

ATLANTIC EPIPHYTES: a data set of vascular and non-vascular epiphyte plants and lichens from the Atlantic Forest

FLAVIO NUNES RAMOS,¹ SARA RIBEIRO MORTARA, NATHALIA MONALISA-FRANCISCO, JOÃO PEDRO COSTA ELIAS, LUIZ MENINI NETO, LEANDRO FREITAS, RODRIGO KERSTEN, ANDRÉ MÁRCIO AMORIM, FERNANDO BITTENCOURT MATOS, ANDRÉ FELIPPE NUNES-FREITAS, SUZANA ALCANTARA, MARCIA HELENA NAGAHAMA ALEXANDRE, RENATA JIMENEZ DE ALMEIDA-SCABBIA, ODAIR JOSÉ GARCIA DE ALMEIDA, FERNANDA ELIANE ALVES, ROGÉRIO MARCOS DE OLIVEIRA ALVES, FRANCINE SEEHABER ALVIM, ANTÔNIO CARLOS SILVA DE ANDRADE, SIMONE DE ANDRADE, LIDYANNE YURIKO SALEME AONA, ANDRÉA CARDOSO ARAUJO, KELIANNE CAROLINA TARGINO DE ARAÚJO, VANESSA ARIATI, JULIA CAMARA ASSIS, CECÍLIA OLIVEIRA DE AZEVEDO, BRUNO FERREIRA BARBOSA, DANIEL ELIAS FERREIRA BARBOSA, FERNANDO DOS REIS BARBOSA, FABIO DE BARROS, GEICILAINE ALVES BASILIO, FERNANDO ANTONIO BATAGHIN, FERNANDA BERED, JULIANA SANTOS BIANCHI, CHRISTOPHER THOMAS BLUM, CARLOS RENATO BOELTER, ANNETE BONNET, PEDRO HENRIQUE SANTIN BRANCALION, TIAGO BÖER BREIER, CAIO DE TOLEDO BRION, CRISTIANO ROBERTO BUZATTO, ANDRESSA CABRAL, TIAGO JOÃO CADORIN, EDER CAGLIONI, LUCIANA CANÊZ, PEDRO HENRIQUE CARDOSO, FÁBIA SILVA DE CARVALHO, RENAN GONÇALVES CARVALHO, EDUARDO LUIS MARTINS CATHARINO, SERGIO JAVIER CEBALLOS, MONISE TERRA CEREZINI, RICARDO GOMES CÉSAR, CESAR CESTARI, CLEBER JULIANO NEVES CHAVES, VANILDE CITADINI-ZANETTE, LUIZ FRANCISCO MELLO COELHO, JOÃO VICENTE COFFANI-NUNES, RENATO COLARES, GABRIEL DALLA COLLETTA, NADJARA DE MEDEIROS CORRÊA, ANDREA FERREIRA DA COSTA, GRÊNIVEL MOTA DA COSTA, LAÍS MARA SANTANA COSTA, NATÁLIA GABRIELA SOUZA COSTA, DAYVID RODRIGUES COUTO, CAROLINE CRISTOFOLINI, ANA CAROLINA RODRIGUES DA CRUZ, LEOPOLDO ANGELO DEL NERI, MERCEDES DI PASQUO, ALINE DOS SANTOS DIAS, LETÍCIA DO CARMO DUTRA DIAS, RICARDO DISLICH, MARÍLIA CRISTINA DUARTE, JULIANO RICARDO FABRICANTE, FERNANDO HENRIQUE ANTONIOLLI FARACHE, ANA PAULA GELLI DE FARIA, CLAUDENICE FAXINA, MARIANA TERROLA MARTINS FERREIRA, ERICH FISCHER, CARLOS ROBERTO FONSECA, TALITA FONTOURA, TALITHA MAYUMI FRANCISCO, SAMYRA GOMES FURTADO, MAURO GALETTI, MÁRIO LUÍS GARBIN, ANDRÉ LUÍS DE GASPER, MÁRCIA GOETZE, JANAÍNA GOMES-DA-SILVA, MATEUS FELIPE ARAUJO GONÇALVES, DIEGO RAFAEL GONZAGA, ANA CAROLINA GRANERO E SILVA, ANDRÉ DE CAMARGO GUARALDO, ERNESTINO DE SOUZA GOMES GUARINO, ALINE VOTRI GUISLON, LUIGY BITENCOURT HUDSON, JOMAR GOMES JARDIM, PATRICIA JUNGBLUTH, SELMA DOS SANTOS KAESER, IGOR MUSAUER KESSOUS, NATÁLIA MOSSMANN KOCH, YOSHIKO SAITO KUNIYOSHI, PAULO HENRIQUE LABIAK, MARIA ESTHER LAPATE, ANA CAROLINA LAURENTI SANTOS, ROBERTA LUÍSA BARBOSA LEAL, FELIPE SILVEIRA LEITE, PAULA LEITMAN, ANA PAULA LIBONI, DIETER LIEBSCH, DÉBORA VANESSA LINGNER, JULIO ANTONIO LOMBARDI, EVE LUCAS, JHONNY DOS REIS LUZZI, PATRICIA MAI, LUIZ FELIPE MANIA, WALDIR MANTOVANI, ANGELICA GUIDONI MARAGNI, MARCIA CRISTINA MENDES MARQUES, GONZALO MARQUEZ, CRISTIANE MARTINS, LAURA DO NASCIMENTO MARTINS, PEDRO LUIZ SANGLARD SILVA MARTINS, FREDERICO FREGOLENTE FARACCO MAZZIERO, CAMILA DE AGUIAR MELO, MARIA MARGARIDA FIUZA DE MELO, ALEX FERNANDO MENDES, LETÍCIA MESACASA, LEONOR PATRICIA CERDEIRA MORELLATO, VANESSA DE SOUZA MORENO, ADELICIO MULLER, MARIANA MOREIRA DA SILVA MURAKAMI, EDINETE CECCONELLO, CAMILA NARDY, MICHELLE HELENA NERVO, BEATRIZ NEVES, MATHEUS GUIMARÃES CARDOSO NOGUEIRA, FABIANA REGINA NONATO, ARY TEIXEIRA DE OLIVEIRA-FILHO, CÉSAR PEDRO LOPES DE OLIVEIRA, GERHARD ERNST OVERBECK, GABRIEL MENDES MARCUSO, MATEUS LUÍS BARRADAS PACIENCIA, PATRICIA PADILHA, PETERSON TEODORO PADILHA, ANA CLARA ALVES PEREIRA, LUCIANA CARVALHO PEREIRA, RODRIGO AUGUSTO SANTINELLO PEREIRA, JIMMY PINCHEIRA-ULBRICH, JOSÉ SALATIEL RODRIGUES PIRES, MARCO AURÉLIO PIZO, KÁTIA CAVALCANTI PÓRTO, LUDMILA RATTIS, JOICE RODRIGUES DE MENDONÇA REIS, SIMONE GONÇALVES DOS REIS, THEREZA CHRISTINA DA ROCHA-PESSÔA, CARLOS FREDERICO DUARTE ROCHA, FERNANDO SOUZA ROCHA, ALBA REGINA PEREIRA RODRIGUES, RICARDO RIBEIRO RODRIGUES, JULIANA MARCIA ROGALSKI, ROBERTA LUIZA ROSANELLI, ANDRÉS ROSSADO, DAVI RODRIGO ROSSATTO, DÉBORA CRISTINA ROTHER, CARLOS RAMON RUIZ-MIRANDA, FELIPE ZAMBORLINI SAITER, MAURICIO BONESSO SAMPAIO, LUCAS DEZIDERIO SANTANA, JULIANA SILVEIRA DOS SANTOS, RICARDO SARTORELLO,

