini et al. 2007). Essa área tem destaque pela presença de táxons tipicamente amazônicos (Aguiar et al. 2005), e também pela grande quantidade de espécies endêmicas, havendo sido relatada a presença de 395 espécies de angiospermas exclusivas da região compreendida entre o sul da Bahia e o norte do Espírito Santo (Thomas et al. 2003).

Apesar da alta biodiversidade registrada, na região também são observados altos índices de desmatamento na Mata Atlântica, apresentando os municípios que mais desmataram recentemente, como Belmonte e Santa Cruz Cabrália (Fundação SOS Mata Atlântica 2017). A criação de unidades de conservação pode ter um impacto positivo na preservação dos remanescentes florestais, entretanto atualmente o Sistema Nacional de Unidades de Conservação (SNUC) não é eficaz na proteção da maior parte de linhagens e espécies endêmicas (Oliveira et al. 2017). Na Mata Atlântica, menos de 2% do território se encontra protegido em unidades de conservação (Tabarelli et al. 2005) e análises feitas para o Corredor Central da Mata Atlântica, que abarca em parte a área de estudo, mostraram que apenas 5% da região se encontra protegida pelo SNUC (Ministerio do Meio Ambiente et al. 2006).

Devido à importância da Floresta Costeira da Bahia e seu alto grau de ameaça, é necessário que decisões voltadas à conservação da sua rica biodiversidade sejam tomadas. Para determinar que áreas devem ser priorizadas para a conservação, é importante que o conhecimento da distribuição geográfica das suas espécies endêmicas seja levado em consideração (Kerr 1997), no entanto até o momento não há uma delimitação de quais são e onde estão distribuídas as espécies de angiospermas endêmicas da Floresta Costeira da Bahia. Nesse trabalho buscou-se determinar quais são essas espécies, quais são as áreas de endemismo nessa região, e quais locais têm uma maior probabilidade de abrigar espécies endêmicas. Cada objetivo se concretizou em um capítulo nessa dissertação, e esses se encontram interconectados. O segundo e terceiro capítulos são produtos de questionamentos realizados no capítulo predecessor. Cada capítulo contribui para a determinação de locais para futuras coletas e para a determinação de áreas prioritárias para a conservação da região.

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3 PRIMEIRO CAPÍTULO

Endemic angiosperms in Bahia Coastal Forests, Brazil: an update using a newly delimited area

Artigo aceito pela revista Biota Neotropica

3.1 INTRODUCTION

The Atlantic Forest is considered a biodiversity hotspot due to the occurrence of a high number of endemic and threatened species (Myers et al. 2000). The natural distribution of the Atlantic Forest was originally continuous along the Brazilian coast and extended to some areas in Argentina and Paraguay (Fundação SOS Mata Atlântica 2013). Nowadays, it is one of the eight most critically endangered hotspots, as only 12,5% of the original forest remains (Fundação SOS Mata Atlântica 2014). Nevertheless, it is the richest Brazilian phytogeographic domain in plant diversity, with 8,728 endemic species of angiosperms (Flora do Brasil 2020, under construction).

Some studies have emphasized the division of the Atlantic Forest in northern and southern regions (Cracraft 1985, Colombi et al. 2010, Martins 2011) with a limit along the Doce river, in the north of Espírito Santo state. The floristic differences between these two regions were highlighted by Oliveira-Filho & Fontes (2000) and Oliveira-Filho et al. (2005), who observed several taxa with Amazonian affinities occuring in the northern region, while taxa with subtropical Andean affinities are mostly found in the southern region (Berry et al. 2004, Santos et al. 2007, Menini Neto et al. 2016). Other authors recognize three main centers of endemism in the Atlantic Forest: northern (Pernambuco and Alagoas states), southern (from Rio de Janeiro to Santa Catarina states), and central (southern Bahia and Espírito Santo states) (Murray-Smith et al. 2009, Thomas et al. 1998).

Recently, Saiter et al. (2016a) divided the central region of the Atlantic Forest in three subregions based on the composition of tree species, indicating the most important abiotic factors affecting that division. Contrary to previous knowledge, the rivers did not play an important role in this division, which lies about 100 km north of the Doce river and is best explained by climatic factors, such as moisture, elevation and temperature (Saiter et al. 2016a). One of the regions, referred to as Bahia Coastal Forests (BCF) by Saiter et al. (2016a), encompasses the northern extreme of Espírito Santo and most of the coast of the state of Bahia. Due to high biodiversity and the incidence of endemic and threatened species, this region has been designated as a hot-point within the Atlantic Forest hotspot (Martini et al. 2007). Many studies to this date on different groups of organisms support this claim, as the region is considered an area of endemism for frogs (Carnaval et al. 2009), birds (Silva et al. 2004), Myrtaceae (Murray-Smith et al. 2009) and trees in general (Thomas et al. 2003).

An estimate of endemic vascular plant species present in two protected areas in southern Bahia showed that the distribution of 59% of the species is restricted to Bahia and Espírito Santo states (Thomas et al. 1998). These results motivated the compilation of a preliminary list of endemic angiosperm species in the region comprising Espírito Santo to the north of the Doce river and the south of Bahia, including inland Seasonal Dry Forests (Thomas et al. 2003) (Figure 3.1a). This list consisted of 395 endemic species of angiosperms in the region (Thomas et al. 2003), among which several are known to occur only in dry forests, such as *Chrysophyllum subspinosum* Monach. (Sapotaceae) and *Colicodendron bahianum* Cornejo & Ilts (Capparaceae). That study reported eigh endemic genera in this area: *Arapatiella* R.S.Cowan, *Brodriguesia* R.S.Cowan and *Harleyodendron* R.S.Cowan (Fabaceae), *Atractantha* McClure, *Anomochloa* Brogn., *Alvimia* Calderón ex Soderstr. & Londoño, and *Sucrea* Soderstr. (Poaceae), and *Trigoniodendron* E.F.Guim & Miguel (Trigoniaceae) (Thomas et al, 2003).

Checklists of endemic taxa are critical to overcome the lack of data that hinder conservation strategies in highly biodiverse regions: 1) basic taxonomic information (Linnean shortfall, or “which species are there?”), and 2) the lack of geographic information (Wallacean shortfall, or “where do these species occur?”) (Whittaker et al. 2005). Both shortfalls are part of reality in Bahia Coastal Forests, world-renowned as one of the highest diversity areas in tree species (Thomas et al. 1998, Martini et al. 2007, Murray-Smith et al. 2009).

We aimed to provide a list of endemic species of angiosperms in Bahia Coastal Forest following Saiter et al. (2016a) to verify whether the current list agrees with the preliminary checklist by Thomas et al. (2003). We expect this updated list to further highlight the importance of BCF as a critical area for conservation in the Brazilian Atlantic forest.

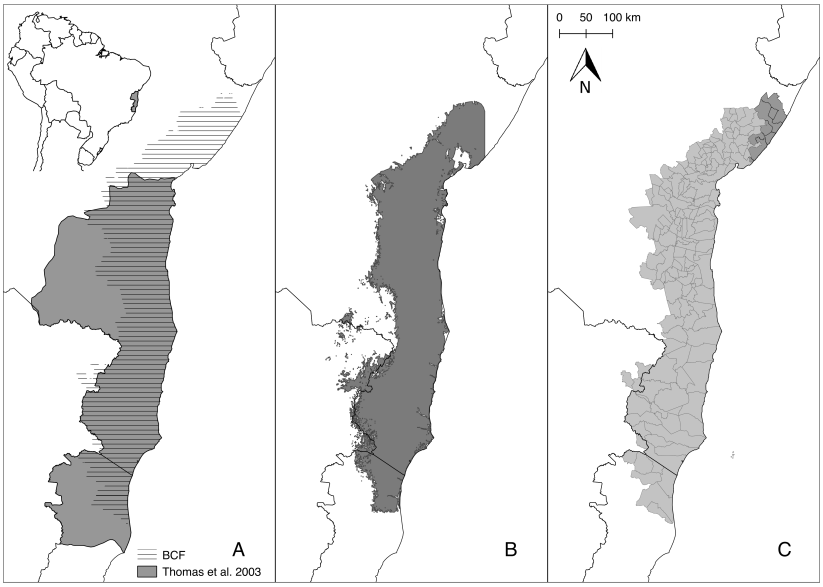
3.2 MATERIAL AND METHODS

3.2.1 Study area

To delimit the study area we used the BCF *sensu* Saiter et al. (2016a) (Figure 3.1b) with a slight modification to include the municipalities whose territory was at least 50% inside that perimeter. Municipalities were used as a base for the retrieval of taxonomic information from online datasets (see data collection). To remove the arbitrary northern limit from Saiter et al. (2016a) (Figure 3.1b), the study area was expanded to include seven municipalities complying with the 50% territory criterion (Figure 3.1c). Municipal limits were defined based on data from the Brazilian Institute for Geography and Statistics (IBGE 1993) (Figure 3.1c).

The resulting area comprised 156 municipalities, which account for approximately 99,000 km^2 (Figure 3.1c) at southern Bahia state, and a small fraction from northern Espírito Santo state and northeastern Minas Gerais state, contrasting with an area of about 119,000 km^2 at southern Bahia which included more inland areas, and northen Espírito Santo with a southern limit at the Doce River (Thomas et al. 2003) (Figure 3.1a).

Figure 3.1 - a) Study area in which Thomas et al. (2003) based its list of endemic species. b) Bahia Coastal Forest (BCF) according to Saiter et al. (2016a). c) Municipalities with at least 50% of its area within the BCF (light grey), and those added to the study area based on IBGE (1993) (dark grey). Coordinates: UTM. Datum WGS 84.



3.2.2 Data collection

To compile the checklist of endemic species of angiosperms in BCF, we started by performing a data search in the Brazilian Plant List

(Flora do Brasil 2020) on March 9, 2017, using the following filters simultaneously: “group: angiosperms”, “endemism: only endemic to Brazil”, “origin: native”, “state: Bahia”, and “phytogeographic domain: Atlantic Forest”. We decided not to search only for species endemic to the Atlantic Forest in Bahia to avoid excluding species that could also occur in the north of Espírito Santo and in a small area in northeastern Minas Gerais (Figure 3.1c). The initial search resulted 3,338 species, 59 subspecies and 154 varieties (3,551 taxa). These records were then checked in the SpeciesLink database (splink.cria.org.br). Each taxon map generated by the SpeciesLink website was visually checked, first to remove taxa that were clearly not endemic to BCF, i.e. those with several records outside the study area. Each of the 1,336 remaining taxa were then mapped with QGis 2.14 (Quantum GIS Development Team 2016) and we verified whether the points of occurrence were enclosed in the limits of the study area, which resulted in the further removal of 701 taxa.

From the 635 taxa left, the records with incongruent data were verified by experts or checked using recent taxonomic studies (Appendix 2.1). This step resulted in 30 additional non-endemic species discarded from the list. The taxa for which no scientific records were found in Google Scholar (scholar.google.com), Biodiversity Heritage Library (biodiversitylibrary.com), SpeciesLink (splink.cria.org.br), and the Brazilian Plant List (Flora do Brasil 2020) were complemented by a search for location records in the CEPEC herbarium. Once this verification was completed, 53 species from the list had to be removed because no records were available and a further five species were removed due to lack of precise geographic information.

3.3 RESULTS

The final checklist consisted of 547 angiosperm taxa endemic to BCF (535 species, six subspecies, and six varieties) in 69 families (none endemic) and 230 genera (Table 3.1). Seven genera are endemic to BCF: *Bahiella* J.F.Morales (Apocynaceae), *Santosia* R.M.King & H.Rob. (Asteraceae), *Harleyodendron* (Fabaceae, Figure 3.2), *Cubitanthus* Barringer (Linderniaceae), *Anomochloa* and *Parianella* Hollowell, F.M.Ferreira & R.P.Oliveira (Poaceae), and *Andreadoxa* Kallunki (Rutaceae). The genera with the highest number of endemic species in the BCF were *Aechmea* Ruiz & Pav. (Bromeliaceae) (33 spp.), *Pavonia* Cav. (Malvaceae) and *Myrcia* DC. (Myrtaceae), each with 16 species. As the three families with the highest numbers of endemic taxa (species + infraspecific taxa) were Bromeliaceae (108), Fabaceae (41) and Myrtaceae (32).

Table 3.1 – Checklist of angiosperms endemic to Bahia Coastal Forest *sensu* Saiter et al. (2016a). *Taxon also in Thomas et al. (2003).

Acanthaceae
Aphelandra ignea Nees ex Steud.
Clistax bahiensis Profice & Leitman
Harpochilus phaeocarpus Nees
Herpetacanthus magnobracteolatus Indriunas & Kameyama
Herpetacanthus strongyloides Indriunas & Kameyama
Herpetacanthus tetrandrus (Nees & Mart.) Herter
Justicia antirrhina Nees & Mart.
Justicia physogaster Lindau
Lepidagathis cuneiformis Kameyama
Mendoncia bahiensis Profice
Mendoncia blanchetiana Profice
Pseuderanthemum albiflorum (Hook.) Radlk.
Pseuderanthemum verbenaceum (Nees & Mart.) Radlk.
Ruellia sessilifolia (Nees) Lindau
Schaueria gonyostachya (Nees & Mart.) Nees
Schaueria hirsuta Nees
Schaueria marginata Nees
Schaueria pyramidalis A.L.A. Côrtes
Achariaceae
Kuhlmanniodendron macrocarpum Groppo, Favaretto & Fiaschi
Amaranthaceae
Lecosia formicarum Pedersen
Amaryllidaceae
Griffinia arifolia Ravenna
Griffinia parviflora Ker Gawl.
Griffinia paubrasilica Ravenna
Annonaceae
Annona bahiensis (Maas & Westra) H.Rainer *
Duguetia magnolioidea Maas *
Duguetia restingae Maas *
Duguetia reticulata Maas *
Guatteria stenocarpa Lobão, Maas & Mello-Silva
Hornschuchia cauliflora Maas & Setten *
Hornschuchia leptandra D.M.Johnson *
Hornschuchia obliqua Maas & Setten *
Hornschuchia polyantha Maas *
Hornschuchia santosii D.M.Johnson *
Malmea obovata R.E.Fr. *
Pseudoxandra bahiensis Maas *
Unonopsis bahiensis Maas & Orava
Xylopia involucrata M.C.Dias & Kinoshita *
Apocynaceae
Aspidosperma thomasii Marc.-Ferr. *
Bahiella blanchetii (A.DC.) J.F.Morales

Bahiella infundibuliflora J.F.Morales
Lacmellea bahiensis J.F.Morales
Marsdenia carvalhoi Morillo & Carnevali
Matelea riparia Morillo
Matelea santosii Morillo & Fontella
Oxypetalum laciniatum Rapini & Farinaccio
Rauvolfia atlantica Emygdio
Araceae
Anthurium bromelicola subsp. *bahiense* Mayo et al. *
Anthurium illepidum Schott
Anthurium molle E.G.Gonç. & J.G. Jardim
Anthurium teimosoanum E.G.Gonç. & J.G. Jardim
Asterostigma riedelianum (Schott) Kuntze
Dracontioides salvianii E.G.Gonç.
Philodendron aemulum Schott
Zomicarpa steigeriana Maxim. ex Schott
Araliaceae
Schefflera aurata Fiaschi
Arecaceae
Bactris soeiroana Noblick ex A.J.Hend.
Geonoma pohliana subsp. *rubescens* (Wendland ex Drude) Henderson
Geonoma pohliana subsp. *unaensis* Henderson
Syagrus ×camposportoana (Bondar) Glassman
Syagrus itapebiensis (Noblick & Lorenzi) Noblick & Meerow
Syagrus santosii K. Soares & C. A. Guim.
Aristolochiaceae
Aristolochia brunneomaculata I. Abreu & Giul.
Aristolochia longispathulata F.González *
Asparagaceae
Hagenbachia brasiliensis Nees & Mart.
Asteraceae
Acmella paniculata (Wall. ex DC.) R.K.Jansen
Austroeupatorium morii R.M.King & H.Rob.
Barrosoa atlantica R.M.King & H.Rob. *
Diacranthera hebeclinia H.Rob.
Litothamnus ellipticus R.M.King & H.Rob. *
Mikania amorimii Borges & Forzza
Mikania kubitzkii R.M.King & H.Rob. *
Mikania mattos-silvae R.M.King & H.Rob. *
Mikania santosii R.M.King & H.Rob. *
Piptocarpha riedelii (Sch.Bip.) Baker
Santosia talmonii R.M.King & H.Rob. *
Vernonanthura vinhae (H.Rob.) H.Rob. *
Begoniaceae
Begonia delicada Gregório & J.A.S. Costa
Begonia elianeae Gregório & J.A.S. Costa
Begonia epibaterium Mart. ex A.DC.
Begonia goldingiana L.Kollmann & A.P.Fontana
Begonia mattos-silvae L.B.Sm. ex S.F.Sm. & Wassh. *
Begonia pinheironis L.B.Sm. ex S.F.Sm. & Wassh. *
Begonia russelliana L.B.Sm. ex S.F.Sm. & Wassh. *

	Begonia saxifraga A.DC.
	Begonia subacida Irmsch.
	Begonia sylvatica Meisn. ex A.DC.
	Bignoniaceae
	Handroanthus parviflorus Espírito-Santo & M.M. Silva-Castro
	Bromeliaceae
	Aechmea amicorum B.R. Silva & H. Luther
	Aechmea amorimii Leme *
	Aechmea ampla L.B.Sm.
	Aechmea andersoniana Leme & H.Luther
	Aechmea andersonii H.Luther & Leme
	Aechmea carvalhoi E.Pereira & Leme
	Aechmea correia-araujoi E.Pereira & Moutinho
	Aechmea curranii (L.B.Sm.) L.B.Sm. & M.A.Spencer
	Aechmea digitata L.B.Sm. & R.W.Read
	Aechmea discordiae Leme
	Aechmea disjuncta (L.B.Sm.) Leme & J.A.Siqueira
	Aechmea echinata (Leme) Leme *
	Aechmea farinosa (Regel) L.B.Sm.
	Aechmea glandulosa Leme
	Aechmea gregaria Leme & L.Kollmann
	Aechmea guaratingensis Leme & L.Kollmann
	Aechmea heterosepala Leme
	Aechmea incompta Leme & H.Luther
	Aechmea ituberaensis Leme & L.Kollmann
	Aechmea laevigata Leme
	Aechmea lanata (L.B.Sm.) L.B.Sm. & M.A.Spencer
	Aechmea limae Leme
	Aechmea lymanii W.Weber
	Aechmea miniata Beer ex Baker
	Aechmea mira Leme & H.Luther
	Aechmea mollis L.B.Sm.
	Aechmea pendulispica Leme & L.Kollmann
	Aechmea ramusculosa Leme
	Aechmea tentaculifera Leme, Amorim & J.A. Siqueira
	Aechmea turbinocalyx Mez
	Aechmea viridipetala A.F.Costa & Amorim
	Aechmea viridostigma Leme & H.Luther
	Aechmea weberi (E.Pereira & Leme) Leme
	Alcantarea cerosa Leme, A.P.Fontana & O.A.B.Ribeiro
	Alcantarea pataxoana Versieux
	Araeococcus montanus Leme
	Araeococcus nigropurpureus Leme & J.A.Siqueira
	Araeococcus sessiliflorus Leme & J.A.Siqueira
	Billbergia fosteriana L.B.Sm.
	Billbergia macrocalyx Hook.
	Canistrum fosterianum L.B.Sm.
	Canistrum guzmanioides Leme
	Canistrum lanigerum H.Luther & Leme
	Canistrum sandrae Leme
	Canistrum seidelianum W.Weber

Cryptanthus colnagoi Rauh & Leme
Cryptanthus coriaceus Leme
Cryptanthus ilhanus Leme
Cryptanthus lyman-smithii Leme
Cryptanthus pseudopetiolatus Philcox *
Cryptanthus ruthiae Philcox
Cryptanthus ubairensis I.Ramírez
Cryptanthus vexatus Leme
Cryptanthus viridovinosus Leme
Cryptanthus walkerianus Leme & L.Kollmann
Hohenbergia barbarespina Leme & Fraga
Hohenbergia brachycephala L.B.Sm.
Hohenbergia burle-marxii Leme & W.Till
Hohenbergia capitata Schult. & Schult.f.
Hohenbergia castellanosii L.B.Sm. & Read
Hohenbergia correia-araujoi E. Pereira & Moutinho
Hohenbergia flava Leme & C.C.Paula
Hohenbergia hatschbachii Leme *
Hohenbergia itamarajuensis Leme & Baracho
Hohenbergia littoralis L.B.Sm.
Hohenbergia pabstii L.B.Sm. & Read
Hohenbergia reconcavensis Leme & Fraga
Hohenbergia sandrae Leme
Lymania alvimii (L.B.Sm. & R.W.Read) R.W.Read *
Lymania azurea Leme
Lymania brachycaulis (E.Morren ex Baker) L.F.Sousa
Lymania corallina (Brong. ex Beer) R.W.Read
Lymania globosa Leme
Lymania languida Leme
Lymania marantoides (L.B.Sm.) R.W.Read
Lymania spiculata Leme & Forzza *
Neoregelia azevedoi Leme
Neoregelia crispata Leme *
Neoregelia longisepala E.Pereira & I.A.Penna *
Neoregelia rothinessa Leme, H. Luther & W. Till
Neoregelia silvomontana Leme & J.A.Siqueira
Neoregelia viridolineata Leme
Neoregelia wilsoniana M.B.Foster
Orthophytum buranhense Leme & A.P.Fontana
Orthophytum guaratingense Leme & L.Kollmann
Orthophytum rubrum L.B.Sm.
Portea alatisepala Philcox *
Portea filifera L.B.Sm.
Portea grandiflora Philcox *
Portea kermesina K.Koch
Portea nana Leme & H.Luther
Quesnelia alborosea A.F.Costa & T.Fontoura
Quesnelia clavata Amorim & Leme
Quesnelia dubia Leme
Quesnelia koltesii Amorim & Leme
Ronnbergia brasiliensis E.Pereira & I.A.Penna *

Ronnbergia carvalhoi Martinelli & Leme *
Ronnbergia neoregelioides Leme
Ronnbergia silvana Leme
Vriesea dictyographa Leme
Vriesea graciliscapa W.Weber
Vriesea longisepala A.F.Costa
Vriesea minuta Leme
Vriesea minutiflora Leme
Vriesea roberto-seidelii W.Weber
Vriesea ruschii L.B.Sm. subsp. *ruschii*
Vriesea sandrae Leme
Vriesea silvana Leme
Burseraceae
Protium icicariba var. *talmonii* Daly *
Trattinnickia lorenziana Daly & M. F. F. Melo
Cactaceae
Rhipsalis hileiabaiana (N.P.Taylor & Barthlott) N. Korotkova & Barthlott *
Calophyllaceae
Kielmeyera itacarensis Saddi
Kielmeyera marauensis Saddi
Capparaceae
Colicodendron martianum Cornejo
Caryocaraceae
Caryocar edule Casar.
Chrysobalanaceae
Couepia bondarii Prance *
Couepia coarctata Prance *
Couepia impressa subsp. *cabraliae* Prance *
Couepia longipetiolata Prance *
Licania bahiensis Prance
Licania lamentanda Prance *
Licania littoralis Warm. var. *littoralis*
Licania santosii Prance *
Licania turbinata Benth.
Parinari alvimii Prance *
Clusiaceae
Tovomita iaspidis L. Marinho & Amorim
Tovomita megantha L. Marinho & Amorim
Commelinaceae
Dichorisandra jardimii Aona & M.C.E.Amaral
Dichorisandra leucophthalmos Hook.
Dichorisandra leucosepala Aona & M.C.E.Amaral
Dichorisandra marantoides Aona & Faden
Dichorisandra ordinatiflora Aona & Faden
Dichorisandra radicalis Nees & Mart.
Dichorisandra subtilis Aona & M.C.E.Amaral
Connaraceae
Connarus blanchetii var. *laurifolius* (Baker) Forero
Connarus cuneifolius Baker
Connarus portosegurensis Forero
Rourea bahiensis Forero *

	Rourea carvalhoi Forero et al. *
	Rourea discolor Baker
	Rourea macrocalyx Carbonó et al. *
	Rourea tenuis G.Schellenb.
	Cucurbitaceae
	Cayaponia nitida Gomes-Klein & Pirani
	Fevillea bahiensis G.Rob. & Wunderlin
	Gurania wawrei Cogn.
	Cyclanthaceae
	Asplundia maximiliani Harling
	Cyperaceae
	Becquerelia discolor Kunth
	Hypolytrum bahiense M.Alves & W.W.Thomas *
	Hypolytrum jardimii M.Alves & W.W.Thomas *
	Hypolytrum lucennoi M.Alves & W.W.Thomas
	Dichapetalaceae
	Stephanopodium magnifolium Prance *
	Tapura martiniae Amorim & D. Lisboa
	Tapura zei-limae Amorim & Fiaschi
	Dilleniaceae
	Davilla bahiana Aymard
	Davilla macrocarpa Eichler
	Dioscoreaceae
	Dioscorea macrothyrsa Uline
	Diospyros amabi B.Walln.
	Diospyros riedelii (Hiern) B.Walln.
	Diospyros scottmorii B.Walln.
	Eriocaulaceae
	Actinocephalus ochrocephalus (Körn.) Sano
	Erythroxylaceae
	Erythroxylum compressum Peyr.
	Erythroxylum leal-costae Plowman
	Erythroxylum martii Peyr.
	Erythroxylum mattos-silvae Plowman *
	Erythroxylum membranaceum Plowman E *
	Erythroxylum santosii Plowman *
	Erythroxylum splendidum Plowman *
	Euphorbiaceae
	Actinostemon lasiocarpus (Müll.Arg.) Baill.
	Algernonia bahiensis (Emmerich) G.L.Webster *
	Bernardia gambosa Müll.Arg.
	Bernardia micrantha Pax & K.Hoffm.
	Croton sapiifolius Müll.Arg.
	Croton thomasii Riina & P.E. Berry
	Dalechampia armbrusteri G.L.Webster
	Dalechampia viridissima G.L.Webster *
	Gymnanthes gaudichaudii Müll. Arg.
	Ophthalmoblapton pedunculare Müll.Arg.
	Fabaceae
	Andira carvalhoi R.T.Penn. & H.C.Lima *
	Andira marauensis N.F.Mattos *