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¹E-mail: fnramos@gmail.com

MARLIES SAZIMA, JULIANE LUZÍA SCHMITT, GENIANE SCHNEIDER, BRUNA GROSCH SCHROEDER, LUCIA SEVEGNANI, VASCONCELOS OLIVEIRA SILVA JÚNIOR, FERNANDO RODRIGUES DA SILVA, MARIA JULIANA DA SILVA, MÉRCIA PATRÍCIA PEREIRA SILVA, RAFAELA GUIMARÃES SILVA, SANDRO MENEZES SILVA, RODRIGO BUSTOS SINGER, GEOVANE SIQUEIRA, LUIS EDUARDO SOARES, HILDEBERTO CALDAS DE SOUSA, ADRIANO SPIELMANN, VINICIUS RODRIGUES TONETTI, MARIA TERESA ZUGLIANI TONIATO, PAULO SÉRGIO BORDONI ULGUIM, CÁSSIO VAN DEN BERG, EDUARDO VAN DEN BERG, ISABELA GALARDA VARASSIN, IZABELA BITENCOURT VELOSO DA SILVA, ALEXANDER CHRISTIAN VIBRANS, JORGE LUIZ WAECHTER, ERICK WILLY WEISSENBERG, PAULO GÜNTER WINDISCH, MARINA WOŁOWSKI, AGUSTINA YAÑEZ, VANIA NOBUKO YOSHIKAWA, LUCIANO RAMOS ZANDONÁ, CAMILA MARTINI ZANELLA, ELISABETE MARIA ZANIN, DANIELA CRISTINA ZAPPI, VALESKA BONONI ZIPPARRO, JOÃO PAULO FERNANDES ZORZANELLI, AND MILTON CEZAR RIBEIRO

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Abstract. Epiphytes are hyper-diverse and one of the frequently undervalued life forms in plant surveys and biodiversity inventories. Epiphytes of the Atlantic Forest, one of the most endangered ecosystems in the world, have high endemism and radiated recently in the Pliocene. We aimed to (1) compile an extensive Atlantic Forest data set on vascular, non-vascular plants (including hemiepiphytes), and lichen epiphyte species occurrence and abundance; (2) describe the epiphyte distribution in the Atlantic Forest, in order to indicate future sampling efforts. Our work presents the first epiphyte data set with information on abundance and occurrence of epiphyte phorophyte species. All data compiled here come from three main sources provided by the authors: published sources (comprising peer-reviewed articles, books, and theses), unpublished data, and herbarium data. We compiled a data set composed of 2,095 species, from 89,270 holo/hemiepiphyte records, in the Atlantic Forest of Brazil, Argentina, Paraguay, and Uruguay, recorded from 1824 to early 2018. Most of the records were from qualitative data (occurrence only, 88%), well distributed throughout the Atlantic Forest. For quantitative records, the most common sampling method was individual trees (71%), followed by plot sampling (19%), and transect sampling (10%). Angiosperms (81%) were the most frequently registered group, and Bromeliaceae and Orchidaceae were the families with the greatest number of records (27,272 and 21,945, respectively). Ferns and Lycophytes presented fewer records than Angiosperms, and Polypodiaceae were the most recorded family, and more concentrated in the Southern and Southeastern regions. Data on non-vascular plants and lichens were scarce, with a few disjunct records concentrated in the Northeastern region of the Atlantic Forest. For all non-vascular plant records, Lejeuneaceae, a family of liverworts, was the most recorded family. We hope that our effort to organize scattered epiphyte data help advance the knowledge of epiphyte ecology, as well as our understanding of macroecological and biogeographical patterns in the Atlantic Forest. No copyright restrictions are associated with the data set. Please cite this *Ecology* Data Paper if the data are used in publication and teaching events.

Key words: abundance; Atlantic Forest; biodiversity data set; biodiversity hotspot; epiphyte; phorophyte; presencelabsence; tropical forest.

The complete data sets corresponding to abstracts published in the Data Papers section in the journal are published electronically as Supporting Information in the online version of this article at <http://onlinelibrary.wiley.com/doi/10.1002/ecy.2541/supinfo>.

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AUTHORS:

Flavio Nunes Ramos¹, Sara Ribeiro Mortara¹, Nathalia Monalisa-Francisco¹, João Pedro Costa Elias¹, Luiz Menini Neto², Leandro Freitas³, Rodrigo de Andrade Kersten⁴, André Márcio Amorim⁵, Fernando Bittencourt de Matos⁶, André Felipe Nunes-Freitas⁷, Suzana Alcantara⁸, Marcia Helena Nagahama Alexandre⁹, Renata Jimenez de Almeida-Scabbia¹⁰, Odair José Garcia de Almeida¹¹, Fernanda Eliane Alves¹², Rogério Marcos de Oliveira Alves¹³, Francine Seehaber Alvim², Antônio Carlos Silva de Andrade³, Simone de Andrade¹⁴, Lidyanne Yuriko Saleme Aona¹⁵, Andréa Cardoso Araujo¹⁶, Kelianne Carolina Targino de Araújo¹⁷, Vanessa Ariati¹⁸, Julia Camara Assis¹⁹, Cecília Oliveira de Azevedo²⁰, Bruno Ferreira Barbosa²¹, Daniel Elias Ferreira Barbosa², Fernando dos Reis Barbosa¹⁰, Fabio de Barros²², Geicilaine Alves Basilio²¹, Fernando Antonio Bataghin²³, Fernanda Bered²⁴, Juliana Santos Bianchi²⁵, Christopher Thomas Blum²⁶, Carlos Renato Boelter²⁷, Annete Bonnet²⁸, Pedro Henrique Santin Brancalion²⁹, Tiago Böer Breier⁷, Caio de Toledo Brion²¹, Cristiano Roberto Buzatto³⁰, Andressa Cabral³¹, Tiago João Cadorin¹⁴, Eder Caglioni¹⁴, Luciana Canêz¹⁶, Pedro Henrique Cardoso², Fábila Silva de Carvalho³², Renan Gonçalves Carvalho¹, Eduardo Luis Martins Catharino²², Sergio Javier Ceballos³³, Monise Terra Cerezini³⁴, Ricardo Gomes César²⁹, Cesar Cestari³⁵, Cleber Juliano Neves Chaves³⁶, Vanilde Citadini-Zanette³⁷, Luiz Francisco Mello Coelho³⁸, João Vicente Coffani-Nunes⁹, Renato Colares³⁷, Gabriel Dalla Colletta³⁹, Nadjara de Medeiros Corrêa⁷, Andrea Ferreira da Costa⁴⁰, Grênivel Mota da Costa¹⁵, Laís Mara Santana Costa²⁴, Natália Gabriela Souza Costa¹, Dayvid Rodrigues Couto⁴⁰, Caroline Cristofolini¹⁴, Ana Carolina Rodrigues da Cruz⁴⁰, Leopoldo Angelo Del Neri⁹, Mercedes di Pasquo⁴¹, Aline dos Santos Dias⁴², Letícia do Carmo Dutra Dias², Ricardo Dislich⁴³, Marília Cristina Duarte¹⁰, Juliano Ricardo Fabricante¹⁷, Fernando Henrique Antonioli Farache⁴⁴, Ana Paula Gelli de Faria², Claudenice Faxina⁴⁵, Mariana Terrola Martins Ferreira⁴⁶, Erich Fischer¹⁶, Carlos Roberto Fonseca⁴⁷, Talita Fontoura⁴⁸, Talitha Mayumi Francisco⁴⁹, Samyra Gomes Furtado², Mauro Galetti¹⁹, Mário Luís Garbin⁵⁰, André Luís de Gasper¹⁴, Márcia Goetze²⁴, Janaína Gomes-da-Silva³, Mateus Felipe Araujo Gonçalves¹, Diego Rafael Gonzaga³, Ana Carolina Granero e Silva¹, André de Camargo Guaraldo⁵¹, Ernestino de Souza Gomes Guarino⁵², Aline Votri Guislon³⁷, Luigy Bitencourt Hudson², Jomar Gomes Jardim⁵³, Patricia Jungbluth⁵⁴, Selma dos Santos Kaeser²¹, Igor Musauer Kessous⁴⁰, Natália Mossmann Koch¹⁶, Yoshiko Saito Kuniyoshi²⁶, Paulo Henrique Labiak⁶, Maria Esther Lapate⁴⁴, Ana Carolina Laurenti Santos⁵⁵, Roberta Luísa Barbosa Leal³, Felipe Silveira Leite⁵⁶, Paula Leitman³, Ana Paula Liboni^{39,57}, Dieter Liebsch²⁶, Débora Vanessa Lingner¹⁴, Julio Antonio Lombardi³⁶, Eve Lucas⁵⁸, Jhonny dos Reis Luzzi²¹, Patricia Mai⁵⁹, Luiz Felipe Mania⁶⁰, Waldir Mantovani⁶¹, Angelica Guidoni Maragni^{22,62}, Marcia Cristina Mendes Marques⁶, Gonzalo Marquez⁶³, Cristiane Martins⁶⁴, Laura do Nascimento