Arapatiella psilophylla (Harms) R.S.Cowan *
Canavalia cassidea G.P.Lewis *
Canavalia dolichothyrsa G.P.Lewis *
Chamaecrista amabilis H.S.Irwin & Barneby *
Chamaecrista amorimii Barneby *
Chamaecrista onusta H.S.Irwin & Barneby *
Chamaecrista salvatoris (H.S.Irwin & Barneby) H.S.Irwin & Barneby
Copaifera majorina Dwyer
Dahlstedtia bahiana (A.M.G. Azevedo) M.J. Silva & A.M.G. Azevedo
Harleyodendron unifoliolatum R.S.Cowan *
Inga aptera (Vinha) T.D.Penn. *
Inga conchifolia L.P.Queiroz
Inga pedunculata (Vinha) T.D.Penn. *
Inga pleiogyna T.D.Penn.
Machaerium aureum Filardi & H.C.Lima
Moldenhawera blanchetiana var. *multijuga* L.P.Queiroz et al.
Moldenhawera intermedia G.P.Lewis & L.P.Queiroz
Moldenhawera luschnathiana Yakovlev
Moldenhawera nutans L.P.Queiroz et al.
Muellera longiunguiculata (MJ.Silva & AMG.Azevedo) MJ.Silva & AMG.Azevedo
Ormosia lewisii D.B.O.S.Cardoso, C.H.Stirt. & Torke *
Ormosia limae D.B.O.S.Cardoso & L.P.Queiroz
Ormosia timboensis D.B.O.S.Cardoso, Meireles & H.C.Lima
Parapiptadenia ilheusana G.P.Lewis *
Phanera carvalhoi (Vaz) Vaz
Piptadenia killipii var. *cacaophila* G.P.Lewis *
Piptadenia ramosissima Benth.
Piptadenia santosii Barneby ex G.P.Lewis *
Schnella lilacina (Wunderlin & Eilers) Wunderlin
Senegalia amorimii M. J. F. Barros & M. P. Morim
Senegalia olivensana (G.P.Lewis) Seigler & Ebinger
Senegalia piptadenioides (G.P.Lewis) Seigler & Ebinger
Swartzia alternifoliolata Mansano
Swartzia arenophila R. B. Pinto, Torke & Mansano
Swartzia curranii R.S.Cowan
Swartzia pinheiroana R.S.Cowan *
Swartzia riedelii R.S.Cowan
Swartzia thomasii R. B. Pinto, Torke & Mansano
Zollernia magnifica A.M.Carvalho & Barneby *
Gentianaceae
Macrocarpaea atlantica J.R. Grant & V. Trunz
Macrocarpaea dolichophylla J.R. Grant & V. Trunz
Macrocarpaea orbiculata J.R. Grant & V. Trunz
Icacinaceae
Pleurisanthes brasiliensis (Val.) Tiegh.
Iridaceae
Neomarica brachypus (Baker) Sprague
Neomarica floscella A. Gil & M.C.E.Amaral
Neomarica portosecurensis (Ravenna) Chukr *
Neomarica unca (Ravenna) A. Gil
Lauraceae

Nectandra micranthera Rohwer
Ocotea montana (Meisn.) Mez
Ocotea ramosissima L.C.S. Assis e Mello-Silva
Ocotea sperata P.L.R. Moraes et van der Werff
Ocotea thinicola van der Werff et P.L.R. Moraes
Lecythidaceae
Eschweilera complanata S.A.Mori
Eschweilera mattos-silvae S.A.Mori *
Eschweilera sphaerocarpa M. Ribeiro & S.A. Mori
Linderniaceae
Cubitanthus alatus (Cham. & Schltdl.) Barringer
Loganiaceae
Spigelia genuflexa Popovkin & Struwe
Strychnos alvimiana Krukoff & Barneby *
Strychnos setosa Krukoff & Barneby
Loranthaceae
Psittacanthus excrenulatus Rizzini
Psittacanthus salvadorensis Kuijt
Struthanthus longiflorus Rizzini
Malpighiaceae
Bunchosia itacarensis W.R.Anderson *
Heteropterys sanctorum W.R.Anderson *
Peixotoa sericea C.E.Anderson *
Stigmaphyllon hispidum C.E.Anderson
Stigmaphyllon macropodum A.Juss.
Malvaceae
Byttneria cristobaliana Dorr
Pavonia cauliflora (Nees) Fryxell ex G.L.Esteves
Pavonia ciliata G.L.Esteves & Krapov. *
Pavonia crispa Krapov. *
Pavonia gerleniae Gonçalez & M.C. Duarte
Pavonia goetheoides (Hassl.) Fryxell ex G. L. Esteves
Pavonia latibracteolata Krapov. *
Pavonia longifolia A.St.-Hil.
Pavonia macrobracteolata Gonçalez & M.C. Duarte
Pavonia ovaliphylla G.L.Esteves & Krapov. *
Pavonia paucidentata Fryxell
Pavonia pilifera Krapov.
Pavonia rubriphylla G.L.Esteves
Pavonia sancti Krapov.
Pavonia spectabilis Krapov. *
Pavonia spiciformis Krapov. *
Pavonia stipularis Krapov. *
Marantaceae
Goeppertia fasciata (Linden ex K.Koch) Borchs. & S.Suárez
Goeppertia rufibarba (Fenzl) Borchs. & S.Suárez
Ischnosiphon bahiensis L.Andersson *
Monotagma grallatum Hagberg & R. Erikss. *
Stromanthe bahiensis Yosh.-Arns, Mayo & J.M.A. Braga
Marcgraviaceae
Schwartzia geniculatiflora Gir.-Cañas & Fiaschi

	Melastomataceae
	Bertolonia alternifolia Baumgratz, Amorim & A.B. Jardim
	Bertolonia bullata Baumgratz, Amorim & A.B. Jardim
	Huberia carvalhoi Baumgratz
	Huberia sessilifolia R. Godenberg & Michelangelo
	Meriania inflata Michelangeli & R.Goldenb.
	Miconia lurida Cogn.
	Ossaea loligomorpha R.Goldenb. & Reginato
	Ossaea sulbahiensis D´El Rei Souza
	Physeterostemon aonae Amorim, Michelangeli & R.Goldenb.
	Physeterostemon fiaschii R.Goldenb. & Amorim
	Physeterostemon jardimii R.Goldenb. & Amorim
	Physeterostemon thomasii Amorim, Michelangeli & R.Goldenb.
	Pleiochiton amorimii Reginato & R.Goldenb.
	Tibouchina bahiensis Wurdack *
	Tibouchina bradeana Renner
	Tibouchina paulo-alvinii Guimarães da Vinha *
	Tibouchina stipulacea Vinha *
	Tibouchina taperoensis Wurdack *
	Tibouchina tomentulosa Wurdack
	Meliaceae
	Guarea anomala T.D.Penn
	Trichilia florbranca T.D.Penn. *
	Trichilia magnifoliola T.D.Penn. *
	Menispermaceae
	Curarea crassa Barneby *
	Moraceae
	Dorstenia setosa Moric.
	Myrtaceae
	Calyptranthes blanchetiana O.Berg
	Eugenia barrana Sobral
	*Eugenia berutti*i (Mattos) Mattos
	Eugenia fissurata Mattos
	Eugenia itacarensis Mattos *
	Eugenia longifolia DC.
	Eugenia serraegrandis Sobral
	Eugenia sessilifolia DC.
	Eugenia unana Sobral
	Marlierea lealcostae G.M.Barroso & Peixoto
	Marlierea verticillaris O.Berg
	Myrcia abrantea (O.Berg) E.Lucas & Sobral
	Myrcia cataphyllata M.F.Santos
	Myrcia felisbertii (DC.) O.Berg
	Myrcia gigantea (O.Berg) Nied.
	Myrcia grazielae NicLugh.
	Myrcia marianae Staggemeier & E.Lucas
	Myrcia monoclada Sobral
	Myrcia pendula Sobral
	Myrcia pseudomarlierea Sobral
	Myrcia raminfinita L. Marinho & E. Lucas
	Myrcia spathulifolia Proença

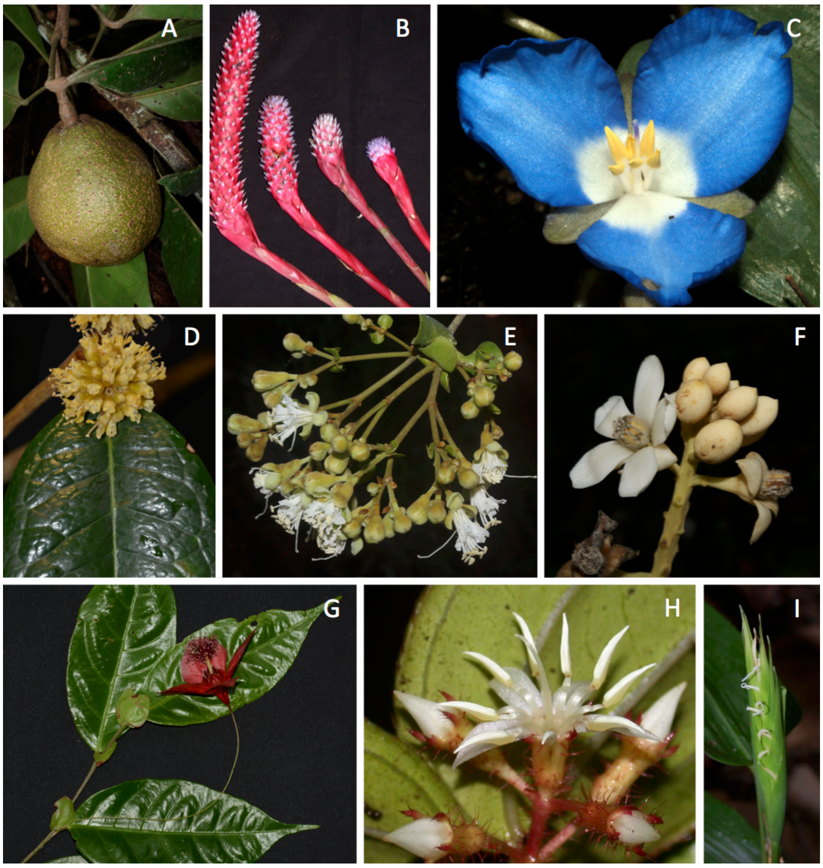
Myrcia stigmatosa O.Berg
Myrcia teimosa Sobral
Myrcia tetraphylla Sobral
Myrcia thomasii B.S.Amorim & A.R.Lourenço
Myrcia truncata Sobral
Plinia callosa Sobral *
Plinia longiacuminata Sobral
Plinia muricata Sobral *
Plinia rara Sobral *
Plinia spiciflora (Nees & Mart.) Sobral
Nyctaginaceae
Neea alumnorum M. Pignal, Soares Filho & Romaniuc
Neea duckei (Huber) Furlan
Ochnaceae
Ouratea bahiensis Sastre *
Ouratea gigantophylla (Erhard) Engl.
Ouratea longipes Sastre *
Ouratea papulosa Sastre
Ouratea platicaulis Sastre *
Orchidaceae
Anathallis velvetina Luer & Toscano
Aspasia silvana F.Barros *
Bifrenaria silvana V.P.Castro *
Brassavola reginae Pabst
Bulbophyllum teimosense E.C.Smidt & Borba
Cattleya alaorii (Brieger & Bicalho) Van den Berg
Cattleya grandis (Lindl. & Paxton) A.A.Chadwick
Cattleya kerrii Brieger & Bicalho *
Cirrhaea silvana V.P.Castro & Campacci *
Coryanthes bahiensis Marçal & Chiron
Coryanthes bueraremensis Campacci & Bohnke
Elleanthus hymenophorus (Rchb.f.) Rchb.f.
Encyclia fimbriata C.A.Bastos, Van den Berg & Meneguzzo
Epidendrum garciae Pabst
Gomesa silvana (V.P.Castro & Campacci) M.W.Chase & N.H.Williams
Gongora meneziana V.P.Castro & G.Gerlach
Koellensteinia abaetana L.P.Queiroz
Leptotes bohnkiana Campacci
Masdevallia sururuana Campacci
Pabstiella dasilvae Chiron & Xim.Bols.
Promenaea silvana F.Barros & Cath. *
Prosthechea bohnkiana V.P.Castro & G.F.Carr
Prosthechea bueraremensis (Campacci) Campacci
Stanhopea bueraremensis Campacci & Marçal
Stenia bohnkiana V.P.Castro & G.F.Carr
Oxalidaceae
Oxalis alata var. *hirta* Lourteig *
Oxalis bela-vitoriae Lourteig *
Oxalis kuhlmannii var. *adpressipila* Lourteig
Passifloraceae
Passiflora igrapiunensis T.S.Nunes & L.P.Queiroz

	Phyllanthaceae
	Discocarpus pedicellatus Fiaschi & Cordeiro
	Phyllanthus carvalhoi G.L.Webster
	Picramniaceae
	Picramnia coccinea W.W.Thomas *
	Piperaceae
	Peperomia epipremnifolia D. Monteiro & Leitman
	Peperomia riparia Yunck.
	Peperomia serpentarioides Miq.
	Peperomia sulbahiensis D. Monteiro & M. Coelho
	Piper bahianum Yunck.
	Piper robustipedunculum Yunck.
	Piper vellosoi Yunck.
	Poaceae
	Alvimia auriculata Soderstr. & Londoño *
	Alvimia gracilis Soderstr. & Londoño *
	Anomochloa marantoidea Brongn. *
	Arberella bahiensis Soderstr. & Zuloaga *
	Atractantha cardinalis Judz. *
	Atractantha radiata McClure *
	Chusquea clemirae A. C. Mota, R. P. Oliveira & L. G. Clark
	Diandrolyra pygmaea Soderstr. & Zuloaga ex R.P.Oliveira & L.G.Clark
	Digitaria doellii Mez *
	Eremetis robusta Hollowell, F.M.Ferreira & R.P.Oliveira
	Eremocaulon aureofimbriatum Soderstr. & Londoño *
	Ichnanthus longhi-wagnerae A.C. Mota & R.P. Oliveira
	Merostachys annulifera Send.
	Merostachys argentea Send.
	Merostachys lanata Send.
	Merostachys magnispicula Send.
	Merostachys medullosa Send.
	Merostachys ramosissima Send.
	Olyra bahiensis R.P.Oliveira & Longhi-Wagner
	Olyra filiformis Trin.
	Olyra latispicula Soderstr. & Zuloaga *
	Parianella carvalhoi (R.P. Oliveira & Longhi-Wagner) F.M. Ferreira & R.
	Parianella lanceolata (Trin.) F.M. Ferreira & R.P. Oliveira
	Paspalum restingense Renvoize *
	Paspalum strigosum Döll
	Piresia palmula M.L.S.Carvalho & R.P.Oliveira
	Raddia distichophylla (Schrad. ex Nees) Chase *
	Raddia stolonifera R.P.Oliveira & Longhi-Wagner
	Polygalaceae
	Caamembeca martinelli (Marques & E.F.Guim.) J.F.B.Pastore *
	Caamembeca martinelli var. *carnosa* (Marques & E.F.Guim.) J.F.B.Pastore
	Securidaca revoluta (A.W.Benn.) Marques
	Primulaceae
	Cybianthus nemoralis (Mez) G.Agostini
	Rubiaceae
	Chomelia bahiae J.H.Kirkbr.
	Denscantia andrei (E.L.Cabral & Bacigalupo) E.L.Cabral & Bacigalupo *

Denscantia macrobracteata (E.L.Cabral & Bacigalupo) E.L.Cabral & Bacigalupo *
Faramea bicolor J.G.Jardim & Zappi
Faramea nocturna J.G.Jardim & Zappi
Ixora bahiensis Benth.
Ixora cabraliensis Di Maio et Peixoto
Malanea harleyi J.H.Kirkbr. *
Mitracarpus anthospermoides K.Schum.
Posoqueria bahiensis Macias & Kin.-Gouv.
Psychotria martiusii Müll.Arg.
Psychotria megalocalyx Müll.Arg.
Psychotria salzmanniana Müll.Arg.
Psychotria silvicola Müll.Arg.
Psychotria strigosa Müll.Arg.
Psychotria wawrana Müll.Arg.
Rudgea hileiabaiana Zappi & Bruniera
Rudgea ilheotica Müll.Arg.
Rudgea involucrata Müll.Arg.
Rudgea malpighiacea Standl.
Rudgea mouririoides Standl.
Salzmannia arborea J.G. Jardim
Sphinctanthus insignis Steyerm.
Rutaceae
Andreadoxa flava Kallunki *
Conchocarpus concinnus Kallunki *
Conchocarpus dasyanthus Kallunki *
Conchocarpus fissicalyx Pirani *
Conchocarpus gaudichaudianus subsp. *bahiensis* Kallunki *
Conchocarpus hirsutus Pirani *
Conchocarpus inopinatus Pirani *
Conchocarpus longipes Kallunki *
Conchocarpus mastigophorus Kallunki *
Conchocarpus modestus Kallunki *
Conchocarpus punctatus Kallunki *
Conchocarpus racemosus (Nees & Mart.) Kallunki & Pirani
Conchocarpus santosii Pirani & Kallunki *
Ertela bahiensis (Engl.) Kuntze
Galipea revoluta Pirani
Neoraputia calliantha Kallunki
Neoraputia micrantha Kallunki
Zanthoxylum nemorale Mart.
Zanthoxylum retusum (Albuq.) P.G.Waterman
Sapindaceae
Cardiospermum integerrimum Radlk. *
Paullinia livescens Radlk.
Paullinia unifoliolata Perdiz & Ferrucci
Serjania morii Acev.-Rodr.
Serjania scopulifera Radlk.
Sapotaceae
Chromolucuma apiculata Alves-Araújo & M.Alves
Pouteria atlantica Alves-Araújo & M.Alves
Pouteria glauca T.D. Penn.

Pouteria synsepala Popovkin & A.D. Faria
Pouteria trifida Alves-Araújo & M.Alves
Pradosia longipedicellata Alves-Araújo & M.Alves
Verbenaceae
Citharexylum obtusifolium Kuhlm.
Stachytarpheta hirsutissima Link
Vochysiaceae
Vochysia talmonii M.C.Vianna et al.

Figure 3.2 - Some species found in the checklist of endemic angiosperms of BCF: a) *Kuhlmanniodendron macrocarpum* (Achariaceae). b) *Quesnelia koltesii* (Bromeliaceae). c) *Dichorisandra leucophtalmos* (Commelinaceae). d) *Tapura zeilimae* (Dichapetalaceae). e) *Arapatiella psilophylla* (Fabaceae). f) *Harleyodendron unifoliolatum* (Fabaceae). g) *Pavonia goetheoides* (Malvaceae). h) *Pleiochiton amorimii* (Melastomataceae). i) *Anomochloa marantoidea* (Poaceae). Photos: a, b, d, g, h) A.Amorim; c) L.Aona; e, f) D.Cardoso; i) J.Jardim.



3.4 DISCUSSION

The families with the highest numbers of endemic taxa in BCF are also among the ten richest angiosperm families in Brazil and in the Atlantic Forest (BFG 2015). Thomas et al. (2003) reported Fabaceae (53 spp.) as the richest family of a total of 65 families in the previous list. Compared with the BFG (2015), it is remarkable that Orchidaceae, one of the three richest families in Brazil and in the Atlantic Forest, was not among the richest families in this study, with only 25 taxa. This may be due to the lack of geographic records for 14 species in this family, which had to be discarded.

Among the 20 richest angiosperm genera in Brazil (BFG 2015), *Aechmea* and *Myrcia* are also among the genera with the highest number of endemic species in the BCF. In a preliminary list of the endemic angiosperm species from southern Bahia and northern Espírito Santo, Thomas et al. (2003) cited *Conchocarpus* J.C.Mikan (Rutaceae) (19 spp.) as the richest genus, followed by *Pavonia* Cav. (Malvaceae) (13 spp.), *Couepia* Aubl., and *Erythroxylum* P.Browne (seven spp. each). The occurrence of only 12 endemic species of *Conchocarpus* in the present checklist probably indicates that several endemic species of this genus are exclusively found at more inland seasonally dry forests (Kallunki & Pirani 1998).

Among the endemic genera from southern Bahia and northern Espírito Santo reported by Thomas et al. (2003), such as *Arapatiella* and *Brodriguesia* (Fabaceae), *Atractantha*, *Alvimia* and *Sucrea* (Poaceae), and *Trigoniodendron* (Trigoniaceae), several are not endemic to BCF. For example, *Brodriguesia*, *Atractantha* and *Trigoniodendron* have been recorded outside our study area, respectively, in Sergipe,,Amazonas, and near the Doce River. Similarly, *Physeterostemon* R.Goldenb. & Amorim (Melastomataceae), a recently described endemic genus from the Atlantic Forest of Bahia state (Amorim et al. 2014, Goldenberg et al. 2016, Goldenberg & Amorim 2006), was not considered endemic to BCF in this checklist, as among its species *P. gomesii* Amorim & R.Goldenb. occurs in the municipality of Boa Nova (Amorim et al. 2014), which lies slightly outside our study area.

In comparison with the preliminary list of Thomas et al. (2003), which included 395 endemic angiosperm taxa from an area that covered a larger part of northern Espírito Santo state, as far as the Doce River, and the southern Bahia Atlantic Forest, including more inland areas, and almost reaching the municipality of Salvador (i.e., an area ca. 20% larger than ours) (Figure 3.1a), the list presented here surprisingly shares only 143 taxa (Table 3.1). If we had used the Doce River as our area southern limit, it would have included at least 45 additional species restricted to the Linhares region, such as *Cryptanthus beuckeri* E.Morren (Bromeliaceae), *Rourea luizalbertoi* Forero, L.A.Vidal & Carbonó (Connaraceae), *Simira eliezeriana* Peixoto (Rubiaceae) and the endemic genus *Riodocea* Delprete (Thomas et al. 2003, Rolim et al. 2016). Despite being geographically close and having several species in common (Saiter et al. 2016b), the vegetation of Linhares and the Doce River floodplain are ecologically different from the BCF (Rolim et al. 2005, 2006). In floristic terms, the Linhares region may be more similar to northern Rio de Janeiro, southern Espírito Santo (Silva & Nascimento 2001, Saiter et al. 2016b) and eastern Minas Gerais states (see Krenák-Waitaká Forests *sensu* Saiter et al. 2016a).

Another difference between the two checklists is due to the time gap of about 15 years between studies. A total of 174 species in our checklist were described after 2003, probably due to increased efforts in collecting and studying plants in the Atlantic Forest in Bahia. For instance, about 41.5% of all new angiosperms in the Brazilian flora described between 1990 and 2006 are endemic to the Atlantic Forest (Sobral and Stehmann 2009). Moreover, 23 species of angiosperms endemic to BCF were described between 2015 and 2017 (e.g., Araújo et al. 2015, Santos et al. 2015, Abreu & Giulietti 2016, Amorim et al. 2016, Côrtes et al. 2016, Ferreira et al. 2016, Marinho & Lucas 2016, Popovkin et al. 2016, Ribeiro et al. 2016, Terra-Araujo et al. 2016, Daly & Melo 2017, Gonçalez et al. 2017).

Compared to the results of a search in the Brazilian Plant List (Flora do Brasil 2020, under construction) using the following filters: “group: angiosperms”, “endemism: only endemic to Brazil”, “occurrence: only occurs in”, “origin: native”, “state: Bahia”, and “phytogeographic domain: Atlantic Forest”, the number of species in our checklist (547 spp.) was much smaller than the 795 species identified by the search engine. Among the reasons for this large difference (248 spp.) it is worth mentioning that a) more than 50 taxa from our list had to be removed due to lack of precise geospatial data, such as the municipality name, which precluded us from citing them as endemic to BCF; b) among the taxa exclusive to the Brazilian Plant List (Flora do Brasil 2020, under construction) that are not restricted to BCF, several occur in more inland seasonally dry forests in the Atlantic Forest, such as *Chrysophyllum subspinosum* Monach. (Sapotaceae) and *Colicodendron bahianum* Cornejo & Iltis (Capparaceae); and c) at least 29 species exclusive to the Brazilian Plant List search occur close to, but outside the study area, such as *Canistrum camacaense* Martinelli & Leme (Bromeliaceae), *Inga grazielae* (Vinha) T.D.Penn. (Fabaceae), and *Bertolonia carmoi* Baumgratz (Melastomataceae), all from the municipality of Boa Nova, and *Aechmea bicolor* L.B.Sm. (Bromeliaceae), *Heteropterys jardimii* Amorim (Malpighiaceae), and *Passiflora timboensis* T.S.Nunes & L.P.Queiroz (Passifloraceae), from the municipality of Santa Teresinha.

There are additional reasons to anticipate that the difference in species numbers between the Brazilian Plant List and our list could be even greater, as the list presented here includes 84 taxa that also occur in northern Espírito Santo and in a small area in northeastern Minas Gerais (Figure 3.1c). Moreover, the Brazilian Plant List (Flora do Brasil 2020, under construction) is an ongoing project on which new taxa can be continuously added and identified as endemic, what could bring the total number of endemic angiosperm species using the same filters even larger. Alternatively, if the native distribution of several taxa is shown to extend beyond the Atlantic Forest domain in Bahia, the difference between the lists could decrease, as fewer species from the Brazilian Plant List would appear as endemic while applying the same search filters.

Developing knowledge on patterns of endemism for plant species is extremely important and must be taken into account in conservation strategies. This information is relevant for the establishment of new protected areas (Kerr 1997), restoration policies (Chazdon 2008) and in directing additional studies (Francisco-Ortega et al. 2010). Considering the key role of endemic species in the design of conservation policies (Myers et al. 2000, Van Der Werff & Consiglio 2004, Moraes et al. 2005, Lamoreux et al. 2006, Martinelli et al. 2008, Essl et al. 2009, Nowak & Nobis 2010), we expect this checklist could guide future studies and conservation strategies, as well as emphasize the importance of the BCF region as a key area for plant conservation.

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4 SEGUNDO CAPÍTULO

Angiosperm endemism in a Brazilian Atlantic Forest biodiversity hot-point

4.1 INTRODUCTION

Species are considered endemic to a region if their occurrence are limited to that region and found nowhere else (Anderson 1994). The distribution of endemic species are determined by different factors (e.g. geographical barriers, altitude, stochastic events, water, light and nutrient availability), which might affect different taxonomic groups in a similar way, often leading to somewhat congruent patterns of endemism for different taxa. Areas of endemism (AoE) harbor many different endemic groups (Szumik et al. 2002), and are the basic operational units for historical biogeography (Morrone 2001, 2018). Moreover, because of their unique biotas, these areas are commonly highlighted as priorities for biodiversity conservation (Humphries et al. 1995; Silva et al. 2004; Lamoreux et al. 2006; Pérez-García et al. 2012). Because endemic species are more susceptible to extinction because of their usually small range of living, population sizes, and often specific habitat requirements (Essl et al. 2009).

Due to both high number of endemic species and threatened conservation status, the Atlantic Forest is considered a top-priority biodiversity hotspot for plant conservation (Mittermeier et al. 2005; Eisenlohr et al. 2015), with its endemic vascular plant species representing 2.7% of all vascular plants in the world (Myers et al. 2000). Endemic taxa from the Atlantic Forest are not uniformly distributed, and several areas of endemism have been recognized based on distributional data from different groups of organisms, such as trees (Thomas et al. 1998), species of Myrtaceae (Murray-Smith et al. 2009; Giaretta et al. 2015), epiphytic angiosperms (Menini Neto et al. 2016), arthropods (Hoffmeister and Ferrari 2016), harvestmen (Pinto-da-Rocha et al. 2005; DaSilva et al. 2015; DaSilva et al. 2016), mammals (Costa et al. 2000), and birds (Cracraft 1985; Silva et al. 2004).