Martins⁷, Pedro Luiz Sanglard Silva Martins², Frederico Fregolente Faracco Mazziero⁶, Camila de Aguiar Melo²⁴, Maria Margarida Fiuza de Melo⁶⁵, Alex Fernando Mendes²⁹, Letícia Mesacasa⁸, Leonor Patricia Cerdeira Morellato³⁶, Vanessa de Souza Moreno²⁹, Adelcio Muller³⁴, Mariana Moreira da Silva Murakami⁷, Edinete Cecconello⁶⁶, Camila Nardy², Michelle Helena Nervo⁶⁷, Beatriz Neves⁴⁰, Matheus Guimarães Cardoso Nogueira⁴⁰, Fabiana Regina Nonato³⁹, Ary Teixeira de Oliveira-Filho⁵⁶, César Pedro Lopes de Oliveira¹⁴, Gerhard Ernst Overbeck⁶⁷, Gabriel Mendes Marcusso³⁶, Mateus Luís Barradas Paciencia⁶⁸, Patricia Padilha⁸, Peterson Teodoro Padilha³⁷, Ana Clara Alves Pereira², Luciana Carvalho Pereira², Rodrigo Augusto Santinelo Pereira⁴⁴, Jimmy Pincheira-Ulbrich⁶⁹, José Salatiel Rodrigues Pires⁷⁰, Marco Aurélio Pizo³⁵, Kátia Cavalcanti Pôrto⁷¹, Ludmila Rattis^{72,73}, Joice Rodrigues de Mendonça Reis¹³, Simone Gonçalves dos Reis²¹, Thereza Christina da Rocha-Pessôa⁷, Carlos Frederico Duarte Rocha⁴², Fernando Souza Rocha⁷⁴, Alba Regina Pereira Rodrigues⁷⁵, Ricardo Ribeiro Rodrigues⁵⁷, Juliana Marcia Rogalski⁶⁶, Roberta Luiza Rosanelli⁷⁶, Andrés Rossado⁷⁷, Davi Rodrigo Rossatto⁷⁸, Débora Cristina Rother^{39,57}, Carlos Ramon Ruiz-Miranda⁴⁹, Felipe Zamborlini Saiter⁷⁹, Mauricio Bonesso Sampaio¹, Lucas Deziderio Santana⁸⁰, Juliana Silveira dos Santos¹⁹, Ricardo Sartorello¹⁰, Marlies Sazima³⁹, Juliane Luzia Schmitt⁴¹, Geniane Schneider⁸¹, Bruna Grosch Schroeder¹⁴, Lucia Sevegnani¹⁴, Vasconcelos Oliveira Silva Júnior²¹, Fernando Rodrigues da Silva²¹, Maria Juliana da Silva⁸², Mércia Patrícia Pereira Silva⁷¹, Rafaela Guimarães Silva⁸⁰, Sandro Menezes Silva⁸³, Rodrigo Bustos Singer⁶⁷, Geovane Siqueira⁸⁴, Luis Eduardo Soares²⁴, Hildeberto Caldas de Sousa⁴⁶, Adriano Spielmann¹⁶, Vinicius Rodrigues Tonetti¹⁹, Maria Teresa Zugliani Toniato⁸⁵, Paulo Sérgio Bordoni Ulguim²¹, Cássio van den Berg⁸⁶, Eduardo van den Berg⁸⁰, Isabela Galarda Varassin⁶, Izabela Bitencourt Veloso da Silva⁷, Alexander Christian Vibrans¹⁴, Jorge Luiz Waechter⁶⁷, Erick Willy Weissenberg⁹, Paulo Günter Windisch⁶⁷, Marina Wolowski¹, Agustina Yañez⁸⁷, Vania Nobuko Yoshikawa¹⁰, Luciano Ramos Zandoná^{22,62}, Camila Martini Zanella²⁴, Elisabete Maria Zanin⁸⁸, Daniela Cristina Zappi⁸⁹, Valesca Bononi Zipparro³⁶, João Paulo Fernandes Zorzanelli⁹⁰ and Milton Cezar Ribeiro¹⁹

1. Universidade Federal de Alfenas (UNIFAL), Instituto de Ciências da Natureza, Rua Gabriel Monteiro da Silva, 700, Alfenas, MG, 37130-000, Brasil.
2. Universidade Federal de Juiz de Fora (UFJF), Departamento de Botânica, Rua José Lourenço Kelmer, S/n - Martelos, Juiz de Fora, MG, 36036-330, Brasil.
3. Jardim Botânico do Rio de Janeiro, Rua Pacheco Leão, 915, Rio de Janeiro, RJ, 22460-030, Brasil.
4. Pontifícia Universidade Católica do Paraná (PUC-PR), Escola de Ciências da Vida, Rua Imaculada Conceição, 1155, Curitiba, PR, 80215-901, Brasil.
5. Universidade Estadual de Santa Cruz (UESC); Departamento de Ciências Biológicas; Campus Soane Nazaré de Andrade, Rodovia Jorge Amado Km 16, Ilhéus, Bahia, 45662-900, Brasil.

6. Universidade Federal do Paraná (UFPR), Departamento de Botânica, Centro Politécnico, Caixa Postal 19031, Jardim das Américas, Curitiba, PR, 81531-980, Brasil.
7. Universidade Federal Rural do Rio de Janeiro (UFRRJ), Instituto de Florestas, Rodovia BR-465, Km 07, Seropédica, Rio de Janeiro, 23897-000, Brasil.
8. Universidade Federal de Santa Catarina (UFSC), Centro de Ciências Biológicas, Departamento de Botânica, Campus Reitor João David Ferreira Lima, s/n - Trindade, Florianópolis, SC, 88040-900, Brasil.
9. Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP), Campus Experimental de Registro, Av. Nelson Brihi Badur, 430, Registro, São Paulo, 11900-000, Brasil.
10. Universidade de Mogi das Cruzes (UMC), Núcleo de Ciências Ambientais, Avenida Doutor Cândido Xavier de Almeida e Souza, 200, Mogi das Cruzes, SP, 08780-911, Brasil.
11. Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP), Praça Infante Dom Henrique, s/nº São Vicente, SP - Brasil.
12. Prefeitura Municipal de Olaria, Meio Ambiente, Praça 1º de Março 13, Centro, Olaria, MG, 36145000, Brasil.
13. Instituto Federal de Educação, Ciência e Tecnologia Baiano (IF-Baiano), Campus Itaberaba, Av. Rio Branco, 1003, Centro, Itaberaba, BA, 46880-000, Brasil.
14. Universidade Regional de Blumenau (FURB), Rua Antônio da Veiga, 140, Blumenau, Santa Catarina, 89030-903, Brasil.
15. Universidade Federal do Recôncavo da Bahia (UFRB), CCAAB, Rua Rui Barbosa, 710, Centro, Cruz das Almas, 44380-000, Brasil.
16. Universidade Federal de Mato Grosso do Sul (UFMS), Instituto de Biociências, Cidade Universitária, Campo Grande, MS, 79070-900, Brasil.
17. Universidade Federal de Sergipe (UFS), Campus Universitário Prof. Alberto Carvalho, Departamento Biociências (DBCI), Av. Vereador Olímpio Grande, S/N - Bloco D, Centro, Itabaiana, Sergipe, 49510-200, Brasil.
18. Floresce Consultoria Ambiental, Rua Dr. Alexandre Gutierrez, 332, Curitiba, PR, 80240-130, Brasil.
19. Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP), Instituto de Biociências, Departamento de Ecologia, CP. 199, 13506-900 Rio Claro, São Paulo, Brasil.
20. Universidade Estadual do Sudoeste da Bahia (UESB), Ciências Naturais, Departamento de Ciências Naturais, UESB, Estrada do Bem-Querer, km 4, s.n., Bairro Universitário, Vitória da Conquista, Bahia, 45083-900, Brasil.
21. Centro de Ensino Superior em Juiz de Fora (CESJF), Campus Arnaldo Janssen, Luz Interior, 345, Santa Luzia, Juiz de Fora, MG, 36030-776, Brasil
22. Instituto de Botânica de São Paulo, Núcleo de Pesquisas Orquidário do Estado, Avenida Miguel Stefano, São Paulo, SP, 04301-902, Brasil.