Regardless of the taxonomic group analyzed, the central Atlantic Forest, whose limits include the northern Espírito Santo and southern Bahia, is always assigned as an important area of endemism (Prance 1982a, b; Thomas et al. 2003; Silva et al. 2004; Carnaval et al. 2009; Murray-Smith et al. 2009). Based on turnover models of tree species composition, Saiter et al. (2016) recognized three main phytogeographic regions along such an area, one of which includes coastal forests from the southern Bahia (Bahia Coastal Forests, or BCF hereafter). The BCF, with approximately 99,000 km^2, is home to 547 endemic angiosperm species (Ostroski et al. submitted). This highlights the BCF as a critical hot-point for plant conservation within the Atlantic Forest hotspot

(Martini et al. 2007).

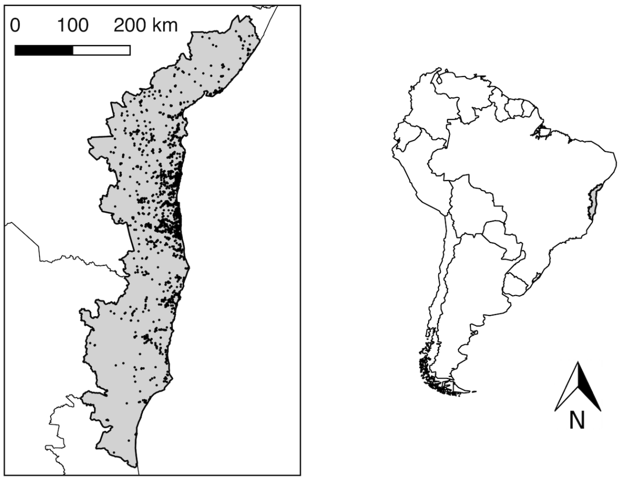
Understanding distribution patterns of endemic taxa can be decisive to successfully plan strategies and future research for conservation of biodiversity (Kerr 1997). Despite BCF importance as a critical area for plant conservation in the Atlantic Forest, there is a knowledge gap on how endemic angiosperm plant species are distributed in that area. In this study, we aim to determine the location and extent of angiosperm areas of endemism in BCF, to determine priority areas for future research and plant conservation across the region.

4.2 MATERIAL AND METHODS

4.2.1 Study area

The Bahia Coastal Forest (BCF) *sensu* Saiter et al. (2016) was slightly modified by Ostroski et al. (submitted) to have its limits coincidental with municipal boundaries (Figure 4.1). This strategy allowed us to capture occurrence data from municipality-built databases, such as SpeciesLink (splink.cria.org.br). This region is under the Af climatic type according to Köppen-Geiger's system (Kottek et al. 2006), having an annual average temperature of 25°C, and monthly rainfall around 60 mm year-round (Mori et al. 1983). However rainfall distribution varies latitudinally, with the extreme north and south having less rainfall, i. e. the municipality of Esplanada (BA) in the extreme northern area and Jaguaré (ES) in the extreme south have respectively 1226 mm and 1194 mm average rainfall, while the municipality of Ilhéus has an average rainfall of 1946 mm (climate-data.org).

Figure 4.1 - Distribution of 3,657 records for Bahia Coastal Forests endemic angiosperm species. Inset map on the right shows location of Bahia Coastal Forests within South America.



4.2.2 Data collection

The geospatial dataset was compiled based on a checklist of 547 angiosperm taxa which are endemic to BCF (535 species, six subspecies, and six varieties; Table 3.1) (Ostroski et al. submitted). From those 547 taxa, 506 had precise location data and were used on the analyses. One hundred and twenty taxa represented by a single record (ca. 23,7%) were maintained only for analyses based on assumed/fill radius options (see below). To compile the list of occurrence data, we searched for records of these taxa in the SpeciesLink database (splink.cria.org.br), Google Scholar (scholar.google.com), Biodiversity Heritage Library (biodiversitylibrary.com), Brazilian Plant List (Flora do Brasil 2020), and CEPEC herbarium at Ilhéus, Bahia (acronym following Thiers, cont. updated). Initially 5,745 records were found for endemic angiosperms of BCF, after removing imprecise and duplicated records (i.e., that referred to a same taxon/coordinates), 3,660 records were maintained in the endemicity analyses.

4.2.3 Endemicity analyses

We employed endemicity analysis to identify areas of angiosperm endemism in BCF using NDM/VNDM version 3(Szumik et al. 2002; Szumik and Goloboff 2004). This method assesses congruence among taxic distributions and candidate areas of endemism by measuring an Endemicity Index (EI) for each taxon, ranging from 0 to 1. The EI is 1 for taxa that are distributed in each cell of a group of cells (AoE) under analysis, but is not present outside of the area; if the taxon distribution does not completely overlap the area, the obtained EI will be smaller than 1, and approaching 0 as the area of the taxon differs completely from the area under analysis. The endemicity index of the area will be calculated by the sum of EIs of species that occur in the area. Therefore, two factors will contribute to this value: the number of species that occur in the area, and their degree of congruence (measured by the individual EIs) among species distributions and the area itself (Casagranda et al. 2012).

To evaluate implications of different cell sizes on the delimitation of AoE, we performed analyses using three grid cell sizes (5’ x 5’, 10’ x 10’, and 15’ x 15’). All grids had equal latitudinal and longitudinal origins (41° W, 11° S) to enable comparisons. To account for poor sampling at several localities within BCF, we adapted the presence/absence criterion at each cell by applying observed (“fill”) or assumed presences using the “set radius size” option. Following Casagranda et al. (2009), we used larger radius for smaller cells to increase extrapolation to neighbor cells, and smaller radius for larger cells to avoid unwarranted extrapolation for much larger areas (see also Figure 2 from Hoffmeister & Ferrari 2016). The used radius sizes were: 45 (or 45% of cell side length) for observed, and 60 for assumed presence in 5’ grids (45/60), 30 for observed and 40 for assumed presence in 10’ grids (30/40), and 20 for observed and 25 for assumed presence in 15’ grids (20/25). Values for assumed radius were higher than for fill radius to balance the lower weight given by the algorithm to cells where species presence is only assumed. These three different grid sizes (5’, 10’ and 15’) and three radius filling options (45/60, 30/40, and 20/25) resulted in nine different analyses (I to IX; Table 4.1). The resulting areas were named by roman and arabic numbers (e.g., V12 refers to area of endemism 12 from analysis number five). Except for grid size and assumed/observed radius, all remaining settings from NDM/VNDM were kept constant: temporarily save sets within 0.99 of current score; save sets with score above 3.0; replace existing sets; save up to 50,000 sets; and use edge proportions. Resulting areas were handled using QGis 2.14 (Quantum GIS Development Team 2016).

Table 4.1 –Summary of results including: data extrapolation applied, with (f) referring to fill radius and (a) referring to assumed radius; number of areas from primary analyses before consensus (BC) and areas of endemism after consensus (AoE); minimum, maximum and mean Index of Endemism (IE); minimum, maximum and mean species number per area; minimum, maximum and mean number of grid cells (size) per AoE.

	Grid size	Data extrapolation (%)	BC	AoE	IE min-max	Mean IE	Species # min-max	Mean species #	Size min-max	Mean size
I	5’x5’	45 (f)	25	12	3.0-12.42	5.46	5-20	8	4-8	6.16
II	5’x5’	60 (a)	8	3	3.43-4.66	4.07	5-10	7.5	4-13	8.25
III	5’x5’	-	9	4	3.0-4.46	3.76	4-7	5.8	4-7	5.2
IV	10’x10’	30 (f)	61	17	3.12-28.94	8.26	5-52	18.91	4-11	7.43
V	10’x10’	40 (a)	34	10	3.28-11.91	6.58	5-24	14	6-13	8.4
VI	10’x10’	-	31	9	3.2-12.06	7.09	6-25	15.38	4-11	7.15
VII	15’x15’	20 (f)	86	32	3.07-36.09	12.8	4-88	31.91	2-11	6.9
VIII	15’x15’	25 (a)	64	23	3.1-22.58	10.41	4-49	24.35	3-14	8.4
IX	15’x15’	-	58	24	3.0-24.08	8.84	4-48	19	2-11	6.25

4.2.4 Consensus areas

Endemicity analyses typically recover a massive number of AoE, some very similar among each other (Casagranda et al. 2012). To better visualize the resulting areas of endemism we employed a tight consensus rule according to Aagesen et al. (2013) to join AoE with at least 40% percentage of shared species. Using a consensus rule and establishing a minimum number of shared species for combining AoE we hoped to reduce the quantity of results, keeping only the most relevant ones (Szumik and Goloboff 2004).

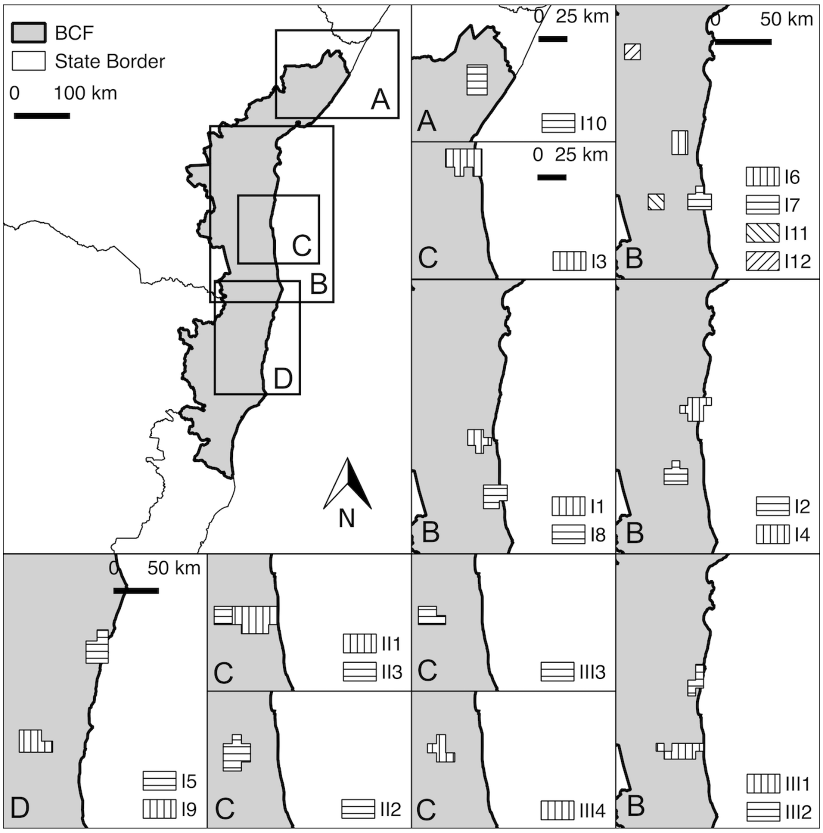
4.3 RESULTS

From a dataset of 506 taxa, 244 supported more than one AoE, and 31 were exclusive to a single AoE (Appendix 3.1). Most of the species that supported AoE belong to Bromeliaceae (52 spp.), Poaceae (19 spp.), Myrtaceae and Fabaceae (16 spp. each).

Most analyses recovered AoE on BCF central eastern area (e.g. Figures 4.2-II1; 4.3-IV8; 4.5-VII16), with a few exceptions at northern (Figures 4.2-I10; 4.3-IV4; 4.4-VI6; 4.5-VII8, VIII12; 4.6-IX9) and southern coastal areas (Figures 4.2-I5, I9; 4.3-IV11, IV13; 4.5-VII1, VII9, VII10, VII17; 4.6-VIII11, IX8, IX12). For smaller and medium-sized cells (5' and 10'), the AoE on the northern and southern portions were only recovered using "radius fill" extrapolation (I, IV). For larger grid cells sizes (15'), regardless of extrapolation option applied, all analyses (VII, VIII, IX) showed both northern and southern AoE. A larger number of AoE was recovered using fill radius option (I, IV, VII), and analyses using assumed radius (II, V, VIII) and no data extrapolation (III, VI, IX) recovered a similar number of AoE (Table 4.1). Regarding the size of AoE (measured in number of cells), larger areas were recovered using assumed radius options (II, V, VIII) if compared to other data extrapolations.

The application of a consensus rule of 40% decreased the number of resulting AoE to about one third (Table 4.1). Most consensus AoE resulted from a combination of several areas (2-16), while some areas did not form consensus AoE (e.g., I8, V10, VI9, IX21). For consensus areas, as grid size increases, the number of species, EI and AoE size also increase regardless of extrapolation option applied (Table 4.1).

Figure 4.2 - Consensus areas of endemism for 5' grid size: I) Fill radius



extrapolation. II) Assumed radius extrapolation. III) No extrapolation.

Figure 4.3 - Consensus areas of endemism for 10’ grid size: IV) Fill radius extrapolation. V) Assumed radius extrapolation.

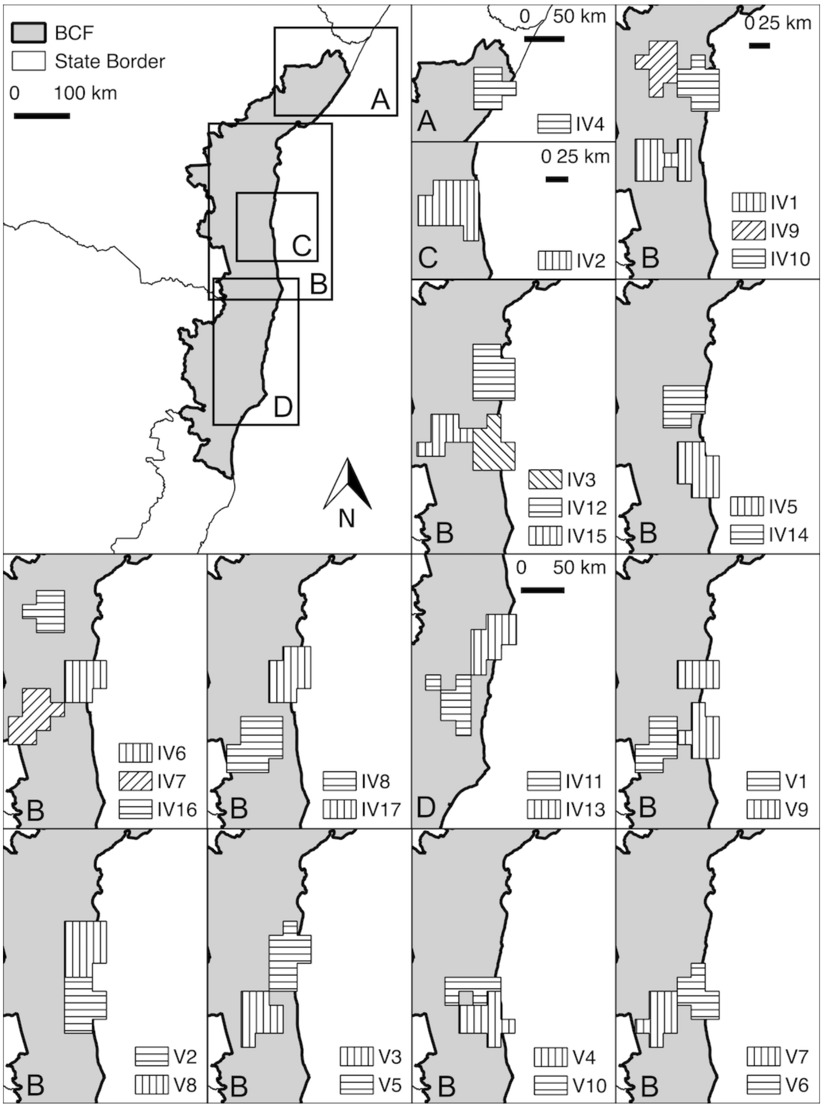


Figure 4.4 - Consensus areas of endemism for 10’ grid size: VI) No extrapolation.

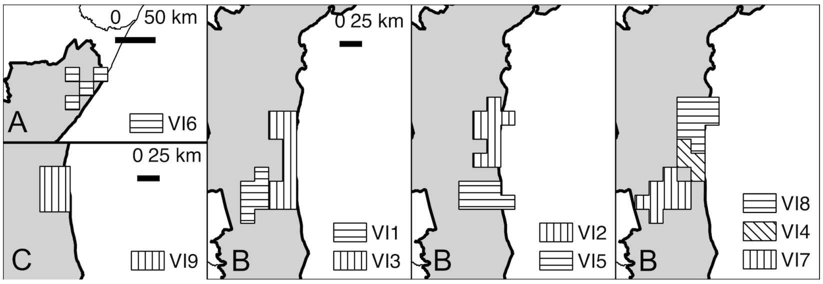


Figure 4.5 - Consensus areas of endemism for 15’ grid size: VII) Fill radius extrapolation. VIII) Assumed radius extrapolation.

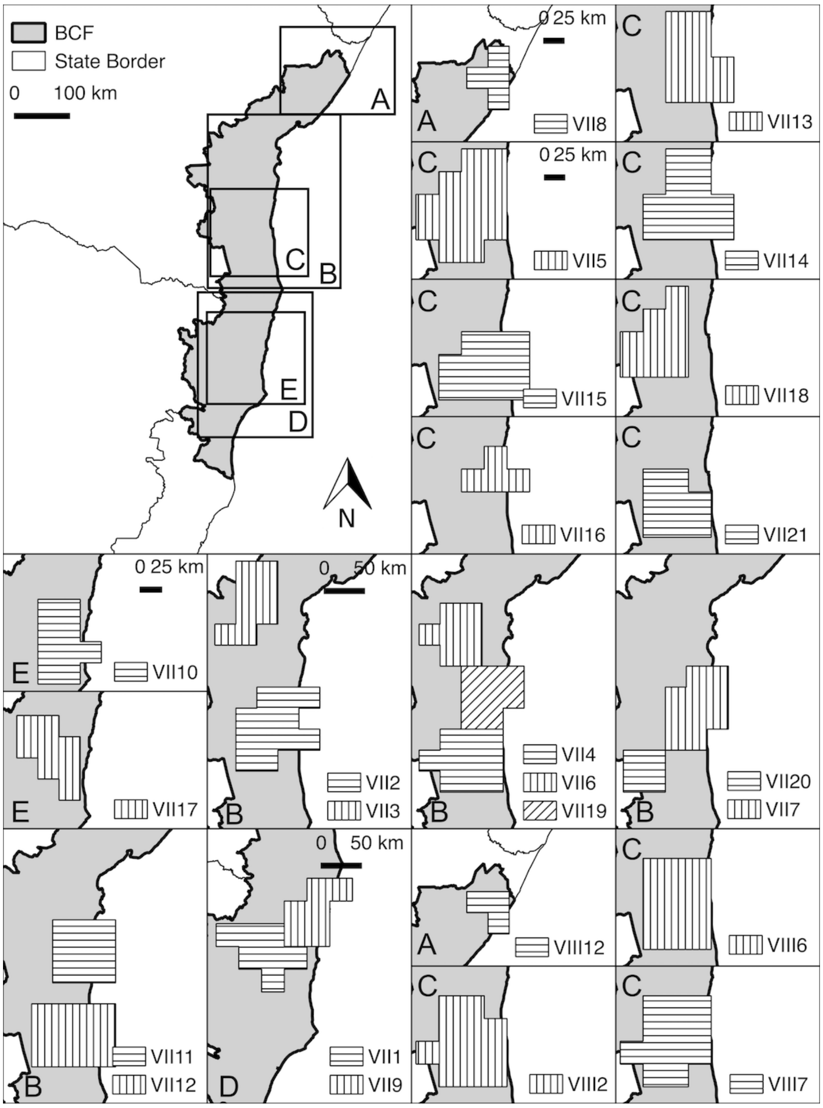


Figure 4.6 - Consensus areas of endemism for 15’ grid size: VIII) Assumed radius extrapolation. IX) No extrapolation.

4.4 DISCUSSION

For all analyses, most of the recovered AoE are located in the central eastern area of BCF (Figures 4.2 to 4.6). This concentration of AoE is likely due to a much higher collection effort in the municipality of Ilhéus and proximities. At Ilhéus there are two research institutes with a long history of botanical exploration, the “Comissão Executiva do Plano da Lavoura Cacaueira” (CEPLAC), where CEPEC herbarium is located, and the “Universidade Estadual de Santa Cruz” (UESC). The CEPEC herbarium was founded in 1965 and ever since gave logistical support and was origin of research expeditions (Mori et al. 1983; Prado et al. 2003) Werneck et al. (2011) found a similar result along the Atlantic Forest, with a higher number of endemic species corresponding to locations of large herbaria and research centers, pointing to a “museum effect” sampling bias (Ponder et al. 2001; Murray-Smith et al. 2009).

Even though the collection bias influenced in this outcome, this is also the result of high endemism in the central eastern areas of BCF (Araujo et al. 1998; Thomas et al. 1998; Amorim and Matos 2009; Amorim et al. 2009). The high endemism might be explained by the influence of the Amazon Forest (Mori et al. 1981; Carnaval et al. 2009), which is separated from bahian Atlantic Forest by a dry open area, the “dry diagonal” (Prado and Gibbs 1993). The dry area serves as a barrier to species that rely on a higher humidity (Leitman et al. 2014), those taxa remained in forest refugia throughout time (Carnaval and Moritz 2008; Carnaval et al. 2009). Another factor that probably influenced on this high endemism is heterogeneity in soils and topography in the region (Thomas et al. 1998).

Due to a lower sampling effort at northern and southern portions of BCF, areas of endemism based on smaller and medium grid sizes were recovered only when applying “fill radius”. This option allows that AoE include empty cells based on extrapolation, given that area EI is high enough for their recognition ($EI \geq 3$). Extrapolation based on “assumed radius”, on the other hand, uses a larger radius, but the EI algorithm gives a lower value for assumed presence, thus sometimes not large enough to recognize an AoE ($EI < 3$). This emphasizes the advantages of using different data extrapolation options to overcome potential sampling bias (Szumik and Goloboff 2004).

As we move from smaller to larger grid cells, number of AoE, EI values, and species number per AoE also increases, a phenomena also observed by Casagranda et al. (2009), Dasilva et al. (2015), Prado et al.

(2015), and Alvez-Valles et al. (2018). However, other studies indicate that number of AoE increased only from small to medium sized cells, while from medium to large sized cells the number of AoE, species and EI decreased (Szumik et al. 2012; Hoffmeister and Ferrari 2016). It is not surprising that species number increases in larger cells, and that the more species are included in an AoE the higher will be the area EI. When extrapolation techniques are applied, the number of AoE, species, and IE were considerably larger with "fill radius" option than "assumed radius", while for AoE size this increase was more pronounced for "assumed radius" (Casagranda et al. 2009). This is expected, as the assumed radius was always higher than the fill radius (Table 4.1).

The use of different grid sizes results in more complete analysis (DaSilva et al. 2015), as smaller grid sizes allow identification of disjoint patterns, if not by sampling gaps, with better resolution (Casagranda et al. 2009; Hoffmeister and Ferrari 2016), while larger grid sizes are less sensitive to those sampling effort bias (Casagranda et al. 2009), but might be less biologically reliable for highly heterogeneous areas (Szumik et al. 2012).

Several authors argue that AoE are artifacts of well-sampled regions disjointed by low-sampled ones (DaSilva et al. 2015), what might consist a problem for biogeographic analyses (Casagranda et al. 2009). To reduce sampling bias, we used three alternative grid sizes, as larger grids can be helpful for finding AoE on less sampled regions, while smaller grids can recover AoE more precisely on well sampled locations (DaSilva et al. 2015). At northern and southern areas of BCF, where sampling effort was less intense than on central areas (Fig. 1), only larger grids (10' and 15') or the small grids (5') with "fill radius" recovered AoE, counteracting the effect of sampling bias on poor detection of AoE (Szumik & Goloboff 2004; Casagranda et al. 2009). We understand that if the BCF were uniformly collected the results might show less but larger and more connected AoE for medium and large grid sizes, as for smaller grid size the AoE would be more precisely determined. Regardless of a well-distributed sampling effort, there would still be AoE with higher IE in the central region, that might be inside bigger AoE with a lower IE.

Bertelli et al. (2017) highlighted the need of updated data on natural history collections to appropriately understand patterns of endemism. For BCF, there is large knowledge gap on plant geographic distribution (wallacean shortfall), with several species known from a single or just a few samples, sometimes from the same or nearby locations. Moreover, the lack of precise geospatial data resulted in the exclusion of 462 records from our dataset, emphasizing this problem in large biological databases (Engler et al. 2004). These sampling problem could have been prevented if more natural history collections had their data available online and with geographic coordinates. Most data on species distribution are not readily available to the scientific community and the public (Ponder et al. 2001; Jetz et al. 2012), specially for private collections, those should be encouraged to publish their data (Beck et al. 2013).

Bahia Coastal Forests areas of angiosperm endemism recovered here point to an overall pattern of higher endemism in central-eastern areas than in southern, northern and more inland areas, what is probably a reflexion of a sampling bias towards areas of greater botanical exploration, and also a result of the high endemism on this region. To gain a better understanding of endemic patterns in BCF, sampling effort should be intensified at these areas to achieve a dataset with more evenly distributed records. With more available data, not only the recovered AoE might be different, but species that are now considered endemic to BCF might be found outside such areas (i.e., rendered non-endemic), or several new endemic species be described. Moreover, to overcome sampling bias, an strategy to select priority areas for further botanical exploration could be developed based on modelling endemic species distribution, to inform those areas more likely to contain unknown records (Casagranda et al. 2009). Considering the relevance of BCF in the Atlantic Forest hotspot, and the importance of endemic species for biodiversity conservation, we expect that our findings can be useful for future studies and for conservation strategies directed to protect this unique and highly threatened forest.

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5 TERCEIRO CAPÍTULO

Where to protect endemic angiosperms in an Atlantic Forest hot-point

5.1 INTRODUCTION

Regions of high biodiversity require that conservation policies take into account local patterns of taxa spatial distribution (Müller et al. 2003; Clements et al. 2008; Huang et al. 2016; Alvez-Valles et al. 2018). Patterns of species distributions can be revealed by delimitating areas of endemism, which can serve as proxies for conservation planning (Silva et al. 2004), but are likely to reflect the museum effect (Casagranda et al. 2009; DaSilva et al. 2015). In priority areas for biological conservation, such as biodiversity hotspots, the local patterns of species distributions can be biased due to uneven sampling effort (Müller et al. 2003), resulting in conservation strategies that might favor areas of greater sampling effort instead of those with greater biological relevance.

The Atlantic Forest is considered a biodiversity hotspot due to its high number of endemic species (about 2.7% of all known vascular plant species), and threatened conservation status (Myers et al. 2000), with only 12.4% of its original forest coverage (Fundação SOS Mata Atlântica 2017). The distribution of endemic taxa in the Atlantic Forest is not uniform, and several areas of endemism have been recognized based on different taxonomic groups (Cracraft 1985; Thomas et al. 1998; Costa et al. 2000; Pinto-da-Rocha et al. 2005; DaSilva et al. 2015. 2016; Giaretta et al. 2015; Hoffmeister and Ferrari 2016; Menini Neto et al. 2016). The coastal region of southern Bahia is a well-known area of endemism in the Atlantic Forest (Thomas et al. 2003; Silva et al. 2004; Carnaval et al. 2009; Murray-Smith et al. 2009), and one of the World's richest areas in number of tree species (Martini et al. 2007). As delimited by Saiter et al. (2016) and Ostroski et al. (submitted), this region (Bahia Coastal Forests, or BCF) harbors 547 endemic angiosperm taxa, being highlighted by several authors as a hot-point for biodiversity conservation within the Atlantic Forest hotspot (Martini et al. 2007; Murray-Smith et al. 2009; Rolim et al. 2016).

The delimitation of areas of endemism is an important tool for conservation planning strategies in the Atlantic Forest. In some cases, however, areas of endemism may reflect the sampling intensity at locations close to research centers or long-term study sites more than natural patterns of geographic distribution (Nelson et al. 1990; Ponder et al. 2001; Murray-Smith et al. 2009; Werneck et al. 2011). At Coastal Bahia Forests, Ostroski et al. (in prep.) revealed that areas of angiosperm endemism which could be highlighted as conservation priorities may in fact correspond either to areas of higher endemism or to areas with more intense sampling effort.

To sort out between these two explanations, one should ideally carry more complete biodiversity inventories in poorly sampled areas, but that might not be viable in short term. Alternatively, techniques that employ available data on species distribution to extrapolate their occurrence to other areas might serve as "shortcuts" for species discoveries where they are more likely to be found, minimizing the effects of a biased dataset (Phillips et al. 2006). Understanding species distribution despite a biased dataset is needed for planning conservation actions such as creating protected areas.

Protected areas can have a very positive impact on maintaining habitat integrity and species diversity (Brooks et al. 2004; Rodrigues et al. 2004; Coad et al. 2009; Butchart et al. 2010). In Brazil, a country that harbors more than 33,000 species of plants (Ulloa et al. 2017), the National System of Protected Areas (SNUC, from the Portuguese "Sistema Nacional de Unidades de Conservação") is not effective on protecting most of its endemic species and lineages (Oliveira et al. 2017). Moreover, less than 2% of the Atlantic Forest cover are under governmental protection, and most of these are too small to maintain species stability (Tabarelli et al. 2005). In Bahia Coastal Forests this same trend is observed, with not enough protected areas, and with most of the large protected areas being threatened by sustainable use, which allows exploitation and has biodiversity conservation as a secondary objective (Rylands and Brandon 2005).

In order to identify areas that are likely to harbor more records of endemic angiosperm species in southern Bahia, we applied Species Distribution Modelling (SDMs) to extrapolate endemic species occurence. By understanding which areas are more likely to harbor endemic species, we were able to highlight main areas for conservation and which are crucial for future expeditions in BCF region.

5.2 MATERIAL AND METHODS

5.2.1 Study area

Area limits were established by Ostroski et al. (submitted) based on Bahia Coastal Forests ecoregion (BCF) *sensu* Saiter et al. (2016). This region is mostly characterized by rainforests under the Af climatic type of Köppen-Geiger's system (Kottek et al. 2006), and an annual average temperature of 25°C (Mori et al. 1983). Monthly rainfall is above 60 mm year-round (Mori et al. 1983), however in the study area rainfall distribution varies widely in a latitudinal range (Saiter et a. 2015).

5.2.2 Taxa Dataset

Our dataset was composed by occurence records of 41 taxa endemic endemic to Bahia Coastal Forests (40 species and one variety) (Table 5.1). Such taxa were selected from a list of more than 500 endemic taxa (Ostroski et al. in prep.) This dataset was limited for taxa with at least 20 different location records.

5.2.3Species Distribution Models (SDMs)

All taxa distribution models were developed with Maxent (Maxent version 3.4.1; Phillips et al. 2006). This method estimates species potential distribution using presence-only occurrence data (Franklin and Miller 2009). We used colinearity by Variance Inflation Factor (VIF) (R Development Core Team 2015) on climatic variables and elevation available on WorldClim (www.worldclim.org) to remove highly correlated predictors (Merow et al. 2013). Non redundant variables used for SDMs were: temperature seasonality (coefficient of variation) (1), mean temperature of wettest quarter (2), mean temperature of driest quarter (3), precipitation of wettest month (4), precipitation seasonality (coefficient of variation) (5), precipitation of warmest quarter (6) and elevation (7), all at a 0.5' scale (Table 5.1). For each taxa, Maxent was run with 5000 maximum iterations with 20% of data reserved for testing resulting models. Ten replicas were done to assess algorithm average behavior using bootstrap. A threshold rule was also applied for each analysis, by generating a feature whose value is 0 below the threshold (in this case the value of "Maximum test sensitivity plus specificity") and 1 above it (Merow et al. 2013). All ".asc files" resulting from the threshold rule were stacked and analyzed using QGis 2.14 (Quantum GIS Development Team 2016), maps also showed terrestrial protected areas classified as IUCN category I-IV, which provides a higher degree of protection (Zachos and Habel 2011).

5.2.4 Models evaluation

For evaluating SDMs we used receiver operating characteristic (ROC) curves, in which the area under the ROC curve (AUC) provides a single measure of model performance (Phillips et al. 2006), being frequently used in evaluation of species modeling distributions with Maxent (for examples see Phillips et al. 2006; Franklin and Miller 2009; Murray-Smith et al. 2009; Leite et al. 2016; van Proosdij et al. 2016).

5.3 RESULTS

For the 41 endemic taxa analyzed, most records were located at eastern-central region of BCF (Figure 5.1), where the cities of Ilhéus, Itacaré and Una are situated. The outcome from SDM of each taxa is provided as supplementary material (Appendix 5.1), and the resulting map from the union of threshold files from each taxa is presented in Figure 5.2. The variables influence used for SDM differed widely among taxa (Table 5.1). On Figure 5.2, it is noticeable that according to the models, the area that is most likely to harbor endemic species is that around Ilhéus. Likewise, secondary regions that also showed a high chance of harboring endemic angiosperm species were located nearby cities of Camaçari, Maracás, Vitória da Conquista, Valença and Wenceslau Guimarães, and are discussed below.

Table 5.1 – Number of records, Area Under the Curve (AUC) and percentage influence of variables on SDMs for 41 angiosperm endemic taxa: temperature seasonality (Var 1), mean temperature of wettest quarter (Var 2), mean temperature of driest quarter (Var 3), precipitation of wettest month (Var 4), precipitation seasonality (Var 5), precipitation of warmest quarter (Var 6), and elevation (Var 7).

Family	Taxa	Records #	AUC	Var 1 (%)	Var 2 (%)	Var 3 (%)	Var 4 (%)	Var 5 (%)	Var 6 (%)	Var 7 (%)
Acanthaceae	*Pseuderanthemum verbenaceum*	29	0.76	9	20.8	2.9	27.7	7.9	4.3	27.4
Annonaceae	*Pseudoxandra bahiensis*	58	0.79	16.2	24.8	5.3	10.5	21.7	10.4	11.1
Annonaceae	*Unonopsis bahiensis*	68	0.76	15.2	3.2	3.7	6	38.9	21.6	11.6
Annonaceae	*Xylopia involucrata*	21	0.69	25.3	10	1.1	10	25.7	17.8	10.2
Apocynaceae	*Lacmellea bahiensis*	22	0.85	16.9	4.1	6	10.6	29.6	19.6	13.2
Apocynaceae	*Rauvolfia atlantica*	30	0.8	14.3	9	3.3	7.3	41.9	13.7	10.6
Araceae	*Asterostigma riedelianum*	26	0.85	7.7	2.4	10	40.5	22	3	14.3
Asparagaceae	*Hagenbachia brasiliensis*	20	0.73	15.3	10.7	0.4	1.2	12	19.2	41.1
Asteraceae	*Vernonanthura vinhae*	21	0.76	1.1	39	0	14.7	12.1	9.9	23.3

Family	Taxa	Records #	AUC	Var 1 (%)	Var 2 (%)	Var 3 (%)	Var 4 (%)	Var 5 (%)	Var 6 (%)	Var 7 (%)
Bromeliaceae	*Aechmea miniata*	48	0.77	21.1	15.2	3.3	6.3	9.4	30.9	13.7
Bromeliaceae	*Cryptanthus pseudopetiolatus*	29	0.77	15.8	12.6	10.7	16.9	7.6	20.6	15.7
Bromeliaceae	*Lymania corallina*	22	0.8	26.1	10.6	6.2	7.7	12.1	11.2	26.2
Bromeliaceae	*Wittmackia turbinocalyx*	24	0.84	6.6	22.1	3.1	4.8	21.8	20.3	21.4
Burseraceae	*Protium icicariba* var. *talmonii*	41	0.83	4.5	5.8	2.4	5.3	33.7	38	10.3
Chrysobalanaceae	*Licania lamentanda*	20	0.72	6	2.6	5.1	1.7	11.9	7.1	65.6
Connaraceae	*Connarus portosegurensis*	23	0.75	7.2	30.5	4.9	9.5	17.8	3.4	26.8
Cyperaceae	*Hypolytrum jardimii*	26	0.84	20.7	18	9.1	8.4	16.3	10.2	17.1
Dilleniaceae	*Davilla macrocarpa*	20	0.83	11.3	9.2	12.5	10.4	12.8	9.4	34.3
Dioscoreaceae	*Dioscorea macrothyrsa*	23	0.85	5.1	21.5	3.8	6.5	17.7	6	39.4
Erythroxylaceae	*Erythroxylum martii*	69	0.74	31.2	6.1	1.3	13.2	18.1	16.2	13.9
Erythroxylaceae	*Erythroxylum mattos-silvae*	52	0.87	12.1	13.7	2.5	4.8	58.1	2.2	6.5
Fabaceae	*Andira carvalhoi*	28	0.87	30.6	7.1	0.1	17.9	23.4	7.6	13.3
Fabaceae	*Arapatiella psilophylla*	73	0.74	9.8	10.1	11.5	0.8	21.1	29.4	17.4
Fabaceae	*Harleyodendron unifoliolatum*	34	0.84	12	4.7	3.8	19.2	28	13.8	18.4
Fabaceae	*Inga pleiogyna*	43	0.83	24	13.5	16.9	5.6	11.1	7	21.9
Fabaceae	*Moldenhawera nutans*	23	0.92	45	13.9	0.5	0.1	1.3	33.1	6.1
Fabaceae	*Swartzia riedelii*	40	0.85	9.2	3.7	5.8	2.7	64	6.6	8
Malpighiaceae	*Stigmaphyllon macropodum*	70	0.8	18.2	14.2	4.4	4.9	11.9	24	22.5
Myrtaceae	*Myrcia tetraphylla*	21	0.72	7.6	6.6	5.8	4.5	61.1	8.1	6.2
Myrtaceae	*Plinia callosa*	23	0.83	13.7	2.4	3.3	46.9	3	19.6	11.1
Ochnaceae	*Ouratea bahiensis*	24	0.78	9.2	23.5	15.8	12.8	6.2	17.9	14.5
Ochnaceae	*Ouratea gigantophylla*	21	0.82	9.7	19.4	13.3	11.3	19	8.2	19.1
Poaceae	*Atractantha cardinalis*	20	0.85	8.6	13.1	10.6	6.1	6.2	3.7	51.7
Poaceae	*Atractantha radiata*	33	0.84	7.9	12.7	7.2	22.8	22.1	7.9	19.4
Poaceae	*Merostachys annulifera*	24	0.8	33.9	8.8	12	5	20.1	11.1	9.1
Rubiaceae	*Faramea nocturna*	26	0.83	12.1	5.6	20.2	19.1	13.5	14.9	14.6
Rubiaceae	*Malanea harleyi*	41	0.84	37.8	13.6	4.4	8.3	19.5	5.4	11.1
Rubiaceae	*Psychotria strigosa*	28	0.82	28.9	17	6.6	0.8	22.6	9.3	14.8
Rutaceae	*Neoraputia calliantha*	24	0.82	0	7.9	4.8	71.1	10.9	4.5	0.7
Rutaceae	*Zanthoxylum nemorale*	21	0.72	8.1	10.1	4.1	0.5	22.4	10.8	44
Sapindaceae	*Serjania*	27	0.83	16.9	8.3	5.4	0.3	26.8	17.4	24.9

Family	Taxa	Records #	AUC	Var 1 (%)	Var 2 (%)	Var 3 (%)	Var 4 (%)	Var 5 (%)	Var 6 (%)	Var 7 (%)
	scopulifera									

Figure 5.1 - Study area and distribution records 41 endemic Bahia Coatal Forests angiosperm taxa. Map on the right shows location of Bahia Coastal Forests within South America.

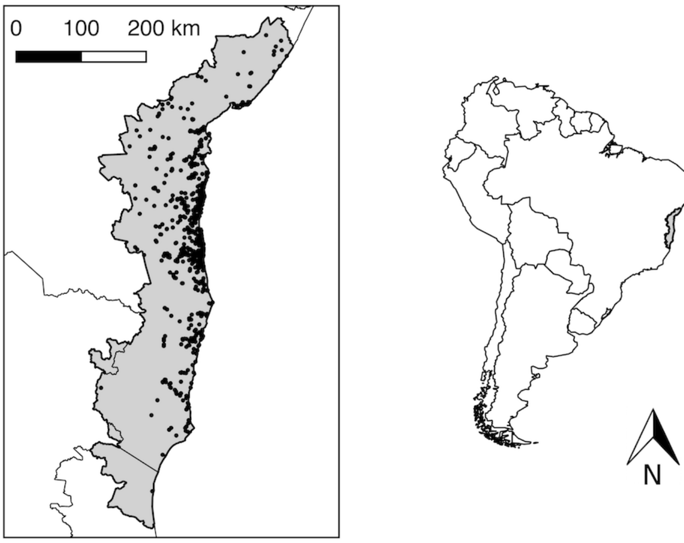
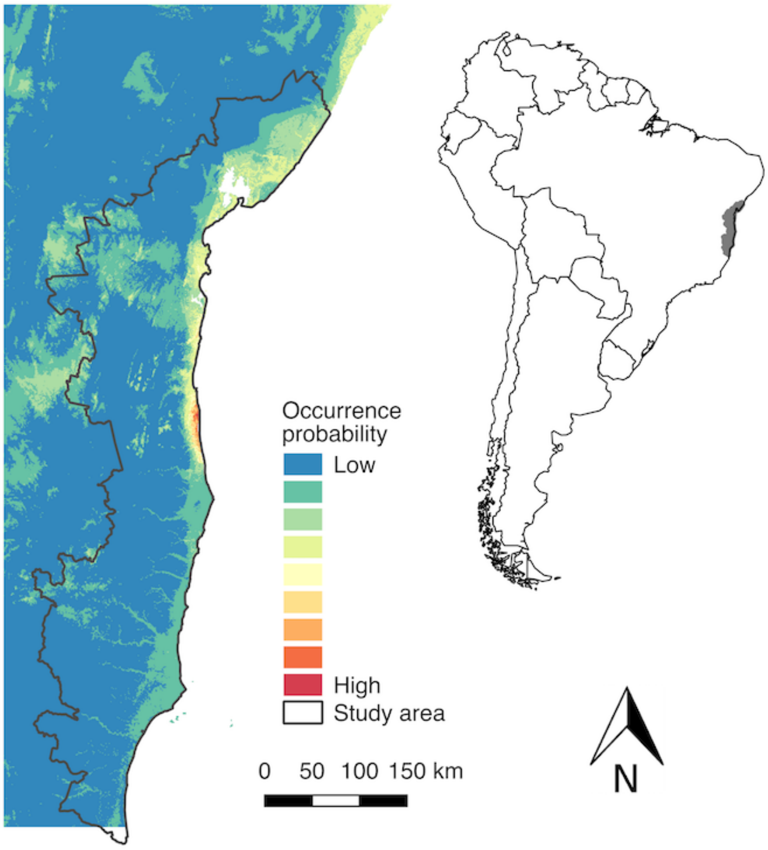


Figure 5.2 – Consensus of Species Distribution Modeling (SDMs) of 41 endemic Bahia Coastal Forests angiosperm taxa.



5.4 DISCUSSION

The central-eastern region of BCF is recognized as the place more likely to find endemic angiosperms. This might result from the fact that most of the botanical exploration in the region has been historically carried out in the region surrounding Ilhéus, where are located some of the main botanical research centers in BCF, i.e. the CEPEC herbarium, and the “Universidade Estadual de Santa Cruz”

(UESC) are located. In spite of the sampling bias, the region is undeniably important for its endemic species diversity (Araujo et al. 1998; Thomas et al. 1998; Amorim and Matos 2009; Amorim et al. 2009) and should be considered a valuable asset for conservation. Fortunately the region has a considerable amount of Strictly Protected Areas (e.g. Parque Nacional da Serra das Lontra, Parque Estadual da Serra do Conduru, Reserva Biológica de Una). In addition to this central region, other areas are also of interest in terms of the likely occurrence of endemic angiosperms from BCF and are discussed below.

5.4.1 "Recôncavo baiano" region (Figure 5.3A)

Even though most of the 41 analyzed taxa had no records in the "Recôncavo baiano" region, SDMs showed a high probability of endemic species occurrence in this area (Fig. 5.3a). The model showed a high probability, which is possibly based on current similar climatic conditions to Ihéus region, where most species were registered. We hypothesize that many of the analyzed species may have not reached the Recôncavo Baiano in the past due to some ecological barrier; therefore not many of the analyzed species have records in the area. This possible break has already been observed and could be a consequence of dry and seasonal paleoclimate in northern coastal Bahia (Carnaval and Moritz 2008; Saiter et al. 2016). Otherwise, subtle south–north changes in the water–energy balance during the critically warm summer months (see Silva & Satyamurty, 2006) have been considered a limiting factor to species distribution in that region (Saiter et al. 2016).

On the other hand, the absence of many endemic species in Recôncavo baiano could be the result of deforestation, as average remaining forest area is 6.8% among the cities of this region (opposed to 11.2% in Bahia's Atlantic Forests as a whole, Fundação SOS Mata Atlântica 2017). Such condition is likely due to massive urban expansion in the last decades (Queiroz et al. 2012). This degree of deforestation might have led some species that occurred in the area to local extinction even before they could have been registered in the regional botanical collections. Nevertheless, there are species of angiosperms endemic to Recôncavo baiano, such as *Aristolochia brunneomaculata*, *Cryptanthus coriaceus*, *Justicia antirrhina*, *Koellensteinia abaetana*, *Pouteria synsepala*, and *Psittacanthus salvadorensis* (Ostroski et al. submitted).

This region has been highlighted as important for research and conservation of several groups of organisms, such as monkeys and anurans (Juncá 2006; Sousa et al. 2008), and also overlaps with a previously designed priority area for biodiversity conservation (Ministério do Meio Ambiente 2008). Despite the low collection effort in the area, it has been highlighted as having a high biodiversity (Gomes and Guedes 2014) but the few terrestrial protected areas on this region are small, private and isolated.

5.4.2 "Costa do Descobrimento" region (Figure 5.3B)

SDMs indicated a low probability of endemic species occurrence in the "Costa do Descobrimento", except on riparian forests. This pattern probably results from the high humidity in soils of riparian forests, where edaphic conditions are more similar to the coast. However, not necessarily the same species recorded along the coast might be able to expand their distributions along inland riparian areas, as suggested by extrapolations based on climatic similarities.

Most endemic angiosperm records from this region are along coastal areas, and also along the roads from Prado to Itamaraju and from Porto Seguro to Eunápolis (Figure 5.1), where several large conservation areas are closely located (Figure 5.3b). Several BCF endemic species are found in the "Costa do Descobrimento", such as *Actinocephalus ochrocephalus*, *Begonia goldingiana*, *Davilla bahiana*, *Herpetacanthus tetrandrus*, *Ixora cabraliensis*, *Ossaea loligomorpha*, *Phyllanthus carvalhoi*, and *Santosia talmonii* (Ostroski et al. submitted).

This region is also extremely relevant for tetrapod conservation, being defined as a priority area for groups of amphibians, snakes, lizards, and birds (Cordeiro 2003; Silvano and Pimenta 2003). It harbors several important protected areas (Aguiar et al. 2005), with many being small private conservation areas and a few parks that cover a large area. Even so the area is under serious threat because of urban expansion, agriculture, wood extraction and *Eucalyptus* monocultures (Aguiar et al. 2005; Amorim and Oliveira 2013), resulting in a high rate of recent deforestation, as in the municipalities of Belmonte and Santa Cruz Cabrália (Fundação SOS Mata Atlântica 2017).

5.4.3 "Matas-de-cipó" (liana forests) (Figure 5.3C)

Two highland regions outside of the study area were highlighted by SDM as likely to harbor endemic species of angiosperms: Maracás (I) and Planalto da Conquista (II). Such regions are floristically similar to Coastal Bahia (Macedo, 2009) and, based on this, we speculate that future expeditions will be able to record new occurrence sites for species that are currently known to be restricted to BCF.

In addition to a few endemic mata-de-cipó species, these areas are home to species typical of the Caatinga and Atlantic Forest (Macedo 2007). We expect that at least some endemic BCF angiosperm species could be found at matas-de-cipó, which are “low forests with shrubby understory and xerophytic species” (Thomas 2003). These forests are one of the less known eastern Brazilian vegetation types (Macedo 2007), but are suffering from a growing deforestation (RADAMBRASIL 1981; Novaes et al. 2005).

Despite the Maracás region partially overlaps a previously designed priority area for biodiversity conservation (Ministério do Meio Ambiente 2008), the only protected area there is the RPPN (Reserva do Patrimônio Natural) Arco Verde. Protected areas coverage is less worrisome in Planalto da Conquista, where there are two large connected areas, the Refúgio da Vida Silvestre de Boa Nova and Parque Nacional de Boa Nova.

5.4.4“Costa do dendê” region (palm oil coast) (Figure 5.3D)

This coastal region has many records of angiosperms endemic to BCF (Figure 5.1). According to SDMs, it might harbor even more endemic species that are unknown to this area. The region is considered a priority area for conservation (Barboza et al. 2014), being threatened by increasing urbanization due to its touristic potential (Silva et al. 2009). This area does not encompass any terrestrial protected area under categories I to IV of IUCN. The only protected area in this region is the Área de Proteção Ambiental Tinharé/Boipeba, which is not too effective, as it operates more like a mechanism for planning land use than a true protected area (Rylands and Brandon 2005). Therefore we recommend for this region not only more collections, but the urgent creation of a strictly protected area in the region, as it has been indicated as one of the most relevant for conservation in this study.

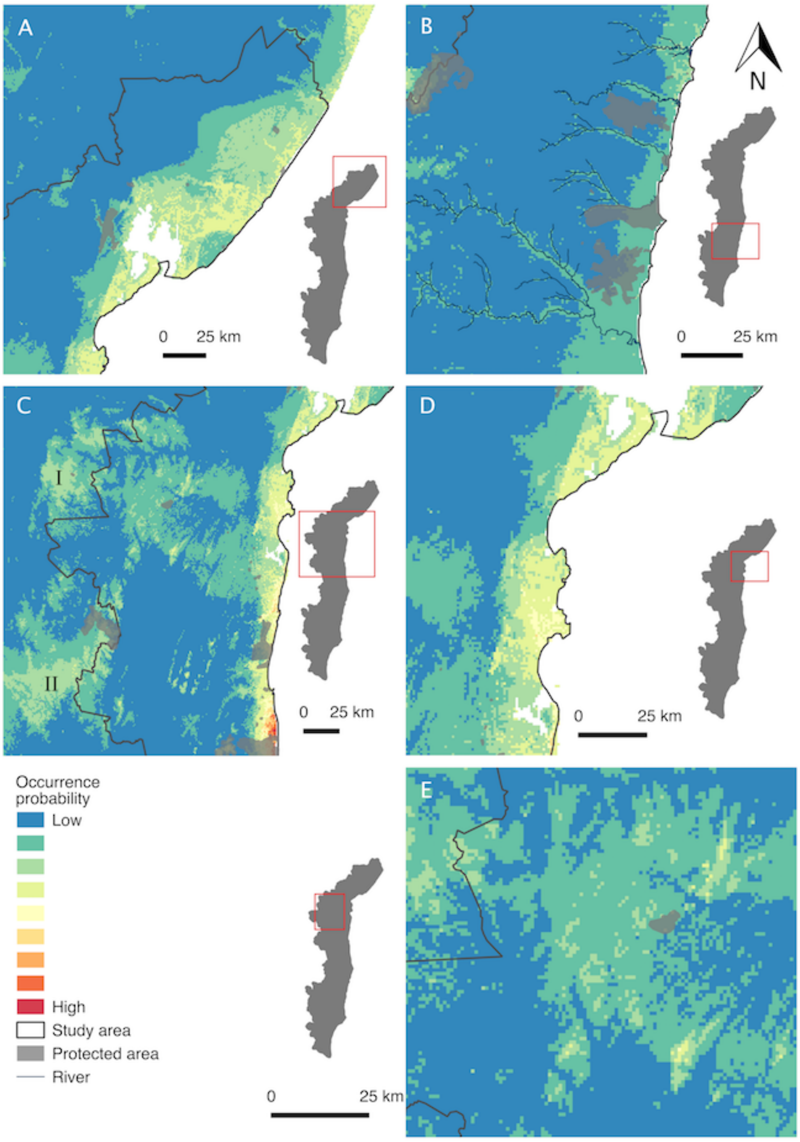
5.4.5 “Wenceslau Guimarães” region (Figure 5.3E)

Even though this region has a low amount of records for the analyzed taxa, SDMs indicated a high probability of occurrence of endemic species. In this region the lanscape is characterized by highlands and steep slopes, in which most of the forest remain preserved due to difficult access by colonizers. Other than the Estação Ecológica

Estadual Wenceslau Guimarães, where several new species of angiosperms have been recently described (Bacci et al. 2016; Goldenberg et al. 2016; Chautems and Perret 2017), there are no other protected areas in this region.

Even with a low sampling effort, several species endemic to BCF are endemic to this region such as *Aechmea glandulosa*, *Canistrum guzmanioides*, *Hohenbergia correia-araujoi*, *Huberia sessifolia*, *Meriania inflata*, *Wittmackia andersoniana*, and *W. neoregelioides* (Aguirre-Santoro 2017; Ostroski et al. submitted). The region is likely to harbor several additional taxonomic novelties, as well as new records for some of the previously known endemic angiosperms. Moreover, a recent study carried out by the government highlights the need to deepen knowledge on species diversity in the region of Wenceslau Guiamarães (Ministério do Meio Ambiente 2008). We also recommend that future expeditions are carried out in this area, as the region is probably the new botanical frontier on BCF (Figure 5.3e).

Figure 5.3 - Detailed results from SDMs: a) “Recôncavo Baiano” region. b) “Costa do Descobrimento” region. c) “Matas-de-cipó” (liana forest): “Maracás” (I) and “Planalto da Conquista” (II). d) “Costa do dendê” region (alm oil coast). e) “Wenceslau Guimarães” region.



Protected areas coverage in Brazil is alarmingly low. Apart from the Amazon, all other biomes have a coverage below the 17% of the area recommended by the Convention on Biological Diversity (Secretariat CBD 2010). Regarding the Atlantic Forest, less than 2% of its area are under protection, from which only 24% are strictly protected areas (Tabarelli et al. 2005). In Bahia’s Atlantic Forests only 11,2% of natural forests remains, and the state recorded the largest deforestation rates in the last couple of years (Fundação SOS Mata Atlântica 2017). From the remaining forested areas in Bahia, about 1.5% is protected, and those areas are not appropriately distributed among forest types. Most of the protected areas from southern Bahia are located at coastal zones, therefore not all ecosystems and endemic species have been sufficiently protected (Saiter et al. 2015). As we are running out of time on conservation policies for BCF, it is crucial to determine priority areas for conservation, otherwise politicians will decide on conservation policies without consulting biodiversity data (Müller et al. 2003).