23. Universidade Federal de Mato Grosso do Sul (UFMS), Faculdade de Engenharia, Arquitetura e Urbanismo e Geografia. Caixa Postal 594, 79070-900. Cidade Universitária. Campo Grande, MS, Brasil.
24. Universidade Federal do Rio Grande do Sul (UFRGS), Instituto de Biociências, Departamento de Genética, Av. Bento Gonçalves, 9500 pr 43312, Porto Alegre, Brasil. 91501-970
25. JB Consultoria Ambiental, Rua Joaquim Firmino, 1318, Foz do Iguaçu, PR, 85853-020, Brasil.
26. Universidade Federal do Paraná (UFPR), Departamento de Ciências Florestais, Avenida Prefeito Lothário Meissner, 632, Curitiba, Paraná, 81530-120, Brasil.
27. Instituto Nacional de Pesquisa da Amazônia (INPA), PPG-Botânica, Av. André Araújo, 2936, Aleixo, Manaus, AM, 69067-375, Brasil.
28. Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA) Florestas, Estrada da Ribeira, Km 111, Colombo, PR, 83411-000, Brasil.
29. Universidade de São Paulo (USP), Escola Superior de Agricultura “Luiz de Queiroz” (ESALQ), Departamento de Ciências Florestais, Avenida Pádua Dias 11, Piracicaba, SP, 13400-970, Brasil.
30. Universidade de Passo Fundo (UPF), Instituto de Ciências Biológicas, Campus I, Bairro São José, BR 285, Passo Fundo, RS, 9052-900, Brasil.
31. Universidade de São Paulo (USP), Departamento de Botânica, Instituto de Biociências, Rua do Matão, 277, São Paulo, 05508-900, Brasil.
32. Universidade Federal de Mato Grosso do Sul (UFMS), Instituto de Biociências, Herbário CGMS, Avenida Costa e Silva, s/n, Campo Grande, Mato Grosso do Sul, 79070-900, Brasil.
33. Instituto de Ecología Regional (UNT-CONICET), Casilla de Correo, 34, Yerba Buena, Tucumán, 4107, Argentina.
34. Universidade Federal de São Carlos (UFSCAR), Centro de Ciências Biológicas e da Saúde - Rodovia Washington Luís, Km 335 - SP 310 São Carlos - SP Brasil 13565-905/ C.P 676 São Carlos, 13565-6799, Brasil.
35. Universidade Estadual Paulista “Júlio de Mesquita Filho” (UNESP), Instituto de Biociências, Departamento de Zoologia, CP. 199, 13506-900 Rio Claro, São Paulo, Brasil.
36. Universidade Estadual Paulista “Júlio de Mesquita Filho” (UNESP), Instituto de Biociências, Departamento de Botânica, Avenida 24 A, 1515, CP. 199, 13506-900, Rio Claro, São Paulo, SP, 13506-900, Brasil.
37. Universidade do Extremo Sul Catarinense (UNESC), Programa de Pós-Graduação em Ciências Ambientais, Avenida Universitária, 1105, Bairro Universitário, Criciúma, SC, 88806-000, Brasil.
38. Universidade Federal do Vale do São Francisco (UNIFASF), NEMA, Brasil 407, Km 12, lote 543, Projeto de Irrigação Nilo Coelho, s/n, Petrolina, Pernambuco, 56304-917, Brasil.

39. Universidade Estadual de Campinas (UNICAMP), Departamento de Biologia Vegetal, Instituto de Biologia, C. P. 6109, 13083-970 Campinas, SP, Brasil.
40. Universidade Federal do Rio de Janeiro (UFRJ), Museu Nacional, Horto Botânico, Quinta da Boa Vista, São Cristóvão, 20940-040, Rio de Janeiro, RJ, Brasil.
41. Laboratory of Palynostratigraphy and Paleobotany, CICyTTP (CONICET-Entre Ríos-UADER), Dr. Matteri y España Diamante, Entre Ríos, E3105BWA, Argentina.
42. Universidade do Estado do Rio de Janeiro (UERJ), Departamento de Ecologia, Rua São Francisco Xavier, 524, Rio de Janeiro, 20550-900, Brasil.
43. Ministério do Planejamento, Desenvolvimento e Gestão, Esplanada dos Ministérios, Bloco K, Sala 352, Brasília, DF, 70040-906, Brasil.
44. Universidade de São Paulo (USP), Campus de Ribeirão Preto, Departamento de Biologia - Av. Bandeirantes, 3900 - Ribeirão Preto, 14040-901, Brasil.
45. Universidade Federal de Mato Grosso do Sul (UFMS), Programa de Pós-Graduação em Ecologia e Conservação, Cidade Universitária, Campo Grande, 79070-900, Brasil.
46. Universidade Federal de Ouro Preto (UFOP), Departamento de Biodiversidade, Evolução e Meio Ambiente, Campus Universitário Morro do Cruzeiro, Ouro Preto, 35400-000, Brasil.
47. Universidade Federal do Rio Grande do Norte (UFRN), Instituto de Biociências, Departamento de Ecologia, Natal, RN, Brasil.
48. Universidade Estadual de Santa Cruz (UESC); Departamento de Ciências Biológicas; Programa de Pós-Graduação em Ecologia e Conservação da Biodiversidade, Rodovia Jorge Amado Km 16, Ilhéus, Bahia, 45662-900, Brasil.
49. Universidade Estadual do Norte Fluminense Darcy Ribeiro (UENF), Laboratório de Ciências Ambientais, Avenida Alberto Lamago 2000, Parque Califórnia, 28013602 - Campos dos Goytacazes, RJ - Brasil.
50. Universidade Vila Velha (UVV), Programa de Pós-Graduação em Ecologia de Ecossistemas, Rua Comissário José Dantas de Melo, s/n, Boa Vista, Vila Velha, ES, 29102770, Brasil.
51. Universidade Federal do Paraná (UFPR), Laboratório de Ecologia Comportamental e Ornitologia, Departamento de Zoologia, Centro Politécnico, Caixa Postal 19031, Jardim das Américas, Curitiba, PR, 81530-900, Brasil.
52. Centro de Pesquisa Agropecuária de Clima Temperado (Embrapa Clima Temperado), Rodovia BR-392, Km 78, 9º Distrito, Monte Bonito, RS, Postal Code 403, 96010-971, Brasil.
53. Universidade Federal do Sul da Bahia (UFSB), campus Jorge Amado, Instituto de Humanidades, Artes e Ciências and Herbário Centro de Pesquisa do Cacau - CEPEC, Km 29 Rod. Ilhéus-Itabuna, CP. 07, 45604-811, Itabuna, Bahia, Brasil.
54. Universidade Federal de Santa Maria (UFSM), Departamento de Zootecnia e Ciências Biológicas - Av. Independência, nº 3751 Bairro Vista Alegre, Palmeiras das Missões - Rio Grande do Sul, 98300000, Brasil

55. Instituto Nacional de Colonização e Reforma Agrária - INCRA/SR22 - Alagoas, Setor de Meio Ambiente e Recursos Naturais, Rua do Imperador, Nº 105, Centro, Maceió, AL, 57020-030, Brasil.
56. Universidade Federal de Minas Gerais (UFMG), Botânica - Av. Antônio Carlos, Pampulha - Belo Horizonte, Minas Gerais, 31270-901, Brasil.
57. Universidade de São Paulo (USP), Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ), Departamento de Ciências Biológicas, Laboratório de Ecologia e Restauração Florestal (LERF), Av. Pádua Dias 11, 13.418-900, Piracicaba, SP, Brazil
58. Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AB, United Kingdom.
59. Universidad de la República, Centro Universitario Regional del Este, Tacuarembó y Bvar, Artigas, Maldonado, 20100, Uruguay.
60. Instituto Federal de Educação, Ciência e Tecnologia de São Paulo (IFSP), Campus São Paulo, Departamento de Ciências e Matemática (DCM), Rua Pedro Vicente, 625, Canindé, São Paulo, SP, 01109-010, Brasil.
61. Universidade Federal do Ceará (UFC), Centro de Ciências, Ciências Biológicas, Campus do PICI, Bloco 906, Fortaleza, Ceará, 60455-760, Brasil.
62. Reservas Votorantim, Rua Amauri, 255, 12º andar, São Paulo, SP, 01448-000, Brasil.
63. Universidad Nacional de La Plata, Facultad de Ciencias Naturales y Museo, 3, 64st, La Plata, 1900, Argentina.
64. Universidade Federal de Ouro Preto (UFOP), Programa de Pós-Graduação em Ecologia de Biomas Tropicais, Campus Morro do Cruzeiro, Bauxita, Ouro Preto, 35400-000, Brasil.
65. Instituto de Botânica de São Paulo, Núcleo de Pesquisas Curadoria do Herbário, Avenida Miguel Stefano, São Paulo, SP, 04301-902, Brasil.
66. Instituto Federal do Rio Grande do Sul (IFRS), Rodovia RS 135, Km 25, Distrito Engenheiro Luiz Englert, Sertão, RS, Caixa Postal 21, 99170-000, Brasil.
67. Universidade Federal do Rio Grande do Sul (UFRGS), Instituto de Biociências, Departamento de Botânica, Av. Bento Gonçalves, 9500 pr 43433, Porto Alegre, Brasil. 91501-970
68. Universidade Paulista (UNIP), Conselho Superior de Ensino, Pesquisa e Extensão. Avenida Paulista, 900, 1º.Andar - Herbário UNIP - Núcleo de Pesquisa em Biodiversidade - Bela Vista, 01310100 - São Paulo, SP - Brasil.
69. Laboratorio de Planificación Territorial, Departamento de Ciencias Ambientales, Facultad de Recursos Naturales, Universidad Católica de Temuco, Rudecindo Ortega, 02950, Temuco, 4813302, Chile.
70. Universidade Federal de Santa Catarina (UFSC), Departamento de Ecologia e Zoologia - ECZ. AC/Cidade Universitária. Trindade. CEP. 88.040-970. Florianópolis, SC, Brasil.
71. Universidade Federal de Pernambuco (UFPE), Av. Prof. Moraes Rego, 1235 - Cidade Universitária, Recife, 50670-901, Brasil.