To better plan future conservation policies for the most diverse floristic assemblage of the Atlantic Forest, we suggest priority areas for conservation of endemic angiosperms and for further botanical expedition. We point out several areas at BCF that are likely to harbor endemic angiosperm species or even undiscovered species. We hope that this could be a starting point to guide future botanical exploration, which could validate our findings, and conservation planning, like establishing priority areas for plant conservation in the BCF. For that aim, further studies on different taxonomic groups are needed to evaluate if our findings can be good proxies for a broader conservation plan of this shrinking biodiversity hotspot.

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6 CONCLUSÃO

A elaboração deste trabalho partiu de uma listagem de 3.551 táxons de angiospermas com ocorrência na Floresta Costeira da Bahia, todas as quais tiveram seus registros checados em registros de herbários, estudos taxonômicos recentes e quando necessário revisados por especialistas. Por fim, 547 espécies de angiospermas foram consideradas endêmicas da Floresta Costeira da Bahia.

Através da compilação dos pontos de ocorrência de todas essas espécies buscou-se compreender quais são as áreas de endemismo na região. A maior parte das áreas de endemismo geradas se localizam na região central da área de estudo, com uma menor quantidade de áreas mais ao norte e ao sul da área de estudo. A concentração de áreas de endemismo na região central é explicada em parte pelo maior numero de coletas na região, mas embora haja um viés de coleta na região, há de fato uma alta riqueza de espécies de angiospermas endêmicas nessa região.

A fim de se apontar áreas com maior probabilidade de ocorrência de angiospermas endêmicas, buscando também superar os efeitos do viés de coleta, foi realizada uma modelagem da distribuição geográfica das 41 espécies que mais contavam com registros fidedignos. Esse método revelou algumas áreas com alta chance de ocorrência de angiospermas endêmicas da região, áreas essas de especial interesse para futuras expedições científicas, além de locais prioritários para a conservação.

Os resultados obtidos nesse trabalho poderiam se fazer mais robustos caso mais coleções científicas disponibilizassem seus registros, justamente com informações precisas de localização da coleta. Infelizmente esse é um problema recorrente em estudos biogeográficos. Em havendo mais tempo para a pesquisa seria interessante que este trabalho contasse com expedições ao campo, tanto para prover dados de áreas pouco coletadas, quanto para validar os modelos de distribuição de espécies aqui gerados. Independente das limitações impostas à essa pesquisa, espera-se que os resultados sirvam de base para outros estudos, e indique áreas potencialmente muito diversas e pouco exploradas pela ciência, com potencial inclusive para descoberta de espécies novas. Principalmente, espera-se que esse estudo balize tomadas de decisões conservacionistas nesta que é uma das áreas mais biodiversas do planeta.

APPENDIX 3.1 – Taxonomic studies and specialists consulted by family

Acanthaceae:

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Annonaceae: Adriana Quintella Lobão (Universidade Federal Fluminense) and Jenifer de Carvalho Lopes (Universidade de São Paulo)

Apocynaceae: Ingrid Koch (Universidade Estadual de Campinas)

Araceae: Marcus Nadruz (Instituto de Pesquisas Jardim Botânico do Rio de Janeiro)

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ABREU, I.S. & GIULIETTI, A.M. 2016. *Aristolochia brunneomaculata*, a new threatened species of Aristolochiaceae from the Atlantic Forest in Bahia, Brazil. Sitientibus 16:10.13102/scb1060.

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Chrysobalanaceae: Renata Asprino (Comissão Executiva do Plano da Lavoura Cacaueira)

Clusiaceae:

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Dioscoreaceae: Ricardo Sousa Couto (Universidade Iguaçu)

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Euphorbiaceae: Juan F. Carrión R. (Universidade Estadual de Feira de Santana)

Fabaceae: Cristiane Snak (Universidade Estadual de Feira de Santana), Eduardo Meireles (University of Minnesota), Flávia C. P. Garcia (Universidade Federal de Viçosa), Juliana Gastaldello Rando (Universidade Federal do Oeste da Bahia) and Vidal de Freitas Mansano (Instituto de Pesquisas Jardim Botânico do Rio de Janeiro)

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Lauraceae: Marcelo Leandro Brotto (Museu Botânico Municipal de Curitiba)

Lecythidaceae: Nathan Phillips Smith (Universidade Federal de Santa Catarina)

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Melastomataceae: Juliana Gomes Freitas (Universidade Estadual de Feira de Santana), Marcelo Reginato (New York Botanical Garden) and Mayara Krasinski Caddah (Universidade Federal de Santa Caratina)

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Myrtaceae: Marcos Sobral (Universidade Federal de São João Del-Rei) and Matheus Fortes Santos (Universidade Federal de São Carlos)

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Ochnaceae: André M. Amorim (Universidade Estadual de Santa Cruz) and Domingos Cardoso (Universidade Federal da Bahia)

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Piperaceae: Daniele Monteiro (Instituto de Pesquisas Jardim Botânico do Rio de Janeiro)

Poaceae: Fabricio Moreira Ferreira (Universidade Federal de Juiz de Fora)

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Primulaceae: Tatiana Carrijo (Universidade do Espírito Santo)

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APPENDIX 4.1 – NDM analyses results

AoE	Areas	Species (Appendix 3.2)	Size	IE	Species #
I1	0, 3, 10, 12	7, 58, 205, 317, 459, 474, 501	6	4.33-4.58	7
I2	1, 13, 17	67, 98, 138, 155, 156, 167, 173, 175, 183, 253, 280, 291, 318, 401, 404, 408, 410, 433, 443, 481	7	7.60-12.42	20
I3	2, 3, 12	5, 58, 205, 300, 317, 360, 459, 474, 501, 505	10	4.50-5.00	10
I4	4, 11, 19	50, 152, 194, 199, 224, 288, 324, 332, 337, 363, 385, 451	8	5.60-7.45	12
I5	5, 14	146, 240, 329, 336, 496	5	3.48-3.73	5
I6	6, 16	102, 103, 152, 184, 283	6	3.00-3.75	5
I7	7, 18	55, 134, 144, 174, 219, 369, 374	7	4.50-5.25	7
I8	8	54, 314, 326, 365, 422	8	3.20-3.45	5
I9	9, 21	41, 47, 77, 203, 344, 414	5	4.00-5.00	6
I10	15	6, 15, 127, 306, 502	6	4.13-4.38	5
I11	20	17, 48, 60, 166, 247, 356, 380, 400, 476, 480, 484	4	9.86-10.11	11
I12	22	43, 95, 136, 341, 342, 373, 455	4	7.00-7.25	7
II1	0, 2, 3, 5	65, 138, 165, 253, 321, 410, 424, 443, 495, 499	13	3.66-4.66	10
II2	1, 4, 6	1, 155, 156, 165, 167, 291, 402, 408	9	3.43-4.18	8
II3	7	17, 356, 476, 480, 484	4	4.08-4.33	5
III1	0, 5	65, 138, 154, 253, 410, 424, 443, 495, 499	9	3.77-4.27	9
III2	1, 7	50, 223, 288, 332	5	3.10-3.35	4
III3	2, 6	17, 218, 356, 402, 476, 480, 484	5	3.75-4.00	7
III4	3, 4, 8	155, 156, 167, 291, 402, 408	5	3.00-4.00	6
IV1	0, 2, 32, 40	7, 33, 39, 74, 91, 111, 172, 198, 275, 290, 292, 419, 490, 492, 494	10	3.64-6.22	15
IV2	1, 10, 11, 12, 16, 25, 34, 42, 47, 54, 56	1, 17, 24, 48, 54, 55, 65, 67, 74, 98, 109, 112, 138, 144, 154, 155, 156, 163, 165, 166, 167, 173, 174, 175, 202, 218, 245, 247, 253, 277, 280, 291, 314, 321, 326, 339, 349, 355, 356, 365, 369, 374, 380, 389, 400, 401, 402, 403, 404, 408, 410, 424, 433, 443, 475, 476, 479, 480, 484, 495, 499	12	9.60-28.25	61

AoE	Areas	Species (Appendix 3.2)	Size	IE	Species #
IV3	3, 4, 5, 30, 31	24, 33, 58, 75, 80, 121, 164, 205, 231, 245, 317, 334, 387, 389, 467, 475, 479, 498, 505	9	3.83-7.94	19
IV4	6, 61	6, 15, 127, 285, 306, 450, 502	7	4.02-4.52	7
IV5	7, 10, 11, 12, 22, 39, 42, 52	24, 54, 55, 65, 67, 98, 138, 144, 155, 156, 165, 167, 173, 174, 175, 219, 245, 253, 280, 291, 314, 321, 326, 355, 365, 369, 374, 389, 401, 403, 408, 410, 424, 443, 475, 479, 495, 499	10	6.50-19.11	38
IV6	8, 36, 38, 46, 58	27, 50, 152, 199, 223, 224, 231, 254, 288, 324, 331, 332, 362, 363, 370, 385, 451	8	3.43-11.26	17
IV7	2, 9, 19, 20	91, 172, 181, 187, 198, 268, 292, 327, 419, 490, 494	10	3.66-4.91	11
IV8	1, 13, 16, 25, 28, 29, 35, 37, 47, 56, 57	1, 17, 42, 48, 60, 65, 67, 74, 83, 98, 109, 112, 138, 154, 155, 156, 163, 165, 166, 167, 168, 169, 173, 175, 202, 218, 247, 253, 277, 280, 291, 321, 339, 349, 355, 356, 380, 397, 400, 401, 402, 403, 404, 408, 410, 424, 428, 433, 443, 476, 480, 484, 495, 499	13	8.40-28.25	54
IV9	14, 23, 53	95, 122, 140, 243, 320, 328, 330, 342, 348, 373, 382	8	4.54-6.04	11
IV10	15, 26, 44	45, 96, 100, 133, 149, 185, 189, 242, 377, 447, 454	9	4.62-4.87	11
IV11	17, 18, 27, 48, 59	13, 41, 47, 76, 77, 203, 279, 344, 350, 357, 406, 414, 442	7	5.20-6.45	13
IV12	21, 26, 50	27, 45, 88, 149, 185, 189, 242, 370, 377, 447	11	4.62-5.37	10
IV13	24, 45, 51	71, 146, 240, 281, 329, 336, 496	8	3.67-4.42	7
IV14	33, 41, 43	27, 33, 88, 93, 152, 254, 283, 331, 363, 417, 431, 483	8	3.17-5.64	12
IV15	2, 19, 20, 32, 49	91, 172, 181, 198, 292, 327, 419, 490, 494	7	3.12-4.87	9
IV16	23, 53, 55	95, 122, 140, 243, 320, 342, 348, 373, 382	7	4.20-5.95	9
IV17	8, 38, 46, 58, 60	27, 50, 88, 152, 185, 189, 199, 223, 224, 231, 254, 288, 324, 331, 332, 362, 363, 370, 376, 385, 451, 453	10	3.43-11.26	22
V1	0, 1, 2, 3, 4, 6	1, 42, 78, 109, 163, 202, 218, 277, 339, 349, 397, 476, 480, 489	9	4.09-5.84	14
V2	5, 11, 12, 24, 28	24, 148, 165, 245, 253, 389, 403, 424, 469, 475, 479, 505	10	3.42-5.55	12
V3	7, 8, 9, 15, 16, 21, 22, 23, 29, 32, 35	1, 74, 78, 109, 148, 155, 156, 163, 165, 167, 202, 218, 230, 253, 277, 291, 321, 339, 349, 356, 402, 408, 424, 476, 480, 484, 499	9	7.86-11.91	27
V4	10, 11, 26, 32, 33	1, 24, 65, 138, 148, 154, 155, 156, 165, 167, 245, 253, 291, 314, 321, 389, 402, 408, 410, 424, 475, 479, 495, 499	9	4.22-10.25	24
V5	13, 14, 19	27, 28, 75, 164, 223, 231, 254, 288, 331, 332, 362, 370, 376, 387, 453	11	5.42-6.42	15

AoE	Areas	Species (Appendix 3.2)	Size	IE	Species #
V6	5, 17, 24	24, 75, 164, 317, 387, 389, 475, 479, 505	8	3.42-3.92	9
V7	0, 1, 3, 8, 9, 18, 21, 22, 35	1, 42, 78, 109, 155, 163, 167, 202, 218, 277, 291, 339, 349, 356, 402, 408, 476, 480, 484, 489	8	4.96-8.78	20
V8	14, 19, 20, 25, 34	27, 28, 185, 189, 223, 254, 288, 331, 332, 362, 370, 376, 453	11	4.41-6.31	13
V9	27, 30	2, 19, 51, 113, 121, 157, 171, 193, 195, 244, 256, 261, 307, 311, 392, 399	14	5.90-6.40	16
V10	31	39, 68, 111, 275, 290	6	3.59-3.84	5
VI1	0, 1, 3, 4, 5, 6, 14, 16, 21, 28, 31	1, 74, 78, 109, 148, 155, 156, 165, 167, 202, 218, 230, 253, 277, 291, 321, 339, 349, 356, 402, 408, 424, 476, 480, 484, 499	8	5.60-12.06	26
VI2	2, 12, 13, 26, 29	27, 28, 164, 189, 223, 231, 254, 288, 331, 332, 362, 370, 376, 387, 453	9	4.41-6.38	15
VI3	7, 8, 20, 24, 27	2, 8, 19, 51, 106, 113, 121, 157, 164, 171, 193, 195, 244, 256, 261, 307, 311, 387, 392, 399, 464	11	4.84-11.09	21
VI4	9	75, 164, 317, 387, 475, 505	4	4.10-4.35	6
VI5	10, 11, 14, 22, 23, 25	1, 65, 138, 148, 154, 155, 156, 165, 167, 253, 291, 314, 321, 389, 402, 408, 410, 424, 495, 499	7	3.20-9.30	20
VI6	15	127, 285, 450, 502	4	3.00-3.25	4
VI7	1, 3, 4, 6, 17	1, 42, 74, 78, 148, 155, 165, 167, 202, 218, 230, 253, 277, 291, 339, 349, 356, 402, 408, 476, 480, 484, 489, 499	9	6.08-12.06	24
VI8	2, 13, 18, 26, 29	27, 28, 185, 189, 223, 254, 288, 331, 332, 362, 370, 376, 453	9	4.41-6.38	13
VI9	19, 30	24, 245, 389, 403, 469, 475, 479, 505	6	3.56-5.06	8
VII1	0, 11, 12	41, 47, 76, 77, 97, 192, 203, 344, 350, 357, 414, 435, 477	7	4.02-7.37	13
VII2	1, 2, 3, 9, 10, 13, 22, 23, 27, 38, 61, 63, 66, 80, 84	5, 7, 8, 10, 19, 24, 27, 28, 33, 39, 50, 51, 58, 68, 75, 80, 91, 93, 102, 103, 111, 112, 121, 137, 152, 153, 163, 164, 171, 172, 184, 188, 198, 199, 202, 205, 223, 224, 230, 231, 245, 246, 254, 275, 277, 283, 288, 290, 292, 294, 300, 311, 317, 324, 331, 332, 334, 339, 360, 362, 363, 385, 386, 387, 399, 403, 407, 416, 419, 420, 431, 440, 451, 459, 464, 467, 468, 469, 474, 475, 489, 490, 492, 494, 498, 501, 505	12	7.40-31.18	87
VII3	4, 31	122, 132, 141, 274, 348, 354, 439	8	3.10-3.35	7
VII4	5, 6, 7, 8, 39, 41, 42, 46, 47, 56, 67, 72, 82	1, 17, 39, 42, 48, 58, 65, 68, 74, 78, 80, 83, 91, 98, 109, 111, 112, 138, 148, 154, 156, 163, 165, 166, 168, 172, 183, 187, 202, 205, 218, 230, 245, 246, 247, 253, 271, 275, 277, 280, 290, 292, 318, 321, 327, 339, 349, 355, 356, 380,	10	14.40-34.99	74

AoE	Areas	Species (Appendix 3.2)	Size	IE	Species #
		397, 400, 402, 403, 410, 416, 419, 420, 424, 433, 443, 459, 469, 474, 476, 480, 481, 484, 489, 494, 495, 499, 501, 505			
VII5	6, 14, 17, 21, 22, 28, 29, 35, 36, 39, 51, 52, 66	5, 7, 8, 10, 11, 14, 17, 19, 24, 39, 48, 58, 65, 68, 74, 75, 78, 80, 83, 91, 98, 106, 111, 112, 121, 137, 138, 148, 153, 154, 156, 157, 163, 164, 165, 166, 171, 172, 183, 187, 188, 195, 198, 202, 205, 218, 230, 231, 244, 245, 246, 247, 253, 271, 275, 277, 280, 283, 290, 292, 300, 311, 317, 318, 321, 327, 339, 349, 355, 356, 360, 362, 380, 386, 387, 389, 392, 400, 402, 403, 407, 410, 416, 419, 420, 424, 431, 433, 440, 443, 459, 464, 467, 468, 469, 473, 474, 475, 476, 479, 480, 481, 484, 489, 490, 492, 494, 495, 498, 499, 501, 505	15	13.21-34.99	87
VII6	15, 32, 33, 69, 78	43, 95, 107, 122, 136, 140, 243, 320, 341, 342, 348, 354, 373, 382, 455	7	8.60-9.85	15
VII7	1, 3, 16, 18, 24, 38, 58, 59, 61, 62	5, 7, 8, 27, 28, 33, 39, 50, 51, 68, 75, 93, 102, 103, 111, 121, 137, 152, 153, 164, 171, 172, 184, 185, 189, 199, 205, 223, 224, 231, 254, 275, 277, 283, 288, 290, 292, 300, 317, 324, 331, 332, 360, 362, 363, 370, 376, 385, 387, 399, 403, 416, 419, 431, 451, 453, 459, 467, 468, 474, 475, 492, 498, 501	10	10.06-31.18	64
VII8	19	6, 15, 127, 285, 306, 450, 502	4	5.09-5.34	7
VII9	20, 73	71, 146, 210, 240, 281, 329, 460	6	3.60-4.35	7
VII10	25, 45, 60	20, 41, 47, 76, 77, 203, 214, 238, 279, 319, 325, 344, 357, 414	9	3.45-7.56	14
VII11	26, 40, 43, 77 81	25, 27, 45, 50, 93, 100, 149, 185, 189, 216, 223, 224, 242, 254, 288, 324, 331, 332, 347, 370, 376, 377, 385, 431, 453	9	5.87-11.37	25
VII12	7, 17, 30, 34, 44, 47, 53, 67, 68, 70, 74	1, 17, 24, 39, 48, 58, 65, 68, 74, 78, 80, 98, 109, 111, 112, 138, 144, 148, 154, 156, 163, 165, 166, 168, 183, 202, 205, 218, 219, 230, 245, 246, 247, 253, 275, 277, 280, 290, 314, 318, 321, 334, 339, 349, 355, 356, 365, 374, 380, 389, 400, 402, 403, 410, 416, 420, 424, 433, 443, 459, 467, 469, 474, 475, 476, 479, 480, 481, 484, 489, 495, 498, 499, 501, 505	12	11.66-31.81	75
VII13	9, 10, 37, 38, 48, 49, 50, 52, 61, 63, 83	2, 5, 7, 8, 10, 11, 19, 24, 28, 33, 39, 51, 58, 68, 74, 75, 80, 93, 102, 103, 106, 111, 112, 113, 121, 137, 148, 152, 153, 157, 163, 164, 171, 172, 184, 193, 195, 199, 202, 205, 223, 231, 244, 245, 246, 256, 275, 277, 283, 288, 290, 292, 300, 307, 311, 317, 331, 332, 334, 339, 355, 360, 362, 363, 385, 386, 387, 389, 392, 399, 403, 407, 416, 419, 420, 431, 440, 451, 459, 464, 467, 468, 469, 474, 475, 479, 492, 498, 501, 505	10	7.11-36.09	75

AoE	Areas	Species (Appendix 3.2)	Size	IE	Species #
VII14	9, 10, 22, 37, 38, 49, 52, 54, 61, 63, 83	2, 5, 7, 8, 10, 11, 19, 24, 28, 33, 39, 51, 58, 68, 74, 75, 80, 93, 102, 103, 106, 111, 112, 113, 121, 137, 148, 152, 153, 157, 163, 164, 171, 172, 184, 188, 193, 195, 199, 202, 205, 223, 231, 244, 245, 246, 256, 275, 277, 283, 288, 290, 292, 300, 307, 311, 317, 331, 332, 334, 339, 355, 360, 362, 363, 385, 386, 387, 389, 392, 399, 403, 407, 416, 419, 420, 431, 440, 451, 459, 464, 467, 468, 469, 474, 475, 479, 489, 492, 498, 501, 505	11	16.66-36.09	75
VII15	7, 17, 30, 34, 44, 53, 55, 67, 68, 70, 74	1, 17, 24, 39, 48, 58, 65, 68, 74, 78, 80, 98, 109, 111, 112, 138, 144, 148, 154, 156, 163, 165, 166, 168, 183, 202, 205, 218, 219, 230, 245, 246, 247, 253, 275, 277, 280, 290, 314, 318, 321, 334, 339, 349, 355, 356, 365, 374, 380, 389, 400, 402, 403, 410, 416, 424, 433, 443, 459, 467, 469, 474, 475, 467, 479, 480, 481, 484, 495, 498, 499, 501, 505	11	8.69-25.06	73
VII16	48, 50, 57	5, 24, 39, 58, 75, 111, 164, 205, 231, 275, 277, 290, 300, 317, 334, 360, 387, 403, 459, 467, 474, 475, 498, 501, 505	4	3.43-10.83	25
VII17	0, 11, 25, 64, 76	41, 47, 76, 77, 192, 203, 214, 279, 325, 344, 350, 357, 414, 435, 477	8	4.50-7.56	15
VII18	27, 29, 35, 36, 51, 65, 66, 71	7, 8, 10, 39, 68, 74, 78, 83, 91, 111, 11, 163, 172, 187, 198, 202, 205, 230, 231, 246, 271, 275, 277, 283, 290, 292, 327, 339, 355, 403, 416, 419, 431, 440, 459, 468, 469, 474, 489, 490, 492, 494, 501	9	5.00-21.39	43
VII19	1, 16, 18, 24, 43, 58, 59, 62, 75, 81	27, 28, 33, 39, 45, 50, 75, 93, 102, 103, 111, 149, 152, 184, 185, 189, 199, 205, 223, 224, 231, 254, 275, 283, 288, 290, 324, 331, 332, 362, 363, 370, 376, 377, 385, 431, 451, 453, 459, 474, 492, 498, 501	8	5.14-17.68	43
VII20	79	42, 187, 349, 397	4	3.07-3.32	4
VII21	7, 8, 46, 67, 85	1, 17, 42, 48, 65, 68, 74, 78, 83, 91, 98, 109, 112, 138, 148, 154, 156, 163, 165, 166, 168, 183, 202, 218, 230, 246, 247, 253, 271, 277, 280, 318, 321, 339, 349, 355, 356, 380, 397, 400, 402, 403, 410, 416, 420, 424, 433, 443, 469, 476, 480, 481, 484, 489, 494, 495, 499	8	7.25-25.06	57
VIII1	0, 12, 13, 42, 47, 50, 51, 60	27, 28, 93, 149, 153, 164, 185, 189, 223, 254, 288, 331, 332, 347, 362, 370, 375, 376, 431, 453	11	4.67-10.43	20
VIII2	1, 4, 5, 6, 7, 8, 9, 21, 23, 24, 25, 31, 32, 37, 40, 58	1, 8, 10, 11, 14, 39, 65, 68, 74, 78, 80, 109, 111, 112, 138, 148, 154, 163, 165, 187, 188, 202, 218, 230, 246, 253, 275, 277, 290, 292, 321, 339, 349, 356, 386, 397, 410, 416, 419, 424, 440, 443, 464, 468, 469, 473, 474, 476, 484, 489, 492, 495, 499	12	9.24-22.07	53

AoE	Areas	Species (Appendix 3.2)	Size	IE	Species #
VIII3	2, 3, 10, 11, 18, 19, 20, 34, 35, 53, 63	2, 8, 10, 11, 14, 19, 24, 28, 51, 52, 68, 74, 75, 80, 82, 106, 112, 113, 121, 137, 142, 148, 157, 164, 171, 193, 195, 221, 231, 235, 244, 245, 256, 261, 277, 307, 311, 335, 339, 346, 362, 386, 387, 389, 392, 399, 403, 407, 420, 421, 427, 440, 444, 458, 464, 465, 468, 469, 474, 475, 479, 492	15	11.28-22.58	62
VIII4	14, 26, 54, 55	24, 65, 138, 148, 154, 165, 245, 253, 314, 321, 365, 389, 403, 410, 424, 430, 443, 469, 475, 479, 495, 499	7	4.13-14.49	22
VIII5	2, 3, 11, 15, 19, 20, 34, 35, 41, 53, 63	2, 8, 10, 11, 14, 19, 24, 28, 51, 52, 68, 74, 75, 80, 82, 106, 112, 113, 121, 137, 142, 148, 157, 164, 171, 193, 195, 221, 231, 235, 244, 245, 256, 261, 277, 286, 307, 311, 335, 339, 346, 362, 386, 387, 389, 392, 399, 403, 407, 420, 421, 427, 440, 444, 458, 464, 465, 468, 469, 474, 475, 479, 492	16	11.28-22.58	63
VIII6	1, 6, 7, 10, 11, 16, 17, 18, 23, 25, 32, 58	2, 8, 10, 11, 14, 24, 39, 68, 74, 78, 80, 111, 112, 113, 148, 157, 163, 164, 188, 195, 202, 218, 230, 244, 245, 246, 261, 275, 277, 290, 292, 339, 346, 356, 386, 389, 392, 399, 403, 416, 420, 440, 464, 468, 469, 473, 474, 475, 476, 479, 484, 489, 492	12	9.24-16.66	53
VIII7	5, 6, 7, 9, 17, 21, 22, 23, 24, 25, 31, 32, 40, 48, 58	1, 8, 10, 11, 14, 39, 65, 68, 74, 78, 80, 91, 109, 111, 112, 138, 148, 154, 163, 188, 202, 218, 230, 253, 271, 275, 277, 290, 292, 321, 339, 349, 356, 386, 397, 410, 416, 419, 420, 424, 440, 443, 464, 468, 469, 473, 474, 476, 484, 489, 492, 494, 495, 499	12	9.24-22.07	54
VIII8	8, 26, 27, 31, 37, 44, 54, 55	1, 24, 39, 65, 68, 74, 78, 80, 109, 111, 112, 138, 148, 154, 163, 165, 202, 218, 230, 245, 246, 253, 275, 277, 290, 292, 314, 321, 339, 356, 365, 389, 403, 410, 416, 424, 443, 469, 474, 475, 476, 479, 484, 489, 495, 499	10	9.65-22.07	46
VIII9	13, 28, 29, 42, 47, 50, 60	27, 28, 33, 93, 153, 164, 185, 189, 223, 254, 288, 294, 331, 332, 362, 370, 376, 431, 453	9	4.67-10.43	19
VIII10	15, 30, 34, 35, 41, 43, 49, 53, 63	2, 8, 10, 11, 19, 28, 33, 51, 75, 82, 93, 106, 113, 121, 137, 142, 153, 157, 164, 171, 188, 193, 195, 223, 231, 244, 256, 261, 286, 288, 311, 331, 332, 335, 362, 376, 386, 387, 392, 399, 407, 420, 421, 431, 440, 444, 458, 464, 465, 468, 469, 492	14	11.28-22.58	52
VIII11	33, 57	76, 350, 357, 414	6	3.10-3.35	4
VIII12	36	127, 285, 306, 450, 502	3	3.83-4.08	5
VIII13	22, 23, 24, 38, 40	10, 11, 39, 68, 74, 78, 91, 112, 148, 163, 188, 202, 230, 271, 292, 339, 416, 419, 468, 469, 489, 492, 494	10	5.04-10.87	23

AoE	Areas	Species (Appendix 3.2)	Size	IE	Species #
VIII14	2, 11, 18, 19, 34, 39, 41, 53, 63	2, 8, 10, 11, 14, 19, 24, 28, 51, 52, 68, 74, 75, 80, 106, 112, 113, 121, 137, 142, 148, 157, 164, 171, 193, 195, 231, 244, 245, 256, 261, 277, 307, 311, 339, 346, 362, 386, 387, 389, 392, 399, 403, 407, 420, 440, 444, 458, 464, 465, 468, 469, 474, 475, 479, 492	14	8.27-20.55	56
VIII15	1, 4, 6, 8, 9, 21, 25, 31, 37, 45, 58, 62	1, 8, 10, 11, 14, 39,65, 68, 74, 78, 80, 109, 111, 112, 138, 148, 154, 163, 165, 187, 188, 202, 218, 230, 246, 253, 275, 277, 290, 292, 321, 339, 349, 356, 386, 397, 410, 416, 424, 440, 443, 464, 468, 469, 474, 476, 484, 489, 495, 499	11	5.46-22.07	50
VIII16	13, 28, 30, 43, 46, 47, 49, 50	8, 27, 28, 33, 51, 75, 93, 113, 137, 142, 153, 164, 185, 188, 193, 195, 223, 231, 254, 286, 288, 331, 332, 362, 370, 376, 386, 387, 399, 431, 453, 458, 468, 469, 492	10	4.11-14.08	35
VIII17	24, 40, 52, 59	11, 33, 39, 68, 74, 78, 111, 112, 148, 163, 188, 202, 230, 275, 290, 292, 339, 416, 419, 468, 469, 474, 489, 492	8	3.46-10.87	24
VIII18	13, 28, 29, 47, 56, 60	27, 28, 33, 93, 153, 164, 185, 189, 223, 254, 288, 294, 331, 332, 362, 370, 376, 431, 453	9	6.13-10.43	19
VIII19	10, 11, 18, 27, 39, 44, 61	2, 8, 10, 11, 14, 24, 65, 68, 74, 78, 80, 112, 113, 138, 148, 154, 157, 164, 165, 195, 244, 245, 253, 261, 277, 321, 339, 346, 365, 389, 392, 399, 403, 410, 420, 424, 440, 443, 464, 468, 469, 474, 475, 479, 492, 495, 499	10	4.60-17.72	47
IX1	0, 5, 9, 10, 11, 22, 32, 34, 35, 45, 53	2, 8, 10, 11, 14, 19, 24, 28, 51, 52, 68, 74, 75, 80, 82, 106, 112, 113, 121, 137, 142, 148, 157, 164, 171, 193, 195, 221, 231, 235, 244, 245, 256, 261, 277, 307, 311, 335, 339, 346, 362, 386, 387, 389, 392, 399, 403, 407, 420, 421, 427, 440, 444, 458, 464, 465, 468, 469, 474, 475, 479, 492	12	13.17-24.08	62
IX2	1, 2, 6, 8, 12, 14, 17, 25, 30, 39, 47	1, 8, 11, 39, 65, 68, 74, 78, 80, 109, 111, 112, 138, 148, 154, 163, 165, 187, 188, 202, 218, 230, 246, 253, 275, 277, 290, 292, 321, 339, 349, 356, 386, 397, 410, 416, 419, 424, 440, 443, 464, 468, 469, 474, 476, 484, 489, 492, 495, 499	11	10.67-22.33	50
IX3	3, 15, 19, 33, 37, 43, 55	27, 28, 93, 149, 153, 164, 185, 189, 223, 254, 288, 331, 332, 347, 362, 370, 375, 376, 431, 453	9	4.33-10.31	20
IX4	4, 15	25, 27, 149, 185, 189, 223, 242, 370, 376, 453	8	3.00-5.26	10
IX5	7, 18, 23, 26	8, 27, 28, 33, 51, 75, 93, 113, 137, 153, 164, 185, 188, 193, 195, 223, 231, 241, 254, 288, 294, 331, 332, 362, 384, 386, 387, 399, 431, 468, 469, 492	8	6.05-15.26	32
IX6	6, 13, 17, 20, 25, 36, 48, 52	1, 24, 39, 65, 68, 74, 78, 80, 109, 111, 112, 138, 148, 154, 163, 165, 202, 218, 230, 245, 246, 253, 275, 277, 290, 292, 314, 321, 339, 356, 365, 389, 403, 410, 416, 424, 443, 469, 474,	10	10.20-22.33	46

AoE	Areas	Species (Appendix 3.2)	Size	IE	Species #
		475, 476, 479, 484, 489, 495, 499			
IX7	16, 20, 36, 38, 52	24, 65, 138, 148, 154, 165, 245, 253, 314, 321, 365, 389, 403, 410, 424, 430, 443, 469, 475, 479, 495, 499	7	3.04-14.52	22
IX8	21	3, 210, 296, 460	4	3.00-3.25	4
IX9	24, 49	127, 285, 306, 450, 502	3	3.00-4.00	5
IX10	18, 19, 26, 27, 33, 40, 42, 55	18, 27, 28, 33, 93, 153, 164, 185, 189, 223, 254, 288, 294, 331, 332, 362, 370, 376, 431, 453	10	3.67-10.31	20
IX11	28, 51	39, 91, 153, 271, 416, 419, 494	5	3.00-4.75	7
IX12	29	76, 350, 357, 414	4	3.12-3.37	4
IX13	2, 8, 14, 31, 35	2, 8, 11, 24, 39, 68, 74, 78, 80, 111, 112, 113, 148, 157, 163, 164, 188, 195, 202, 230, 245, 261, 275, 277, 290, 292, 339, 386, 389, 392, 399, 403, 416, 419, 420, 440, 464, 468, 469, 474, 475, 479, 489, 492	9	10.67-17.54	44
IX14	18, 19, 40, 41, 43, 46	27, 28, 33, 51, 93, 113, 153, 164, 185, 193, 195, 223, 231, 254, 288, 331, 332, 362, 370, 376, 387, 399, 431, 453, 469	7	4.11-10.31	25
IX15	1, 6, 12, 17, 25, 30, 39, 44, 47	1, 39, 65, 68, 74, 78, 80, 109, 111, 112, 138, 148, 154, 163, 165, 187, 202, 218, 230, 246, 253, 275, 277, 290, 292, 321, 339, 349, 356, 397, 410, 416, 424, 443, 469, 474, 476, 484, 489, 495, 499	9	7.25-22.33	41
IX16	2, 8, 31, 39, 50	8, 11, 39, 68, 74, 78, 80, 111, 112, 148, 163, 188, 202, 218, 230, 275, 277, 290, 292, 339, 356, 386, 416, 420, 440, 464, 468, 469, 474, 476, 484, 489, 492	8	5.27-16.31	33
IX17	0, 9, 10, 23, 32, 45, 46, 53, 54	2, 8, 10, 11, 19, 28, 33, 51, 75, 82, 93, 106, 113, 121, 137, 142, 153, 157, 164, 171, 188, 193, 195, 223, 231, 244, 256, 261, 288, 311, 331, 332, 335, 362, 386, 387, 392, 399, 407, 420, 421, 431, 440, 444, 458, 464, 465, 468, 469, 492	11	9.20-24.08	50
IX18	13, 20, 48, 56	24, 65, 68, 74, 78, 80, 112, 138, 148, 154, 165, 245, 253, 277, 314, 321, 339, 365, 389, 403, 410, 424, 443, 469, 474, 475, 479, 495, 499	7	6.44-17.82	29

Caption: areas of endemism after consensus (AoE); areas part of each consensus area (Areas); species part of each AoE (Species); number of grid cells per AoE (Size); index of endemism (IE); species number per area (Species #).

APPENDIX 4.2 – Species codes

#	Family	Species
0	Acanthaceae	*Aphelandra ignea*
1	Acanthaceae	*Clistax bahiensis*
2	Acanthaceae	*Harpochilus phaeocarpus*
3	Acanthaceae	*Herpetacanthus magnobracteolatus*
4	Acanthaceae	*Herpetacanthus strongyloides*
5	Acanthaceae	*Herpetacanthus tetrandrus*
6	Acanthaceae	*Justicia antirrhina*
7	Acanthaceae	*Justicia physogaster*
8	Acanthaceae	*Lepidagathis cuneiformis*
9	Acanthaceae	*Mendoncia bahiensis*
10	Acanthaceae	*Mendoncia blanchetiana*
11	Acanthaceae	*Pseuderanthemum albiflorum*
12	Acanthaceae	*Pseuderanthemum verbenaceum*
13	Acanthaceae	*Ruellia sessilifolia*
14	Acanthaceae	*Schaueria gonyostachya*
15	Acanthaceae	*Schaueria hirsuta*
16	Acanthaceae	*Schaueria marginata*
17	Acanthaceae	*Schaueria pyramidalis*
18	Achariaceae	*Kuhlmanniodendron macrocarpum*
19	Amaranthaceae	*Lecosia formicarum*
20	Amaryllidaceae	*Griffinia arifolia*
21	Amaryllidaceae	*Griffinia parviflora*
22	Amaryllidaceae	*Griffinia paubrasilica*
23	Annonaceae	*Annona bahiensis*
24	Annonaceae	*Duguetia magnolioidea*
25	Annonaceae	*Duguetia restingae*
26	Annonaceae	*Duguetia reticulata*
27	Annonaceae	*Guatteria stenocarpa*
28	Annonaceae	*Hornschuchia cauliflora*
29	Annonaceae	*Hornschuchia leptandra*
30	Annonaceae	*Hornschuchia obliqua*
31	Annonaceae	*Hornschuchia polyantha*
32	Annonaceae	*Hornschuchia santosii*
33	Annonaceae	*Malmea obovata*
34	Annonaceae	*Pseudoxandra bahiensis*
35	Annonaceae	*Unonopsis bahiensis*
36	Annonaceae	*Xylopia involucrata*
37	Apocynaceae	*Aspidosperma thomasii*
38	Apocynaceae	*Bahiella blanchetii*
39	Apocynaceae	*Bahiella infundibuliflora*
40	Apocynaceae	*Lacmellea bahiensis*
41	Apocynaceae	*Marsdenia carvalhoi*
42	Apocynaceae	*Matelea santosii*
43	Apocynaceae	*Oxypetalum laciniatum*
44	Apocynaceae	*Rauvolfia atlantica*
45	Araceae	*Anthurium bromelicola bahiense*
46	Araceae	*Anthurium illepidum*

#	Family	Species
47	Araceae	*Anthurium molle*
48	Araceae	*Anthurium teimosoanum*
49	Araceae	*Asterostigma riedelianum*
50	Araceae	*Philodendron aemulum*
51	Araceae	*Zomicarpa steigeriana*
52	Araliaceae	*Schefflera aurata*
53	Arecaceae	*Bactris soeiroana*
54	Arecaceae	*Geonoma pohliana rubescens*
55	Arecaceae	*Geonoma pohliana unaensis*
56	Arecaceae	*Syagrus itapebiensis*
57	Arecaceae	*Syagrus santosii*
58	Arecaceae	*Syagrus xcamposportoana*
59	Aristolochiaceae	*Aristolochia brunneomaculata*
60	Aristolochiaceae	*Aristolochia longispathulata*
61	Asparagaceae	*Hagenbachia brasiliensis*
62	Asteraceae	*Acmella paniculata*
63	Asteraceae	*Austroeupatorium morii*
64	Asteraceae	*Barrosoa atlantica*
65	Asteraceae	*Diacranthera hebeclinia*
66	Asteraceae	*Litothamnus ellipticus*
67	Asteraceae	*Mikania amorimii*
68	Asteraceae	*Mikania kubitzkii*
69	Asteraceae	*Mikania mattos-silvae*
70	Asteraceae	*Piptocarpha riedelii*
71	Asteraceae	*Santosia talmonii*
72	Asteraceae	*Vernonanthura vinhae*
73	Begoniaceae	*Begolia elianeae*
74	Begoniaceae	*Begonia delicata*
75	Begoniaceae	*Begonia epibaterium*
76	Begoniaceae	*Begonia goldingiana*
77	Begoniaceae	*Begonia mattos-silvae*
78	Begoniaceae	*Begonia pinheironis*
79	Begoniaceae	*Begonia russelliana*
80	Begoniaceae	*Begonia saxifraga*
81	Begoniaceae	*Begonia subacida*
82	Begoniaceae	*Begonia sylvatica*
83	Bignoniaceae	*Handroanthus parviflorus*
84	Bromeliaceae	*Aechmea amicorum*
85	Bromeliaceae	*Wittmackia amorimii*
86	Bromeliaceae	*Aechmea ampla*
87	Bromeliaceae	*Wittmackia andersoniana*
88	Bromeliaceae	*Aechmea andersonii*
89	Bromeliaceae	*Aechmea carvalhoi*
90	Bromeliaceae	*Aechmea curranii*
91	Bromeliaceae	*Aechmea digitata*
92	Bromeliaceae	*Aechmea disjuncta*
93	Bromeliaceae	*Aechmea echinata*
94	Bromeliaceae	*Aechmea farinosa*
95	Bromeliaceae	*Aechmea glandulosa*

#	Family	Species
96	Bromeliaceae	*Wittmackia gregaria*
97	Bromeliaceae	*Aechmea guaratingensis*
98	Bromeliaceae	*Aechmea heterosepala*
99	Bromeliaceae	*Wittmackia incompta*
100	Bromeliaceae	*Wittmackia ituberaensis*
101	Bromeliaceae	*Wittmackia laevigata*
102	Bromeliaceae	*Aechmea lanata*
103	Bromeliaceae	*Aechmea lymanii*
104	Bromeliaceae	*Aechmea miniata*
105	Bromeliaceae	*Aechmea mira*
106	Bromeliaceae	*Aechmea mollis*
107	Bromeliaceae	*Wittmackia pendulispica*
108	Bromeliaceae	*Aechmea ramusculosa*
109	Bromeliaceae	*Wittmackia tentaculifera*
110	Bromeliaceae	*Wittmackia turbinocalyx*
111	Bromeliaceae	*Aechmea viridipetala*
112	Bromeliaceae	*Wittmackia viridostigma*
113	Bromeliaceae	*Aechmea weberii*
114	Bromeliaceae	*Alcantarea cerosa*
115	Bromeliaceae	*Alcantarea pataxoana*
116	Bromeliaceae	*Araeococcus montanus*
117	Bromeliaceae	*Araeococcus nigropurpureus*
118	Bromeliaceae	*Araeococcus sessiliflorus*
119	Bromeliaceae	*Billbergia fosteriana*
120	Bromeliaceae	*Billbergia macrocalyx*
121	Bromeliaceae	*Canistrum fosterianum*
122	Bromeliaceae	*Canistrum guzmanioides*
123	Bromeliaceae	*Canistrum lanigerum*
124	Bromeliaceae	*Canistrum sandrae*
125	Bromeliaceae	*Canistrum seidelianum*
126	Bromeliaceae	*Cryptanthus colnagoi*
127	Bromeliaceae	*Cryptanthus coriaceus*
128	Bromeliaceae	*Cryptanthus ilhanus*
129	Bromeliaceae	*Cryptanthus lyman-smithii*
130	Bromeliaceae	*Cryptanthus pseudopetiolatus*
131	Bromeliaceae	*Cryptanthus ruthiae*
132	Bromeliaceae	*Cryptanthus ubairensis*
133	Bromeliaceae	*Cryptanthus vexatus*
134	Bromeliaceae	*Cryptanthus viridovinosus*
135	Bromeliaceae	*Cryptanthus walkerianus*
136	Bromeliaceae	*Hohenbergia barbarespina*
137	Bromeliaceae	*Hohenbergia brachycephala*
138	Bromeliaceae	*Hohenbergia capitata*
139	Bromeliaceae	*Hohenbergia castellanosii*
140	Bromeliaceae	*Hohenbergia correia-araujoi*
141	Bromeliaceae	*Hohenbergia flava*
142	Bromeliaceae	*Hohenbergia hatschbachii*
143	Bromeliaceae	*Hohenbergia littoralis*
144	Bromeliaceae	*Hohenbergia pabstii*

#	Family	Species
145	Bromeliaceae	*Hohenbergia sandrae*
146	Bromeliaceae	*Honenbergia reconcavensis*
147	Bromeliaceae	*Lymania alvimii*
148	Bromeliaceae	*Lymania azurea*
149	Bromeliaceae	*Lymania brachycaulis*
150	Bromeliaceae	*Lymania corallina*
151	Bromeliaceae	*Lymania globosa*
152	Bromeliaceae	*Lymania languida*
153	Bromeliaceae	*Lymania marantoides*
154	Bromeliaceae	*Lymania spiculata*
155	Bromeliaceae	*Neoregelia azevedoi*
156	Bromeliaceae	*Neoregelia crispata*
157	Bromeliaceae	*Neoregelia longisepala*
158	Bromeliaceae	*Neoregelia rothinessa*
159	Bromeliaceae	*Orthophytum buranhense*
160	Bromeliaceae	*Orthophytum guaratingense*
161	Bromeliaceae	*Orthophytum rubrum*
162	Bromeliaceae	*Portea alatisepala*
163	Bromeliaceae	*Portea filifera*
164	Bromeliaceae	*Portea kermesina*
165	Bromeliaceae	*Portea nana*
166	Bromeliaceae	*Quesnelia alborosea*
167	Bromeliaceae	*Quesnelia clavata*
168	Bromeliaceae	*Quesnelia dubia*
169	Bromeliaceae	*Quesnelia koltesii*
170	Bromeliaceae	*Wittmackia brasiliensis*
171	Bromeliaceae	*Wittmackia carvalhoi*
172	Bromeliaceae	*Wittmackia silvana*
173	Bromeliaceae	*Vriesea dictyographa*
174	Bromeliaceae	*Vriesea graciliscapa*
175	Bromeliaceae	*Vriesea longisepala*
176	Bromeliaceae	*Vriesea minuta*
177	Bromeliaceae	*Vriesea minutiflora*
178	Bromeliaceae	*Vriesea roberto-seidelii*
179	Bromeliaceae	*Vriesea ruschii ruschii*
180	Bromeliaceae	*Vriesea sandrae*
181	Bromeliaceae	*Vriesea silvana*
182	Burseraceae	*Protium icicariba talmonii*
183	Burseraceae	*Trattinnickia lorenziana*
184	Cactaceae	*Rhipsalis hileiabaiana*
185	Calophyllaceae	*Kielmeyera itacarensis*
186	Calophyllaceae	*Kielmeyera marauensis*
187	Capparaceae	*Colicodendron martianum*
188	Chrysobalanaceae	*Couepia bondarii*
189	Chrysobalanaceae	*Couepia coarctata*
190	Chrysobalanaceae	*Couepia impressa cabraliae*
191	Chrysobalanaceae	*Couepia longipetiolata*
192	Chrysobalanaceae	*Licania bahiensis*
193	Chrysobalanaceae	*Licania lamentanda*

#	Family	Species
194	Chrysobalanaceae	*Licania littoralis littoralis*
195	Chrysobalanaceae	*Licania santosii*
196	Chrysobalanaceae	*Licania turbinata*
197	Chrysobalanaceae	*Parinari alvimii*
198	Clusiaceae	*Tovomita iaspidis*
199	Clusiaceae	*Tovomita megantha*
200	Commelinaceae	*Dichorisandra jardimii*
201	Commelinaceae	*Dichorisandra leucophthalmos*
202	Commelinaceae	*Dichorisandra leucosepala*
203	Commelinaceae	*Dichorisandra marantoides*
204	Commelinaceae	*Dichorisandra ordinatiflora*
205	Commelinaceae	*Dichorisandra radicalis*
206	Commelinaceae	*Dichorisandra subtilis*
207	Connaraceae	*Connarus blanchetii var laurifolius*
208	Connaraceae	*Connarus cuneifolius*
209	Connaraceae	*Connarus portosegurensis*
210	Connaraceae	*Rourea macrocalyx*
211	Connaraceae	*Rourea tenuis*
212	Cucurbitaceae	*Cayaponia nitida*
213	Connaraceae	*Rourea bahiensis*
214	Connaraceae	*Rourea carvalhoi*
215	Connaraceae	*Rourea discolor*
216	Cucurbitaceae	*Fevillea bahiensis*
217	Cucurbitaceae	*Gurania wawrei*
218	Cyclanthaceae	*Asplundia maximiliani*
219	Cyperaceae	*Becquerelia discolor*
220	Cyperaceae	*Hypolytrum bahiense*
221	Cyperaceae	*Hypolytrum jardimii*
222	Cyperaceae	*Hypolytrum lucennoi*
223	Dichapetalaceae	*Stephanopodium magnifolium*
224	Dichapetalaceae	*Tapura martiniae*
225	Dichapetalaceae	*Tapura zei-limae*
226	Dilleniaceae	*Davilla bahiana*
227	Dilleniaceae	*Davilla macrocarpa*
228	Dioscoreaceae	*Dioscorea macrothyrsa*
229	Ebenaceae	*Diospyros amabi*
230	Ebenaceae	*Diospyros riedelii*
231	Ebenaceae	*Diospyros scottmorii*
232	Eriocaulaceae	*Actinocephalus ochrocephalus*
233	Erythroxylaceae	*Erythroxylum compressum*
234	Erythroxylaceae	*Erythroxylum leal-costae*
235	Erythroxylaceae	*Erythroxylum martii*
236	Erythroxylaceae	*Erythroxylum mattos-silvae*
237	Erythroxylaceae	*Erythroxylum membranaceum*
238	Erythroxylaceae	*Erythroxylum santosii*
239	Erythroxylaceae	*Erythroxylum splendidum*
240	Euphorbiaceae	*Actinostemon lasiocarpus*
241	Euphorbiaceae	*Algernonia bahiensis*
242	Euphorbiaceae	*Bernardia gambosa*

#	Family	Species
243	Euphorbiaceae	*Bernardia micrantha*
244	Euphorbiaceae	*Croton sapiifolius*
245	Euphorbiaceae	*Croton thomasii*
246	Euphorbiaceae	*Dalechampia armbrusteri*
247	Euphorbiaceae	*Dalechampia viridissima*
248	Euphorbiaceae	*Gymnanthes gaudichaudii*
249	Euphorbiaceae	*Ophthalmoblapton pedunculare*
250	Fabaceae	*Andira carvalhoi*
251	Fabaceae	*Andira marauensis*
252	Fabaceae	*Arapatiella psilophylla*
253	Fabaceae	*Canavalia cassidea*
254	Fabaceae	*Canavalia dolichothyrsa*
255	Fabaceae	*Chamaecrista amabilis*
256	Fabaceae	*Chamaecrista amorimii*
257	Fabaceae	*Chamaecrista onusta*
258	Fabaceae	*Chamaecrista salvatoris*
259	Fabaceae	*Copaifera majorina*
260	Fabaceae	*Dahlstedtia bahiana*
261	Fabaceae	*Harleyodendron unifoliolatum*
262	Fabaceae	*Inga aptera*
263	Fabaceae	*Inga conchifolia*
264	Fabaceae	*Inga pedunculata*
265	Fabaceae	*Inga pleiogyna*
266	Fabaceae	*Machaerium aureum*
267	Fabaceae	*Moldenhawera blanchetiana multijuga*
268	Fabaceae	*Moldenhawera intermedia*
269	Fabaceae	*Moldenhawera luschnathiana*
270	Fabaceae	*Moldenhawera nutans*
271	Fabaceae	*Muellera longiunguiculata*
272	Fabaceae	*Ormosia lewisii*
273	Fabaceae	*Ormosia limae*
274	Fabaceae	*Ormosia timboensis*
275	Fabaceae	*Parapiptadenia ilheusana*
276	Fabaceae	*Phanera carvalhoi*
277	Fabaceae	*Piptadenia killipii cacaophila*
278	Fabaceae	*Piptadenia ramosissima*
279	Fabaceae	*Piptadenia santosii*
280	Fabaceae	*Schnella lilaciana*
281	Fabaceae	*Senegalia amorimii*
282	Fabaceae	*Senegalia olivensana*
283	Fabaceae	*Senegalia piptadenioides*
284	Fabaceae	*Swartzia alternifoliolata*
285	Fabaceae	*Swartzia arenophila*
286	Fabaceae	*Swartzia pinheiroana*
287	Fabaceae	*Swartzia riedelii*
288	Fabaceae	*Swartzia thomasii*
289	Fabaceae	*Zollernia magnifica*
290	Gentianaceae	*Macrocarpaea atlantica*
291	Gentianaceae	*Macrocarpaea dolichophylla*

#	Family	Species
292	Gentianaceae	*Macrocarpaea orbiculata*
293	Iridaceae	*Neomarica brachypus*
294	Iridaceae	*Neomarica floscella*
295	Iridaceae	*Neomarica portosecurensis*
296	Iridaceae	*Neomarica unca*
297	Lauraceae	*Nectandra micranthera*
298	Lauraceae	*Ocotea montana*
299	Lauraceae	*Ocotea ramosissima*
300	Lauraceae	*Ocotea sperata*
301	Lauraceae	*Ocotea thinicola*
302	Lecythidaceae	*Eschweilera complanata*
303	Lecythidaceae	*Eschweilera mattos-silvae*
304	Lecythidaceae	*Eschweilera sphaerocarpa*
305	Linderniaceae	*Cubitanthus alatus*
306	Loganiaceae	*Spigelia genuflexa*
307	Loganiaceae	*Strychnos alvimiana*
308	Loganiaceae	*Strychnos setosa*
309	Loranthaceae	*Psittacanthus salvadorensis*
310	Loranthaceae	*Struthanthus longiflorus*
311	Malpighiaceae	*Bunchosia itacarensis*
312	Malpighiaceae	*Heteropterys sanctorum*
313	Malpighiaceae	*Peixotoa sericea*
314	Malpighiaceae	*Stigmaphyllon hispidum*
315	Malpighiaceae	*Stigmaphyllon macropodum*
316	Malvaceae	*Byttneria cristobaliana*
317	Malvaceae	*Pavonia cauliflora*
318	Malvaceae	*Pavonia ciliata*
319	Malvaceae	*Pavonia crispa*
320	Malvaceae	*Pavonia gerleniae*
321	Malvaceae	*Pavonia goetheoides*
322	Malvaceae	*Pavonia latibracteolata*
323	Malvaceae	*Pavonia longifolia*
324	Malvaceae	*Pavonia macrobracteolata*
325	Malvaceae	*Pavonia ovaliphylla*
326	Malvaceae	*Pavonia paucidentata*
327	Malvaceae	*Pavonia rubriphylla*
328	Malvaceae	*Pavonia sancti*
329	Malvaceae	*Pavonia spectabilis*
330	Malvaceae	*Pavonia spiciformis*
331	Malvaceae	*Pavonia stipularis*
332	Marantaceae	*Goeppertia fasciata*
333	Marantaceae	*Goeppertia rufibarba*
334	Marantaceae	*Ischnosiphon bahiensis*
335	Marantaceae	*Monotagma grallatum*
336	Marantaceae	*Stromanthe bahiensis*
337	Marcgraviaceae	*Schwartzia geniculatiflora*
338	Melastomataceae	*Bertolonia alternifolia*
339	Melastomataceae	*Bertolonia bullata*
340	Melastomataceae	*Huberia carvalhoi*