72. Instituto de Pesquisa Ambiental da Amazônia (INPA), Rua Horizontalina, 104, Centro, Canarana, MT, 74680-000 Brasil.
73. Woods Hole Research Center, 149, Woods Hole Road, Falmouth, Massachusetts, 02540-1644, United States.
74. Embrapa Cerrados / Centro de Pesquisa Agropecuária dos Cerrados, BR-020, Km 18, Brasília, DF, 73310-970, Brasil.
75. Centro Federal de Educação Tecnológica Celso Suckow da Fonseca (CEFET-RJ), Rua Voluntários da Pátria, 30, Bairro Belo Horizonte, Valença, RJ, 27600-000, Brasil.
76. Universidade do Oeste de Santa Catarina (UNOESC), Campus de São Miguel do Oeste, Rua Oiapoc, 211, Bairro Agostini São Miguel do Oeste, Santa Catarina, 89900-000, Brasil.
77. Universidad de la República, Facultad de Ciencias, Iguá y Mataojo, Montevideo, 11400, Uruguay.
78. Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP), Departamento de Biologia, Faculdade de Ciências Agrárias e Veterinárias, Via de Acesso Prof. Paulo Donato Castelane, S/N, Jaboticabal, SP, 14884-900, Brasil.
79. Instituto Federal do Espírito Santo (IFES), Rod. ES-080, Km 93, São João de Petrópolis, Santa Teresa, ES, 29660-000, Brasil.
80. Universidade Federal de Lavras (UFLA), Programa de Pós-Graduação em Engenharia Florestal, Caixa Postal 3037, Lavras, MG, 37200000, Brasil.
81. Universidade Federal de Santa Catarina (UFSC), Departamento de Microbiologia, Imunologia e Parasitologia, Campus Universitário, s/n, Sala 05, MIP - Córrego Grande, Florianópolis, Santa Catarina, 88040-900, Brasil
82. União das Instituições de Serviços, Ensino e Pesquisa Ltda (UNISEP), Faculdades Integradas do Vale do Ribeira, Laboratório de Biologia, Rua Oscar Yoshiaki Magário, 185, Jardim das Palmeiras, Registro, SP, 11900-000, Brasil.
83. Universidade Federal da Grande Dourados (UFGD), Faculdade de Ciências Biológicas e Ambientais - Rua João Rosa Góes, 1761, Dourados, Mato Grosso do Sul, 79835-070, Brasil.
84. Reserva Natural Vale. Rodovia Brasil 101 Norte, Interior, Linhares, ES, 29900-970, Brasil.
85. Instituto Florestal do Estado de São Paulo, Divisão de Florestas e Estações Experimentais, Seção de Bauru, Av. Rodrigues Alves, 38-25, Horto Florestal, Bauru, SP, 17030-000, Brasil.
86. Universidade Estadual de Feira de Santana (UEFS), Departamento de Ciências Biológicas, Avenida Transnordestina s.n., Feira de Santana, Bahia, 44036-900, Brasil.
87. Museo Argentino de Ciencias Naturales Bernardino Rivadavia, División Plantas Vasculares, CONICET, Avenida Ángel Gallardo, 470, Buenos Aires, Argentina.
88. Universidade Regional Integrada do Alto Uruguai e das Missões (URI), Ciências Biológicas, Erechim, RS, 99700-000, Brasil.
89. Instituto Tecnológico Vale, Biodiversidade e Serviços Ecológicos, Rua Boaventura da

Silva, 955, Belém, PA, 66055-090, Brasil.

90. Universidade Federal do Espírito Santo (UFES), Programa de Pós-Graduação em Ciências Florestais, Avenida Governador Lindemberg, 316, Centro, Jerônimo Monteiro, Espírito Santo, 29550-000 Brasil.

Introduction

Biodiversity studies tropical plant communities mainly focus on trees (*e.g.*, Gentry 1988; Oliveira and Daly 1999; Pitman et al. 2001, 2002; Condit et al. 2002; ter Steege et al. 2003; Oliveira-Filho et al. 2005; Eisenlohr et al. 2013) and many other life forms - such as lianas, herbs, shrubs and epiphytes - are frequently ignored or undervalued. However, they are responsible for high levels of species richness and endemism of these ecosystems (Gentry and Dodson 1987a, b; Nieder et al. 1999).

Epiphytic plants provide ecological services related to hydrology and nutrient cycling (Jarvis 2000; Brujinzeel et al. 2011; Stanton et al. 2014) and contribute to diversity through their interactions with other biota (Benzing 1990; Yanoviak et al. 2007). Several invertebrate and vertebrate species use epiphytes as habitat or resource (Lasky and Keitt 2012; Angelini and Silliman 2014; Scheffers et al. 2014). Epiphytes can provide shelter and nesting materials for some insect and bird species, and also are important food sources for several foraging animals (Pike 1978; Coxson and Nadkarni 1995; Knops et al. 1996; Stuntz et al. 2002). Established in forest canopies, epiphytes get most of their nutrients from atmospheric sources and leaf litter (Gotsch et al. 2016; Zotz 2016) and thus are particularly sensitive to environmental changes. The best understanding of commensal interactions between epiphytic organisms and host trees, called phorophytes, are also very important. Epiphyte organisms depend on the structures of trees (trunk and branches) for their establishment, mainly for support (Callaway et al. 2002). Host tree traits can influence the establishment of the epiphytic organisms, such as the diameter, morphology and chemical composition of the bark, the structure and architectural patterns of the crown, the tree height, etc. (Wagner et al. 2015).

The classification of plants into epiphytic life-forms is controversial and different recommendations have been made (Benzing 1987, 1990; Batke et al. 2016, Flores-Palacios 2016). Zotz (2016) defines epiphytes as organisms that germinate and root non-parasitically on other plants without contact with the soil, at least in part of their life cycle. Additionally, Zotz (2013, 2016) accepts only the holo- and primary hemiepiphytes as epiphytes. Herein, we use the epiphyte definition according to Zotz (2013, 2016) but also include non-vascular holoepiphyte plants, as well as epiphytic Lichens.

Most of the data from epiphyte occurrence are in secondary (gray) literature, such as unpublished theses, herbarium vouchers or even from raw datasets. Even some of the published data are difficult to access as they are available in journals without indexation. Whereas many

ecological and conservation studies require large quantities of data, organizing the data of epiphytes from the Atlantic Forest, which is scattered in the literature, will stimulate the research of epiphyte ecology and plant biogeography of the Atlantic Forest as a whole. Biogeographic studies of epiphytes, for example, are mostly restricted to some classic papers (Johansson 1974; Gentry and Dodson 1987; ter Steege and Cornelissen 1989; Kreft et al. 2004; Küper et al. 2004). Only recently, epiphyte biogeography in the Atlantic Forest, one of the centers of the epiphyte diversity in the Neotropics (Gentry and Dodson 1987b; Kersten 2010), received more attention (Kersten 2010, Fontoura et al. 2012; Leitman et al. 2015; Menini Neto et al. 2016). Additionally, in their analysis of endemism patterns among vascular epiphytes in the Atlantic Forest, Freitas et al. (2016) discussed that epiphytes had a relative recent radiation (Pliocene) and higher endemism than overall vascular flora.