#	Family	Species
341	Melastomataceae	*Huberia sessilifolia*
342	Melastomataceae	*Meriania inflata*
343	Melastomataceae	*Miconia lurida*
344	Melastomataceae	*Ossaea loligomorpha*
345	Melastomataceae	*Ossaea sulbahiensis*
346	Melastomataceae	*Physeterostemon fiaschii*
347	Melastomataceae	*Physeterostemon jardimii*
348	Melastomataceae	*Physeterostemon thomasii*
349	Melastomataceae	*Pleiochiton amorimii*
350	Melastomataceae	*Tibouchina bahiensis*
351	Melastomataceae	*Tibouchina bradeana*
352	Melastomataceae	*Tibouchina paulo-alvinii*
353	Melastomataceae	*Tibouchina stipulacea*
354	Melastomataceae	*Tibouchina taperoensis*
355	Meliaceae	*Guarea anomala*
356	Meliaceae	*Trichilia florbranca*
357	Meliaceae	*Trichilia magnifoliola*
358	Menispermaceae	*Curarea crassa*
359	Moraceae	*Dorstenia setosa*
360	Myrtaceae	*Calyptranthes blanchetiana*
361	Myrtaceae	*Eugenia itacarensis*
362	Myrtaceae	*Eugenia longifolia*
363	Myrtaceae	*Eugenia serraegrandis*
364	Myrtaceae	*Eugenia sessilifolia*
365	Myrtaceae	*Eugenia unana*
366	Myrtaceae	*Marlierea lealcostae*
367	Myrtaceae	*Marlierea verticillaris*
368	Myrtaceae	*Myrcia abrantea*
369	Myrtaceae	*Myrcia cataphyllata*
370	Myrtaceae	*Myrcia felisbertii*
371	Myrtaceae	*Myrcia gigantea*
372	Myrtaceae	*Myrcia grazielae*
373	Myrtaceae	*Myrcia marianae*
374	Myrtaceae	*Myrcia monoclada*
375	Myrtaceae	*Myrcia pendula*
376	Myrtaceae	*Myrcia pseudomarlierea*
377	Myrtaceae	*Myrcia raminfinita*
378	Myrtaceae	*Myrcia spathulifolia*
379	Myrtaceae	*Myrcia stigmatosa*
380	Myrtaceae	*Myrcia teimosa*
381	Myrtaceae	*Myrcia tetraphylla*
382	Myrtaceae	*Myrcia thomasii*
383	Myrtaceae	*Myrcia truncata*
384	Myrtaceae	*Plinia callosa*
385	Myrtaceae	*Plinia longiacuminata*
386	Myrtaceae	*Plinia muricata*
387	Myrtaceae	*Plinia rara*
388	Nyctaginaceae	*Neea alumnorum*
389	Nyctaginaceae	*Neea duckei*

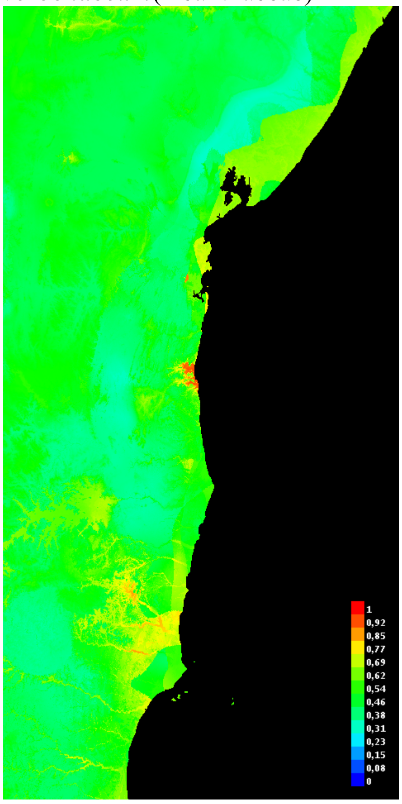
#	Family	Species
390	Ochnaceae	*Ouratea bahiensis*
391	Ochnaceae	*Ouratea gigantophylla*
392	Ochnaceae	*Ouratea longipes*
393	Ochnaceae	*Ouratea papulosa*
394	Ochnaceae	*Ouratea platicaulis*
395	Orchidaceae	*Aspasia silvana*
396	Orchidaceae	*Brassavola reginae*
397	Orchidaceae	*Bulbophyllum teimosense*
398	Orchidaceae	*Cattleya grandis*
399	Orchidaceae	*Cattleya kerrii*
400	Orchidaceae	*Coryanthes bahiensis*
401	Orchidaceae	*Elleanthus hymenophorus*
402	Orchidaceae	*Encyclia fimbriata*
403	Orchidaceae	*Epidendrum garciae*
404	Orchidaceae	*Gomesa silvana*
405	Orchidaceae	*Koellensteinia abaetana*
406	Orchidaceae	*Pabstiella dasilvae*
407	Orchidaceae	*Promenaea silvana*
408	Orchidaceae	*Prosthechea bueraremensis*
409	Oxalidaceae	*Oxalis alata var. hirta*
410	Oxalidaceae	*Oxalis bela-vitoriae*
411	Oxalidaceae	*Oxalis kuhlmannii adpressipila*
412	Passifloraceae	*Passiflora igrapiunensis*
413	Phyllanthaceae	*Discocarpus pedicellatus*
414	Phyllanthaceae	*Phyllanthus carvalhoi*
415	Picramniaceae	*Picramnia coccinea*
416	Piperaceae	*Peperomia epipremnifolia*
417	Piperaceae	*Peperomia riparia*
418	Piperaceae	*Peperomia serpentarioides*
419	Piperaceae	*Peperomia sulbahiensis*
420	Piperaceae	*Piper bahianum*
421	Piperaceae	*Piper robustipedunculum*
422	Poaceae	*Alvimia auriculata*
423	Poaceae	*Alvimia gracilis*
424	Poaceae	*Anomochloa marantoidea*
425	Poaceae	*Arberella bahiensis*
426	Poaceae	*Atractantha cardinalis*
427	Poaceae	*Atractantha radiata*
428	Poaceae	*Chusquea clemirae*
429	Poaceae	*Diandrolyra pygmaea*
430	Poaceae	*Digitaria doellii*
431	Poaceae	*Eremitis robusta*
432	Poaceae	*Eremocaulon aureofimbriatum*
433	Poaceae	*Ichnanthus longhi-wagnerae*
434	Poaceae	*Merostachys annulifera*
435	Poaceae	*Merostachys argentea*
436	Poaceae	*Merostachys lanata*
437	Poaceae	*Merostachys magnispicula*
438	Poaceae	*Merostachys medullosa*

#	Family	Species
439	Poaceae	*Merostachys ramosissima*
440	Poaceae	*Olyra bahiensis*
441	Poaceae	*Olyra filiformis*
442	Poaceae	*Olyra latispicula*
443	Poaceae	*Parianella carvalhoi*
444	Poaceae	*Parianella lanceolata*
445	Poaceae	*Paspalum restingense*
446	Poaceae	*Paspalum strigosum*
447	Poaceae	*Piresia palmula*
448	Poaceae	*Raddia distichophylla*
449	Poaceae	*Raddia stolonifera*
450	Polygalaceae	*Caamembeca martinellii*
451	Polygalaceae	*Caamembeca martinellii carnosa*
452	Polygalaceae	*Securidaca revoluta*
453	Primulaceae	*Cybianthus nemoralis*
454	Rubiaceae	*Chomelia bahiae*
455	Rubiaceae	*Denscantia andrei*
456	Rubiaceae	*Denscantia macrobracteata*
457	Rubiaceae	*Faramea bicolor*
458	Rubiaceae	*Faramea nocturna*
459	Rubiaceae	*Ixora bahiensis*
460	Rubiaceae	*Ixora cabraliensis*
461	Rubiaceae	*Malanea harleyi*
462	Rubiaceae	*Mitracarpus anthospermoides*
463	Rubiaceae	*Posoqueria bahiensis*
464	Rubiaceae	*Psychotria megalocalyx*
465	Rubiaceae	*Psychotria silvicola*
466	Rubiaceae	*Psychotria strigosa*
467	Rubiaceae	*Psychotria wawrana*
468	Rubiaceae	*Rudgea hileiabaiana*
469	Rubiaceae	*Rudgea ilheotica*
470	Rubiaceae	*Rudgea involucrata*
471	Rubiaceae	*Rudgea mouririoides*
472	Rubiaceae	*Salzmannia arborea*
473	Rubiaceae	*Sphinctanthus insignis*
474	Rutaceae	*Andreadoxa flava*
475	Rutaceae	*Conchocarpus concinnus*
476	Rutaceae	*Conchocarpus dasyanthus*
477	Rutaceae	*Conchocarpus fissicalyx*
478	Rutaceae	*Conchocarpus gaudichaudianus bahiensis*
479	Rutaceae	*Conchocarpus hirsutus*
480	Rutaceae	*Conchocarpus inopinatus*
481	Rutaceae	*Conchocarpus longipes*
482	Rutaceae	*Conchocarpus mastigophorus*
483	Rutaceae	*Conchocarpus modestus*
484	Rutaceae	*Conchocarpus punctatus*
485	Rutaceae	*Conchocarpus racemosus*
486	Rutaceae	*Conchocarpus santosii*
487	Rutaceae	*Ertela bahiensis*

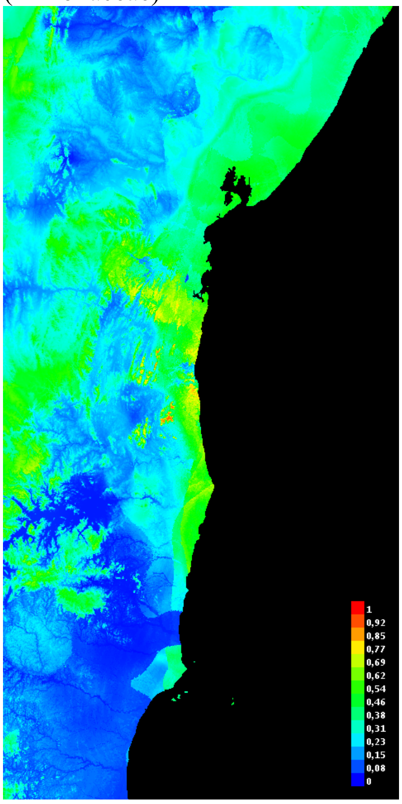
#	Family	Species
488	Rutaceae	*Galipea revoluta*
489	Rutaceae	*Neoraputia calliantha*
490	Rutaceae	*Neoraputia micrantha*
491	Rutaceae	*Zanthoxylum nemorale*
492	Rutaceae	*Zanthoxylum retusum*
493	Sapindaceae	*Cardiospermum integerrimum*
494	Sapindaceae	*Paullinia livescens*
495	Sapindaceae	*Paullinia unifoliolata*
496	Sapindaceae	*Serjania morii*
497	Sapindaceae	*Serjania scopulifera*
498	Sapotaceae	*Chromolucuma apiculata*
499	Sapotaceae	*Pouteria atlantica*
500	Sapotaceae	*Pouteria glauca*
501	Sapotaceae	*Pouteria synselpala*
502	Sapotaceae	*Pouteria trifida*
503	Sapotaceae	*Pradosia longipedicellata*
504	Verbenaceae	*Stachytarpheta hirsutissima*
505	Vochysiaceae	*Vochysia talmonii*

APPENDIX 5.1 – Point-wise mean SDM of the 10 output grids from each specie

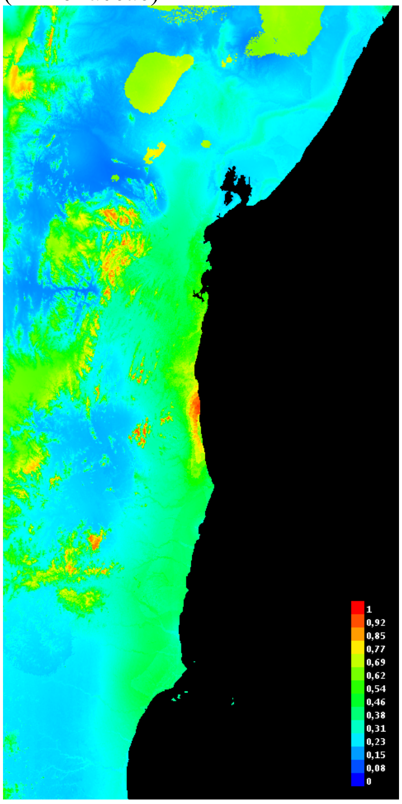
Pseuderanthemum verbenaceum(Acanthaceae)



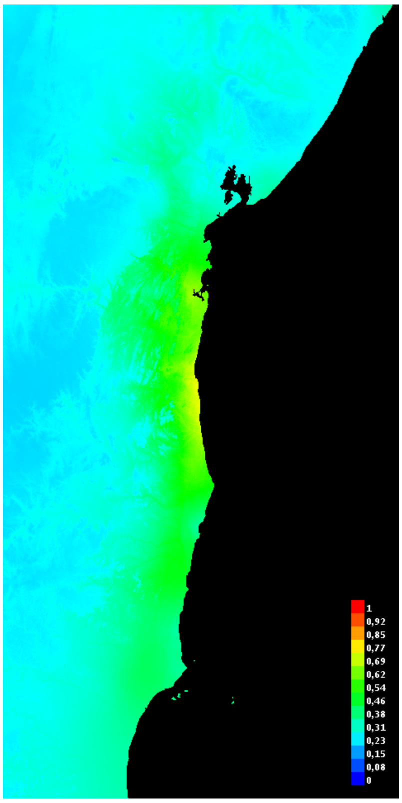
Pseudoxandra bahiensis (Annonaceae)



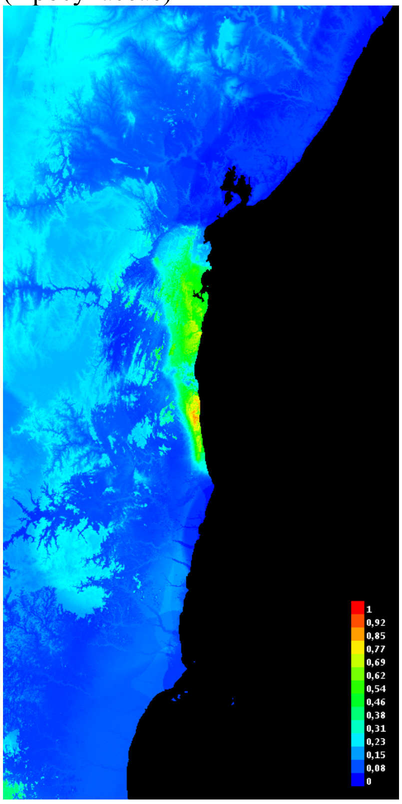
Unonopsis bahiensis (Annonaceae)



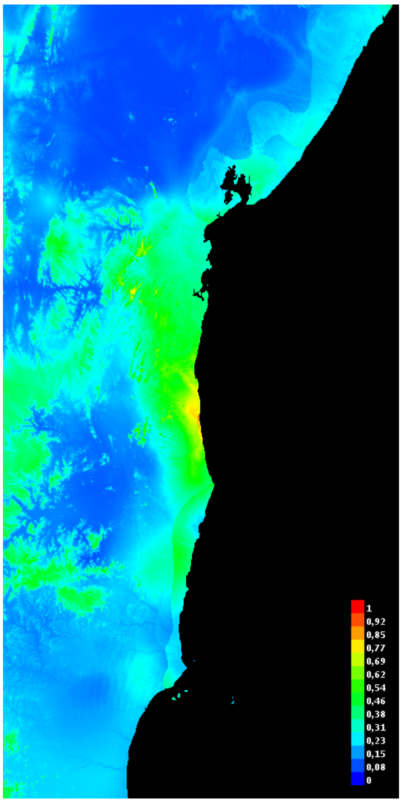
Xylopia involucrata (Annonaceae)



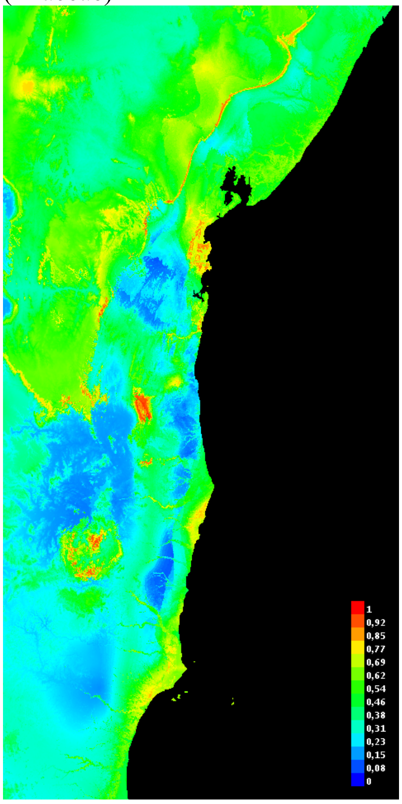
Lacmellea bahiensis (Apocynaceae)



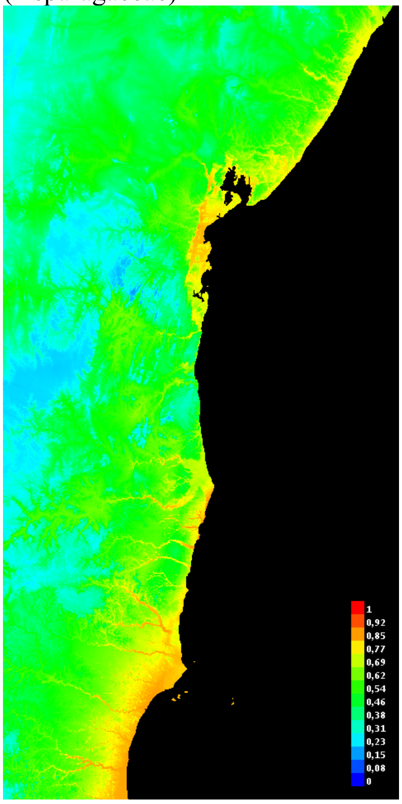
Rauvolfia atlantica (Apocynaceae)



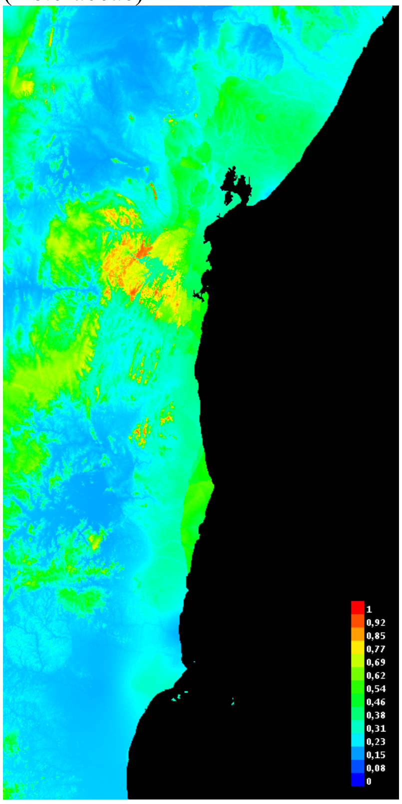
Asterostigma riedelianum
(Araceae)



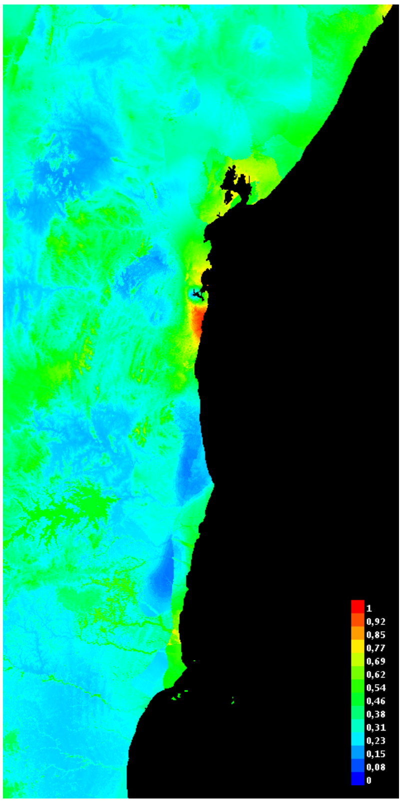
Hagenbachia brasiliensis
(Asparagaceae)



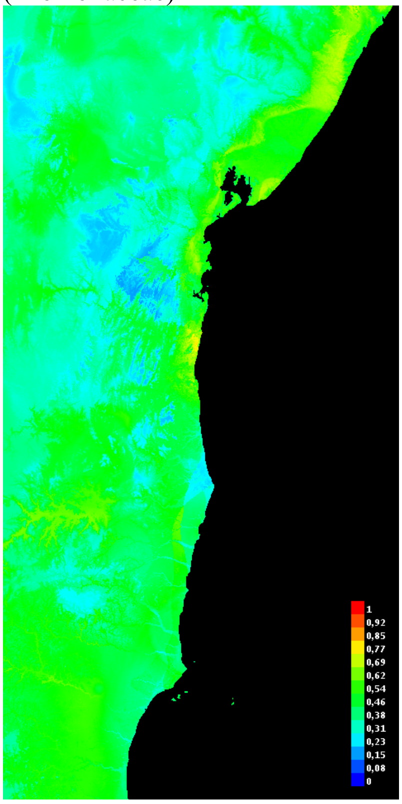
Vernonanthura vinhae (Asteraceae)



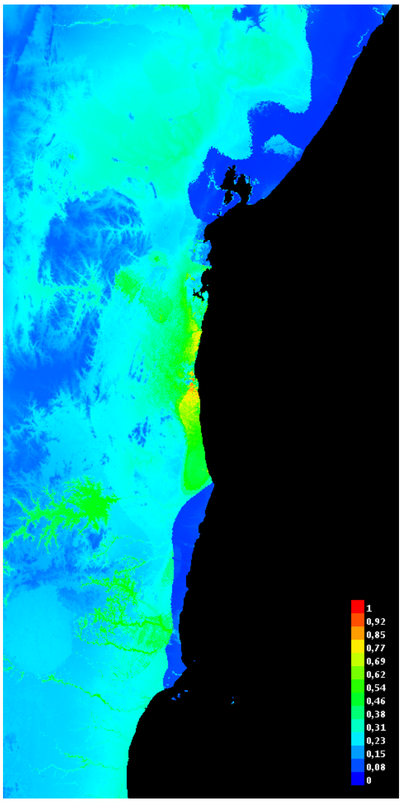
Aechmea miniata (Bromeliaceae)



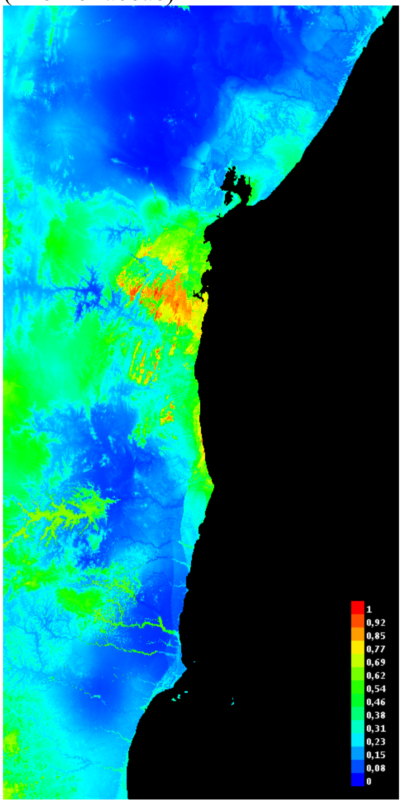
Cryptanthus pseudopetiolatus (Bromeliaceae)



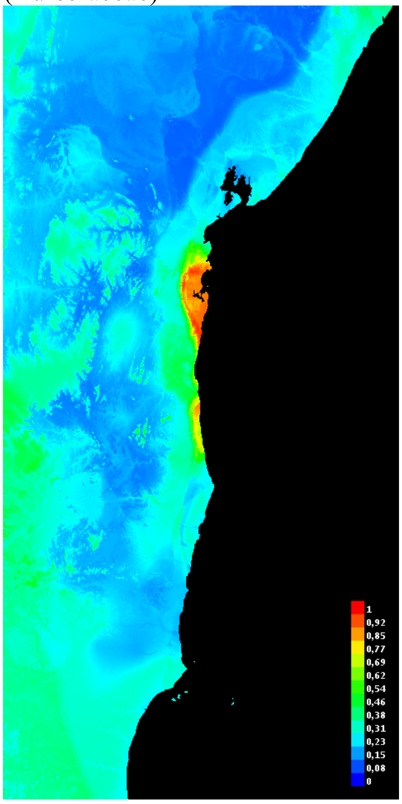
Lymania corallina (Bromeliaceae)



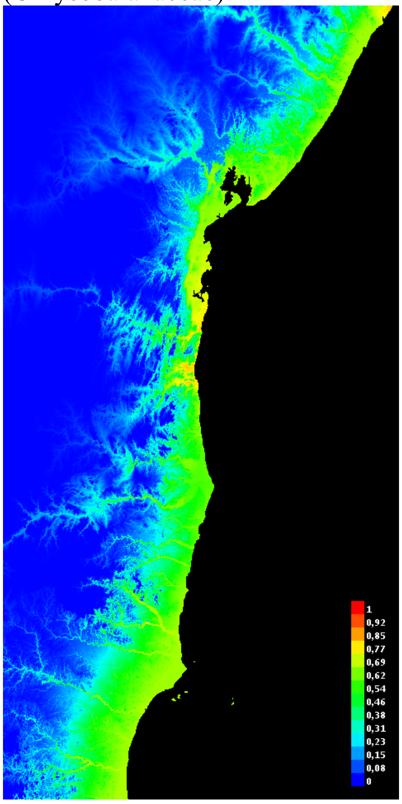
Wittmackia turbinocalyx
(Bromeliaceae)



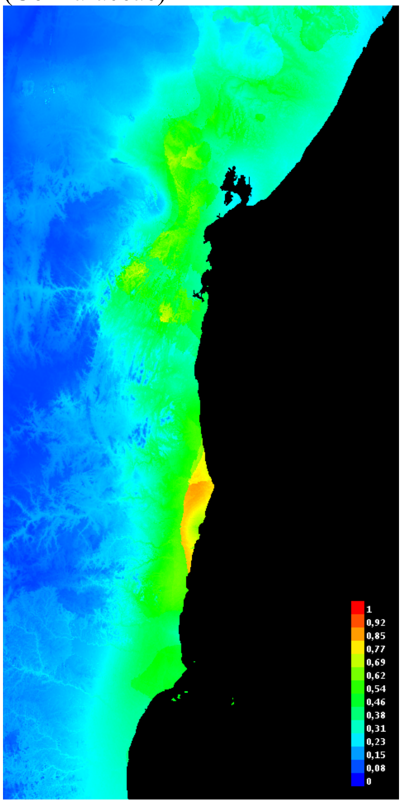
Protium icicariba var. *Talmonii*
(Burseraceae)



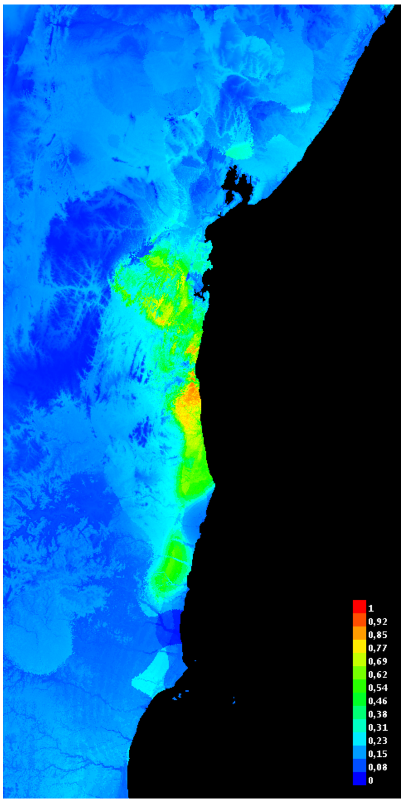
Licania lamentanda
(Chrysobalanaceae)



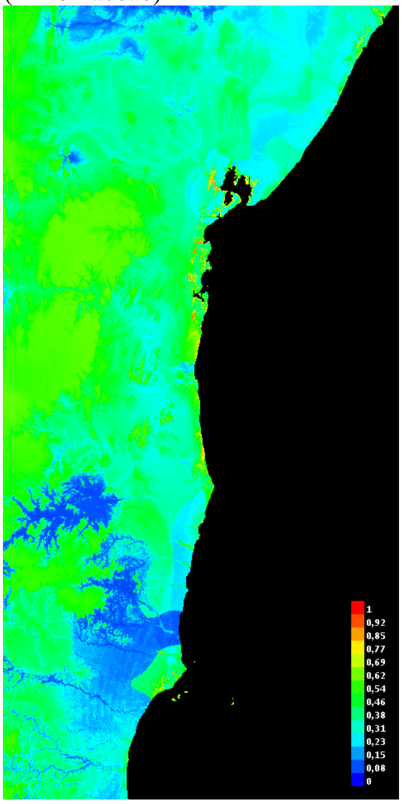
Connarus portosegurensis
(Connaraceae)



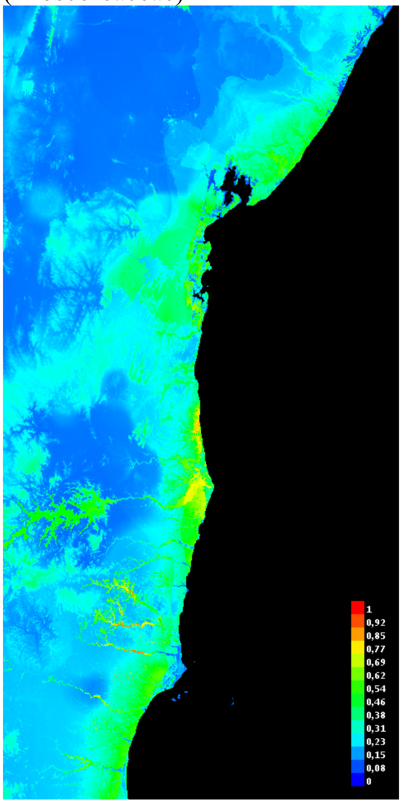
Hypolytrum jardimii (Cyperaceae)



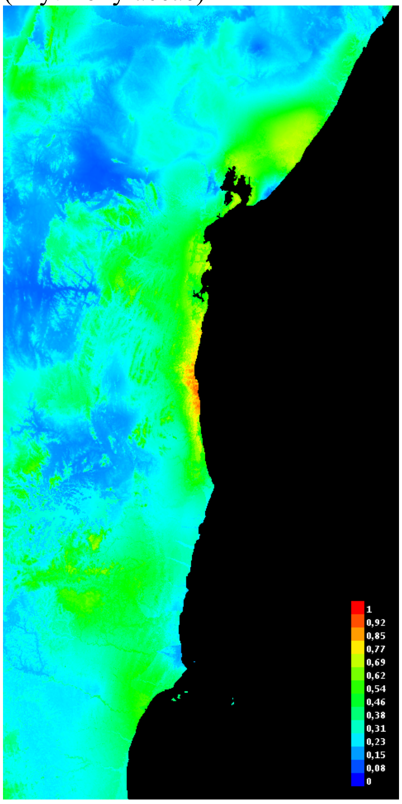
Davilla macrocarpa (Dilleniaceae)



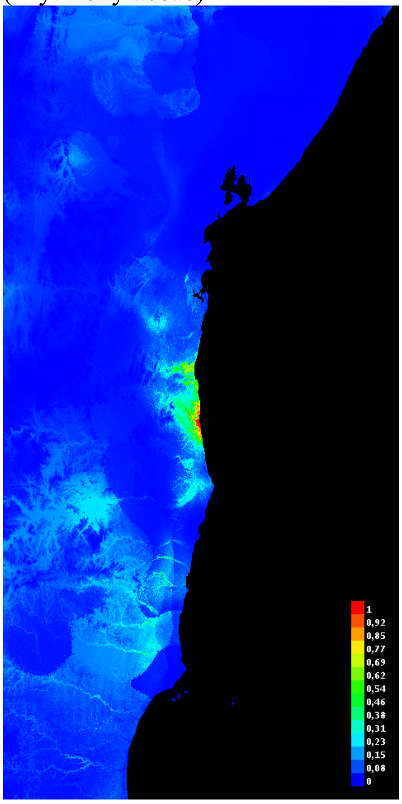
Dioscorea macrothyrsa
(Dioscoreaceae)



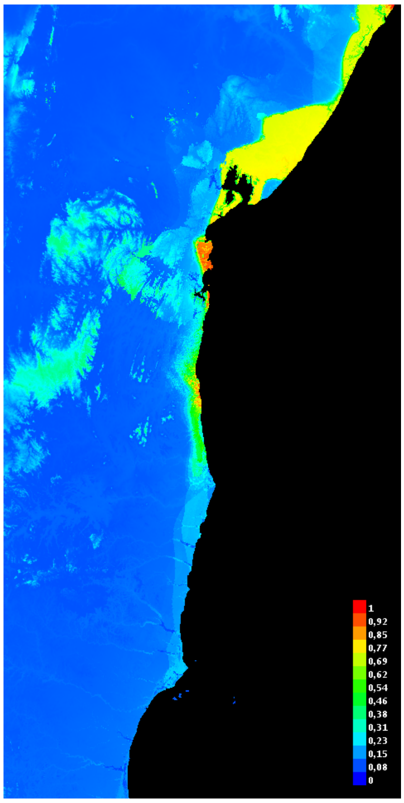
Erythroxylum martii
(Erythroxylaceae)



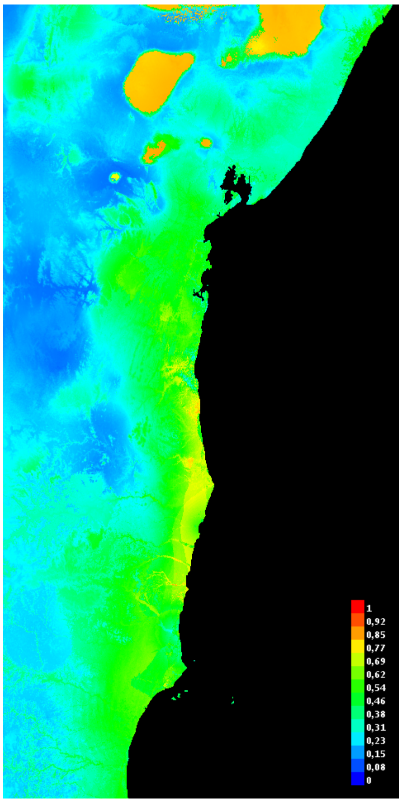
Erythroxylum mattos-silvae (Erythroxylaceae)



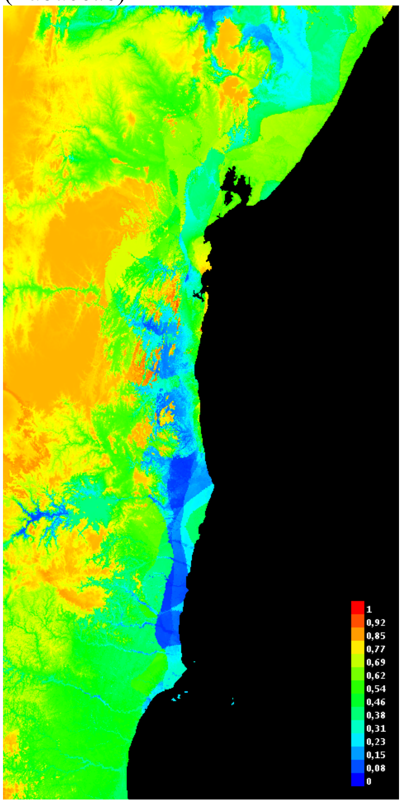
Andira carvalhoi (Fabaceae)



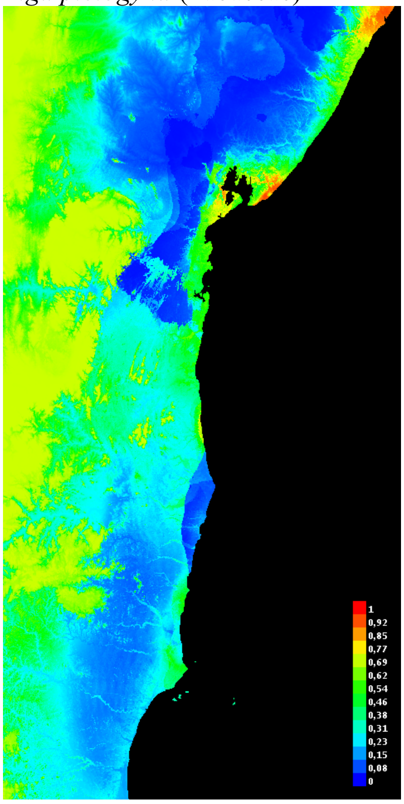
Arapatiella psilophylla (Fabaceae)



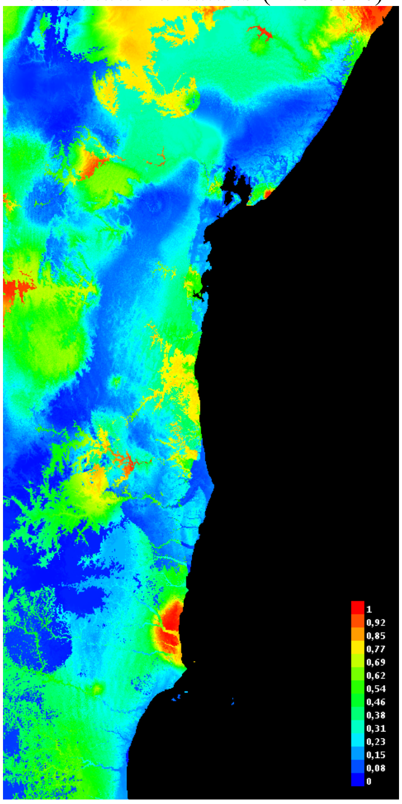
Harleyodendron unifoliolatum (Fabaceae)



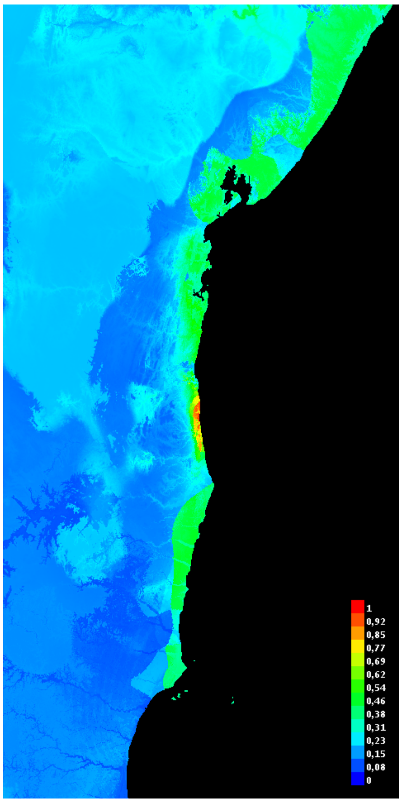
Inga pleiogyna (Fabaceae)



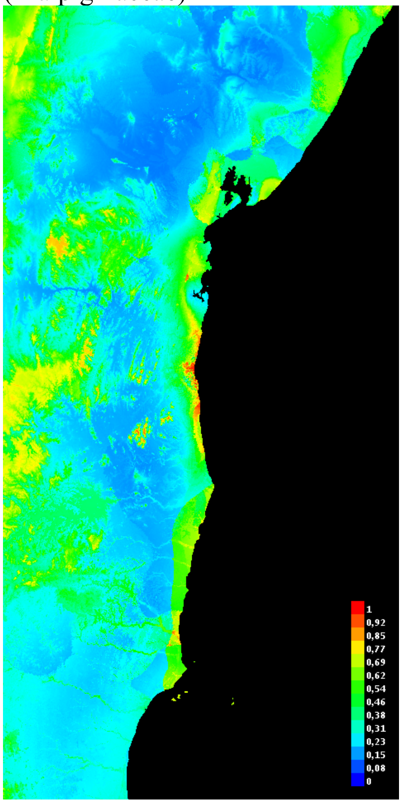
Moldenhawera nutans (Fabaceae)



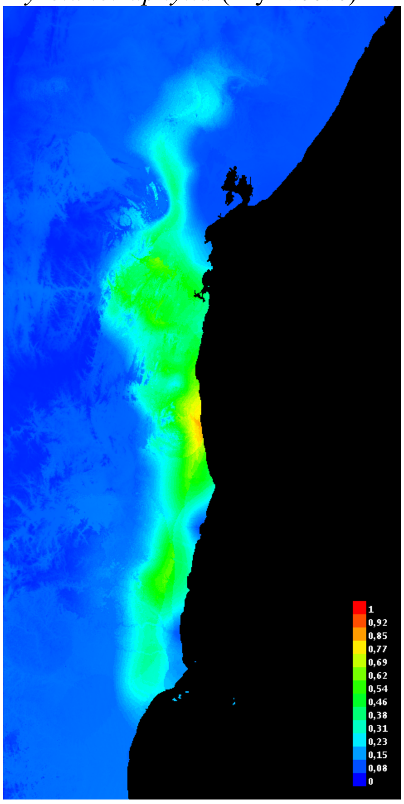
Swartzia riedelii (Fabaceae)



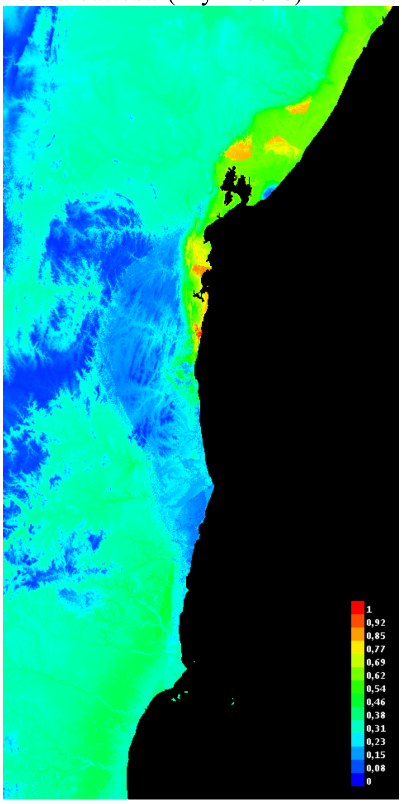
Stigmaphyllon macropodum (Malpighiaceae)



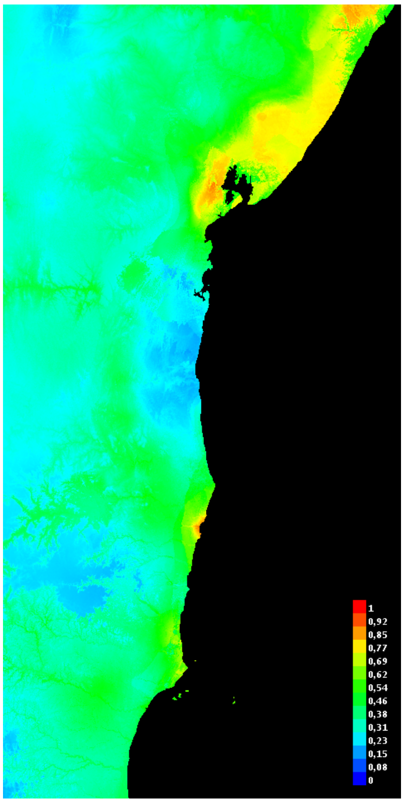
Myrcia tetraphylla (Myrtaceae)



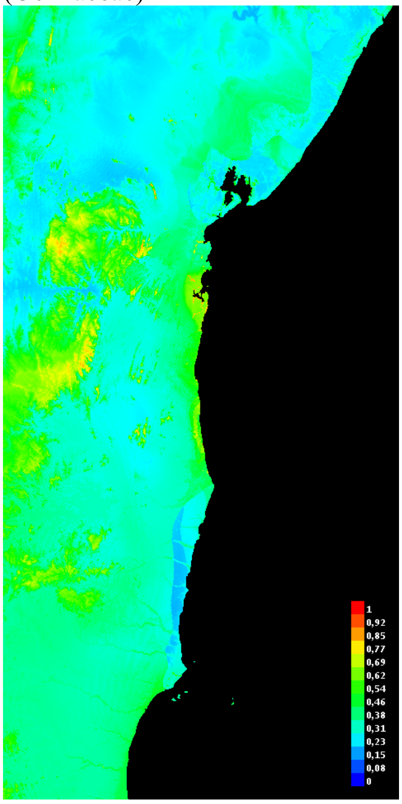
Plinia callosa (Myrtaceae)



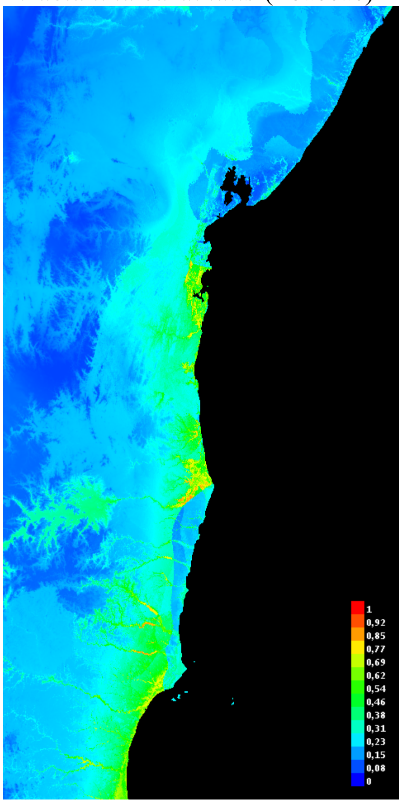
Ouratea bahiensis (Ochnaceae)



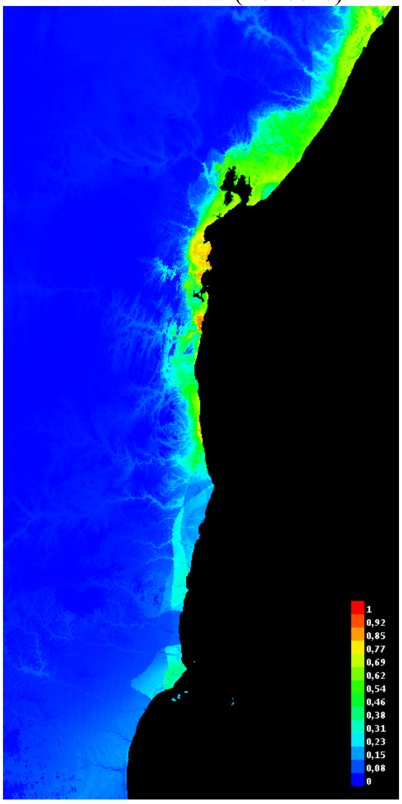
Ouratea gigantophylla (Ochnaceae)



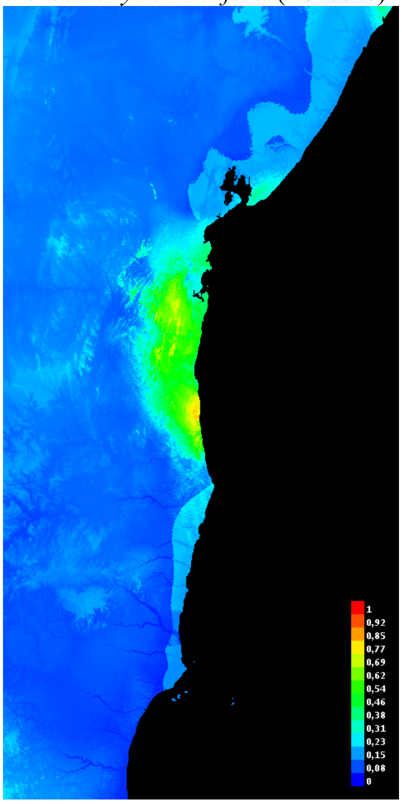
Atractantha cardinalis (Poaceae)



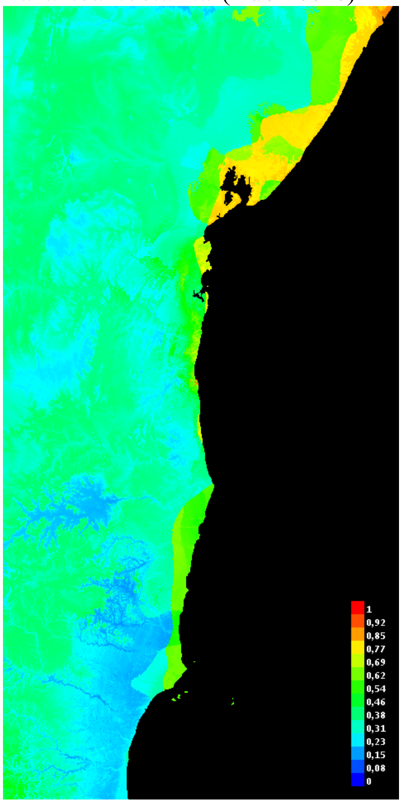
Atractantha radiata (Poaceae)



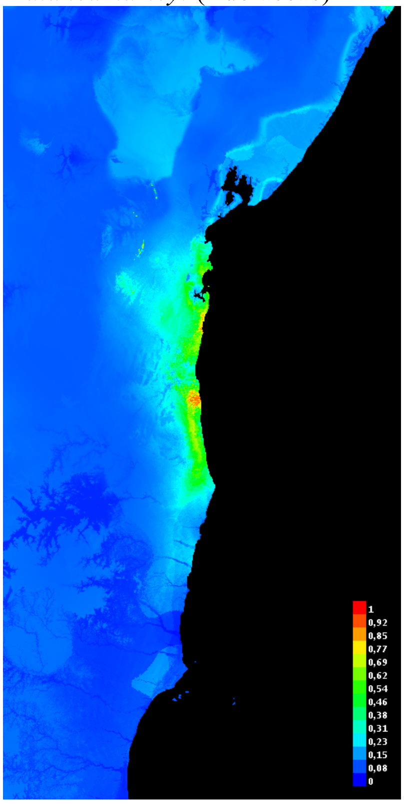
Merostachys annulifera (Poaceae)



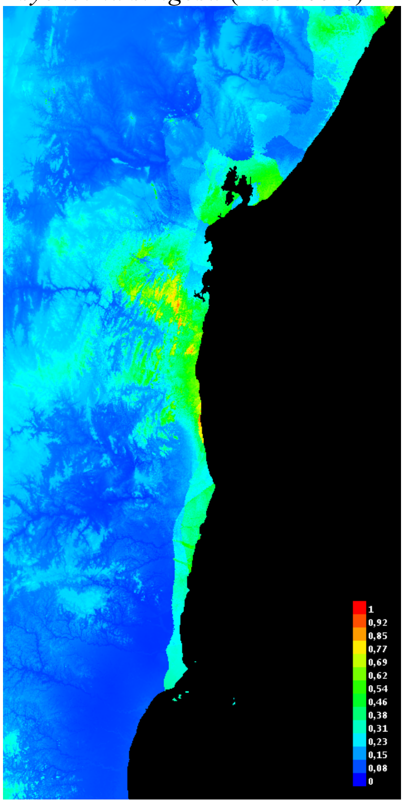
Faramea nocturna (Rubiaceae)



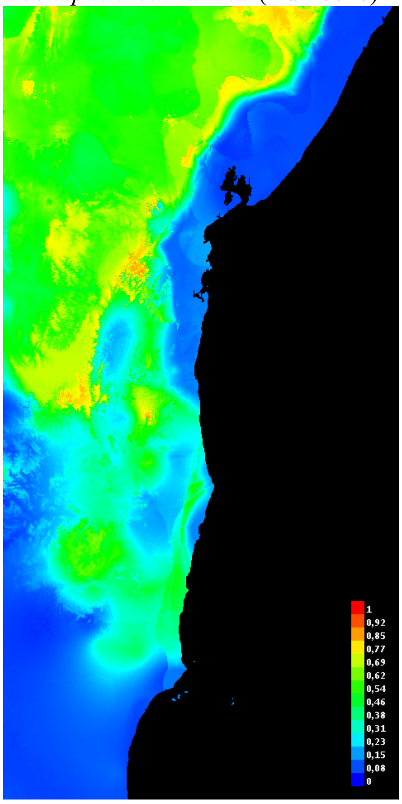
Malanea harleyi (Rubiaceae)



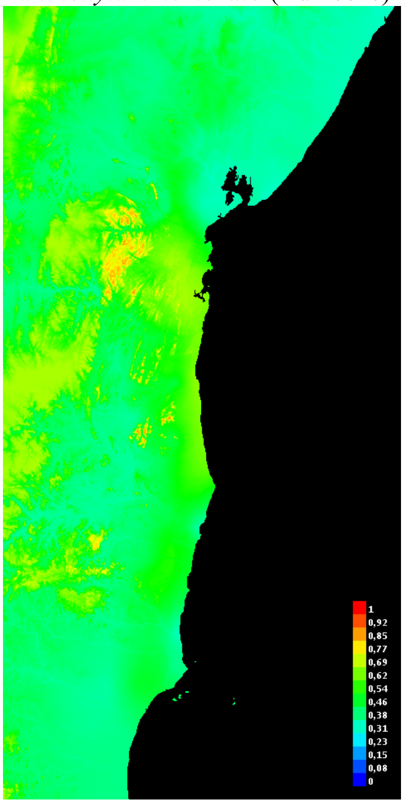
Psychotria strigosa (Rubiaceae)



Neoraputia calliantha (Rutaceae)



Zanthoxylum nemorale (Rutaceae)



Serjania scopulifera (Sapindaceae)