The Atlantic Forest domain is considered one of the most endangered ecosystems in the world (Morellato and Haddad 2000, Myers et al. 2000; Mittermeier et al. 2004) and one of the main centers of plant diversity in the Neotropics (Gentry 1982; Gentry and Dodson 1987b; Stehmann et al. 2009). About 94% of its area is situated in eastern Brazil, along the Atlantic coast, but it also spans parts of Argentina and Paraguay (Ribeiro et al. 2009; Stehmann et al. 2009). Originally, the Atlantic Forest covered around 150 million hectares, however, less than 16% of its original vegetation remains nowadays, most of the remnant patches (~80%) are <50 ha in size and the mean distance between them is 1.4 km (Ribeiro et al. 2009).

Here, we compiled a dataset composed of 89,270 holo/hemiepiphyte records (78,234 of occurrence data and 11,036 of abundance data) in the Atlantic Forest of Brazil, Argentina, Paraguay, and Uruguay (Figure 1), recorded from 1824 to early 2018. ATLANTIC EPIPHYTES is part of the ATLANTIC SERIES of datapapers, an initiative of Brazilian researchers to compile information of Atlantic Forest biodiversity. Many data collection initiatives were funded by Brazilian funding agencies (CNPq, CAPES, FAPESP, FAPEMIG, FAPERJ, FAPESC, FAPESB, FAEP, CNCFlora, FUNBIO, FUNDECT, PUCPR), as well as by Latin American agencies (ANII, CONICET, CSIC, AGENCIA, UNLP). Some articles of this series have already been published: ATLANTIC FRUGIVORY (Bello et al. 2017), ATLANTIC SMALL MAMMALS (Bovendorp et al. 2017), ATLANTIC CAMTRAPS (Lima et al. 2017), ATLANTIC BIRDS (Hasui et al. 2017), ATLANTIC BATS (Muyllaert et al. 2017), ATLANTIC AMPHIBIANS (Vancine et al. in press) and ATLANTIC MAMMAL TRAITS (Gonçalves et al. 2018). All the primary data sets of this series were published into Ecology repository; however we will maintain the updated version within a Github repository: https://github.com/LEEClab/Atlantic_series/.

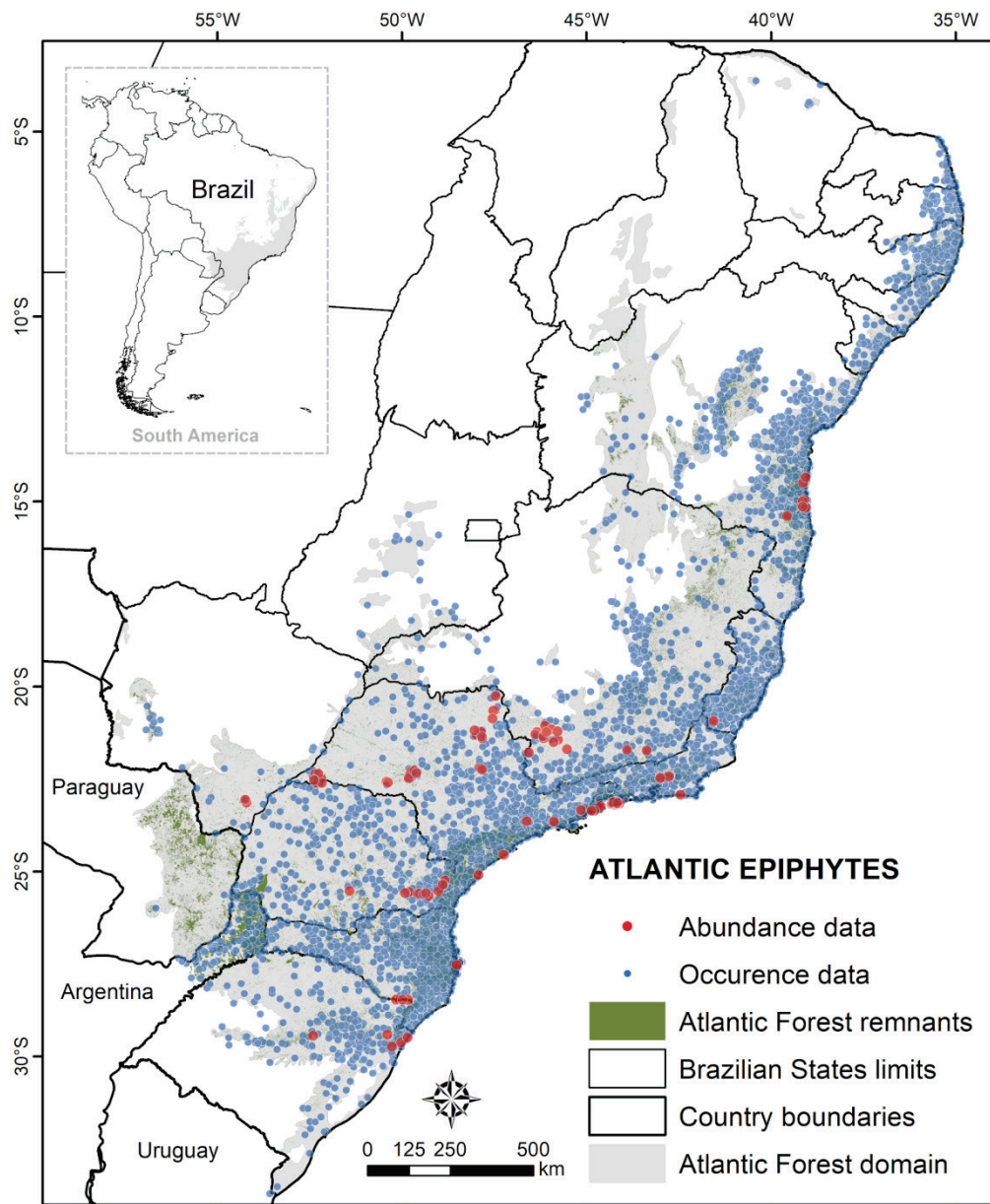


Figure 1. Distribution of holo/hemiepiphyte surveys within the Atlantic Forest domain, with occurrence (blue dots) and abundance data (red dots). Atlantic Forest domain and remnants were defined according to Huang et al. (2007) and Ribeiro et al. (2009).

METADATA

CLASS I. DATA SET DESCRIPTORS

I.A. Data set identity:

Title: ATLANTIC EPIPHYTES: a data set of vascular and non-vascular epiphyte plants and lichens from the Atlantic Forest

I.B. Data set identification code:**Suggested Data Set Identity Codes:**

ATLANTIC_EPIPHYTES_Abundance.csv,

ATLANTIC_EPIPHYTES_Occurrence.csv,

ATLANTIC_EPIPHYTES_References.csv,

I.C. Data set description:**I.C.1. Principal Investigator(s):**

1. Flavio Nunes Ramos

Universidade Federal de Alfenas, Instituto de Ciências da Natureza, Rua Gabriel Monteiro da Silva, 700, Alfenas, MG, 37130-000, Brasil.

2. Sara Ribeiro Mortara

Universidade Federal de Alfenas, Instituto de Ciências da Natureza, Rua Gabriel Monteiro da Silva, 700, Alfenas, MG, 37130-000, Brasil.

3. Nathalia Monalisa-Francisco

Universidade Federal de Alfenas, Instituto de Ciências da Natureza, Rua Gabriel Monteiro da Silva, 700, Alfenas, MG, 37130-000, Brasil.

4. João Pedro Elias Costa

Universidade Federal de Alfenas, Instituto de Ciências da Natureza, Rua Gabriel Monteiro da Silva, 700, Alfenas, MG, 37130-000, Brasil.

5. Luiz Menini Neto

Universidade Federal de Juiz de Fora, Departamento de Botânica, Rua José Lourenço Kelmer, S/n - Martelos, Juiz de Fora, MG, 36036-330, Brasil.

6. Leandro Freitas

Jardim Botânico do Rio de Janeiro, Instituto de Pesquisa Jardim Botânico do Rio de Janeiro, Unidade de Botânica Sistemática, Rua Pacheco Leão - até 914/915 - Jardim Botânico, Rio de Janeiro, RJ, 22460-030, Brasil.

7. Rodrigo de Andrade Kersten

Pontifícia Universidade Católica do Paraná, Rua Imaculada Conceição 1155, CEP 80215-901, Curitiba Paraná, Brasil.

8. André Márcio Amorim

Universidade Estadual de Santa Cruz, Departamento de Ciências Biológicas, Rodovia Jorge Amado, Km 16, s/n, Ilhéus, Bahia, 45662-900, Brasil.

9. Fernando Bittencourt de Matos

Universidade Federal do Paraná (UFPR), Departamento de Botânica, Centro Politécnico, Caixa Postal 19031, Jardim das Américas, Curitiba, PR, 81531-980, Brasil.

10. André Felipe Nunes-Freitas

Universidade Federal Rural do Rio de Janeiro, Instituto de Florestas, Rodovia BR-465, Km 07, Seropédica, Rio de Janeiro, 23897-000, Brasil.

11. Milton Cezar Ribeiro

Universidade Estadual Paulista (UNESP), Instituto de Biociências, Departamento de Ecologia, CP. 199, 13506-900 Rio Claro, São Paulo, Brasil.

I.C.2. Abstract:

Epiphytes are hyper-diverse and one of the frequently undervalued life forms in plant surveys and biodiversity inventories. Epiphytes of the Atlantic Forest, one of the most endangered ecosystems in the world, have high endemism and radiated recently in the Pliocene. We aimed to (1) compile an extensive Atlantic Forest data set on vascular, non-vascular plants (including hemiepiphytes), and Lichen epiphyte species occurrence and abundance; (2) describe the epiphyte distribution in the Atlantic Forest, in order to indicate future sampling efforts. Our work presents the first epiphyte data set with information on abundance and occurrence of epiphyte phorophyte species. All data compiled here comes from three main sources provided by the authors: published sources (comprising peer-reviewed articles, books, and theses), unpublished data, and herbarium data. We compiled a data set composed of 2,095 species, from 89,270 holo/hemiepiphytes records, in the Atlantic Forest of Brazil, Argentina, Paraguay and Uruguay, recorded from 1824 to early 2018. Most of the records were from qualitative data (occurrence only, 88%), well distributed throughout the Atlantic Forest. For quantitative records, the most common sampling method was individual trees (71%), followed by plot sampling (19%), and transect sampling (10%). Angiosperms (81%) were the most frequently registered group, and Bromeliaceae and Orchidaceae were the families with the greatest number of records (27,272 and 21,945, respectively). Ferns and Lycophytes presented fewer records than Angiosperms, and Polypodiaceae were the most recorded family, and more concentrated in the Southern and Southeastern regions. Data on non-vascular plants and Lichens were scarce, with a few disjunct records concentrated in the Northeastern region of the Atlantic Forest. For all non-vascular plant

records, Lejeuneaceae, a family of liverworts, was the most recorded family. We hope that our effort to organize scattered epiphyte data help advance the knowledge of epiphyte ecology, as well as our understanding of macroecological and biogeographical patterns in the Atlantic Forest. No copyright restrictions are associated with the data set. Please cite this Ecology Data Paper if the data are used in publication and teaching events.

I.D. Keywords: abundance, Atlantic Forest, biodiversity data set, biodiversity hotspot, epiphyte, phorophyte, presence/absence, tropical forest

I.E. Description:

Published data comes from 203 references, being mostly from peer-reviewed articles (65%), followed by theses and dissertations (29%), books (3%) and unpublished data (3%). The data set covers the main vegetation types found in the Atlantic Forest of tropical and subtropical Brazil, Paraguay, Argentina, and Uruguay (Ribeiro et al. 2009) and combines 89,270 independent valid records of epiphyte species from 75 data files (Figure 1). In total, our data set contains 2,095 epiphyte species belonging to three main groups: (1) Angiosperms (1,691) with the higher number of records and species, (2) Ferns and Lycophytes (179 and 8, respectively), (3) Non-vascular plants (Mosses and Liverworts with 73 each), and Lichens (80, Table 1). Although non-vascular plants, and Lichens are much less frequent than Ferns and Lycophytes in our data base, richness of the two groups is very similar. Within the Atlantic Forest domain, most of the records were in Ombrophilous Forest (60.1%), followed by Seasonal Forest (24.9%), Savanna enclaves (7.6%) and others (7.4%; Figure 2).

Table 1: Percentage of epiphyte records, percentage of species richness, percentage of family richness and percentage of genus richness in each group: Angiosperms, Ferns and Lycophytes (vascular plants), Liverworts and Mosses (non-vascular plants), and Lichens. Total number of records in each category are in parentheses.

Group	Records	Species richness	Family richness	Genus richness
Angiosperms	81.42 (72,681)	80.7 (1,691)	26.6 (21)	55.0 (180)
Ferns	17.65 (15,756)	8.5 (179)	13.9 (11)	12.2 (40)
Lycophytes	0.38 (338)	0.4 (8)	2.5 (2)	1.8 (6)
Liverworts	0.23 (203)	3.5 (73)	22.8 (18)	10.4 (34)
Mosses	0.20 (176)	3.5 (73)	8.9 (7)	9.2 (30)
Lichens	0.12 (116)	3.4 (71)	25.3 (20)	11.4 (37)

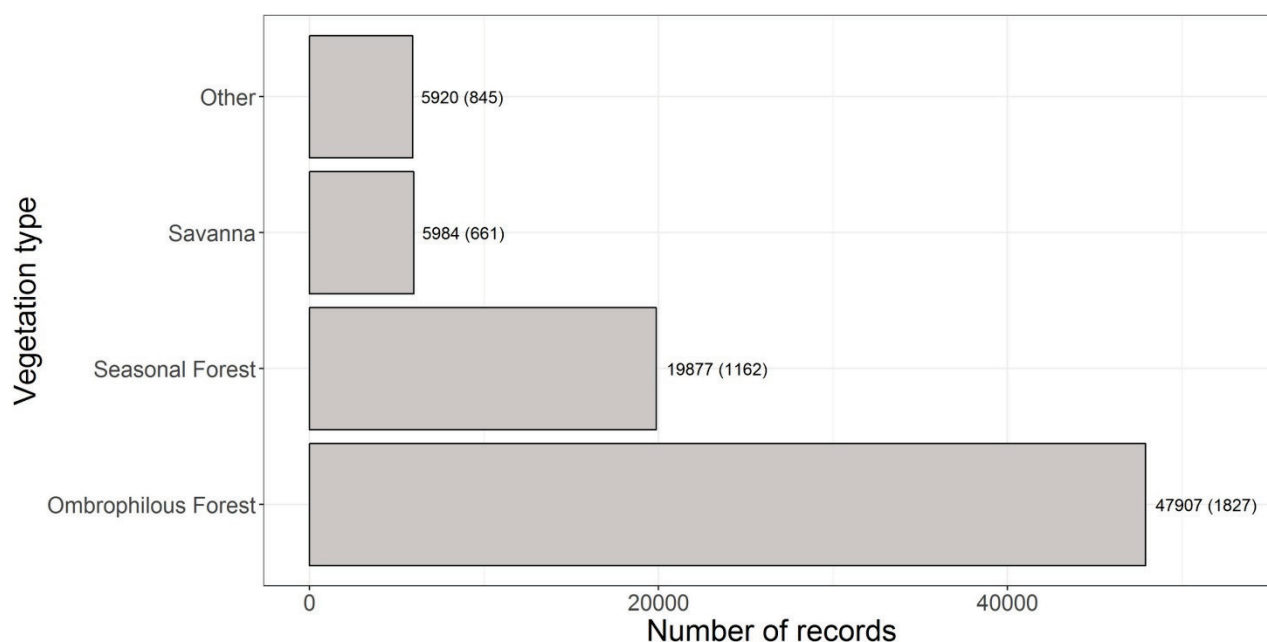


Figure 2: Number of epiphyte records (and number of species) from each vegetation type: Ombrophilous Forests = high temperature (mean 25°C) and high precipitation levels well distributed throughout the year (0 to 60 dry days); Seasonal Forests = four to six dry months or with three months under 15°C. Savanna = Savanna enclaves within the Atlantic Forest; and Other = less representative forest formations, such as pioneer formations and ecological refuges (sensu IBGE 2012). We had 9,582 of the records with no information about vegetation type.

Within Angiosperms, the group with most of the records, the families with the greatest number of records and species were Bromeliaceae (37.6%) and Orchidaceae (30.3%; Figure 3). Records from Bromeliaceae (Figure 4), Orchidaceae (Figure 5), and other Angiosperm families (Figure 6) were widely distributed throughout the Atlantic Forest, from coastal to interior areas. Within Bromeliaceae, the genera *Vriesea* (37%), *Tillandsia* (27.6%) and *Aechmea* (15.2%) were those with the greatest number of records, while those with the greatest number of species were *Vriesea* (25%), *Aechmea* (22.6%) and *Neoregelia* (15%; Figure 7). Within Orchidaceae, *Epidendrum* (10.5%), *Gomesa* (9.4%) and *Acianthera* (9.2%) were the most frequent genera, while the genera with the greatest number of species were *Acianthera* (10%), *Pabstiella* (7.2%) and *Epidendrum* (6.8%; Figure 8). Among the other Angiosperm families, *Peperomia* (Piperaceae, 8.3%), *Rhipsalis* (Cactaceae, 4.8%), and *Nematanthus* (Gesneriaceae, 3.5%) were the most frequent genera, while *Peperomia* (Piperaceae, 3.8%), *Philodendron* (Araceae, 2.5%), *Rhipsalis* (Cactaceae, 2.0%) were those with the greatest number of species (Figure 9).

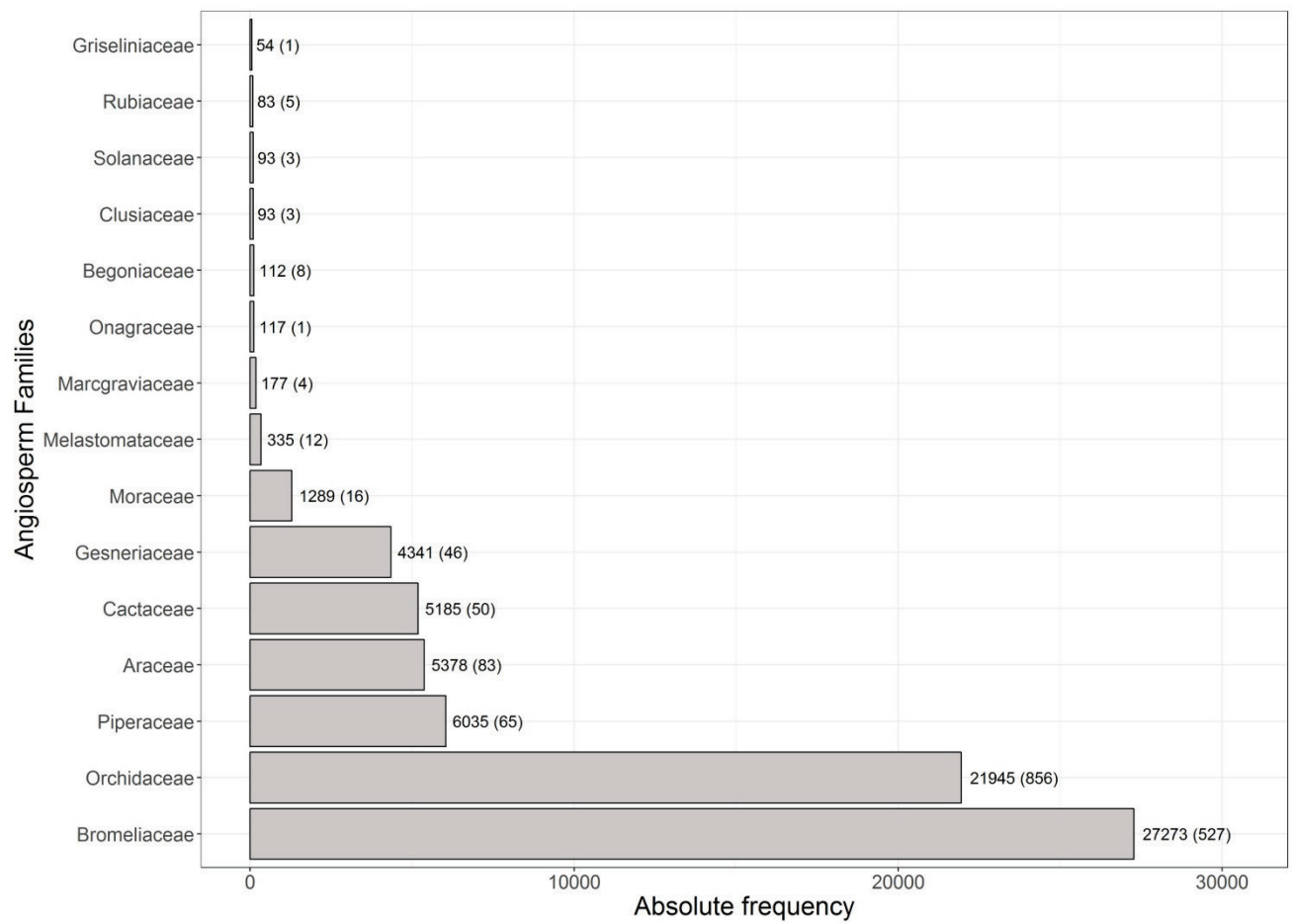


Figure 3: Frequency of records (and number of species) of the 15 Angiosperm families with the greatest number of epiphyte records.

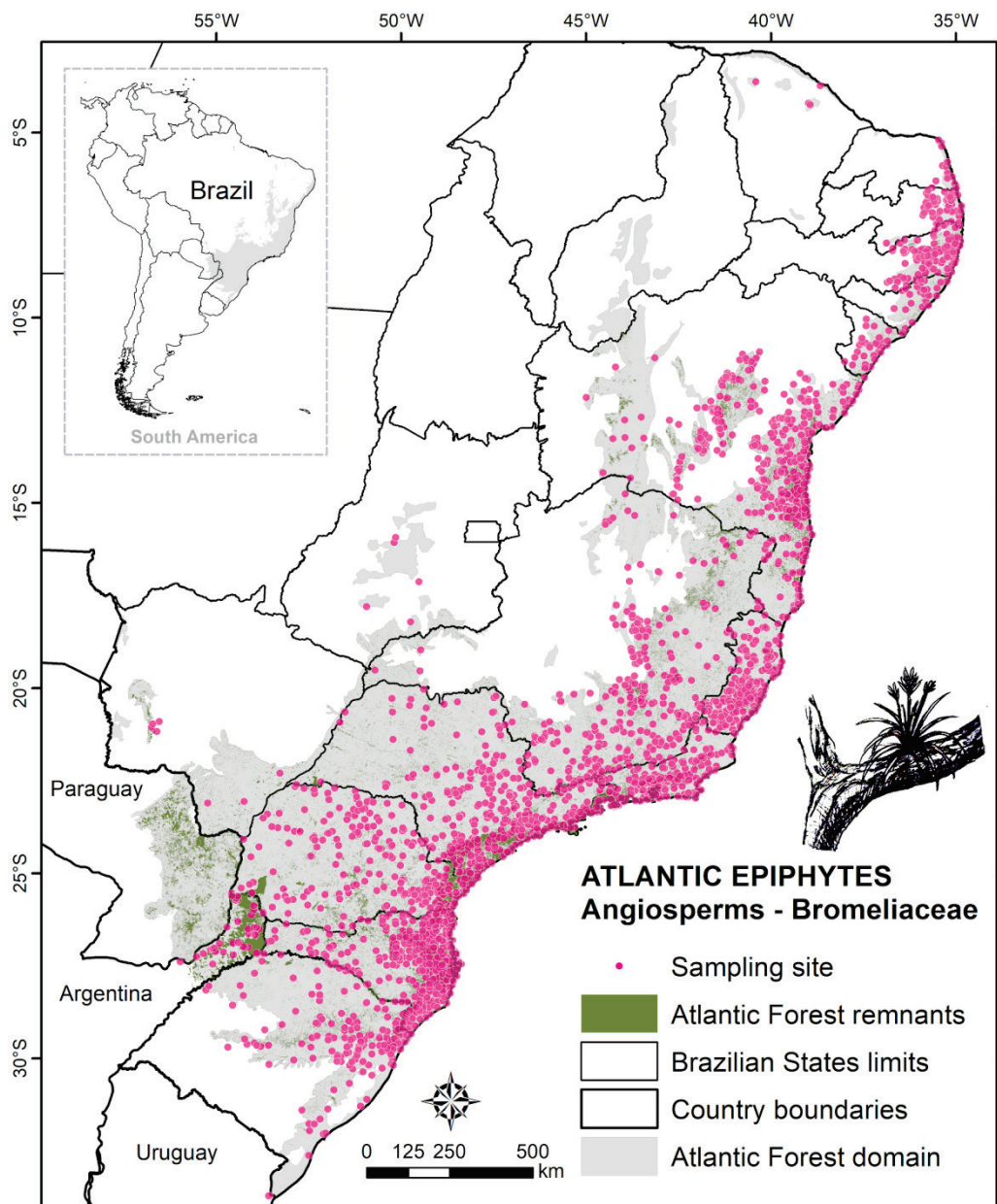


Figure 4: Distribution of epiphyte records from the Bromeliaceae family (Angiosperms) in the Atlantic Forest. Atlantic Forest domain and remnants were defined according to Huang et al. (2007) and Ribeiro et al. (2009).

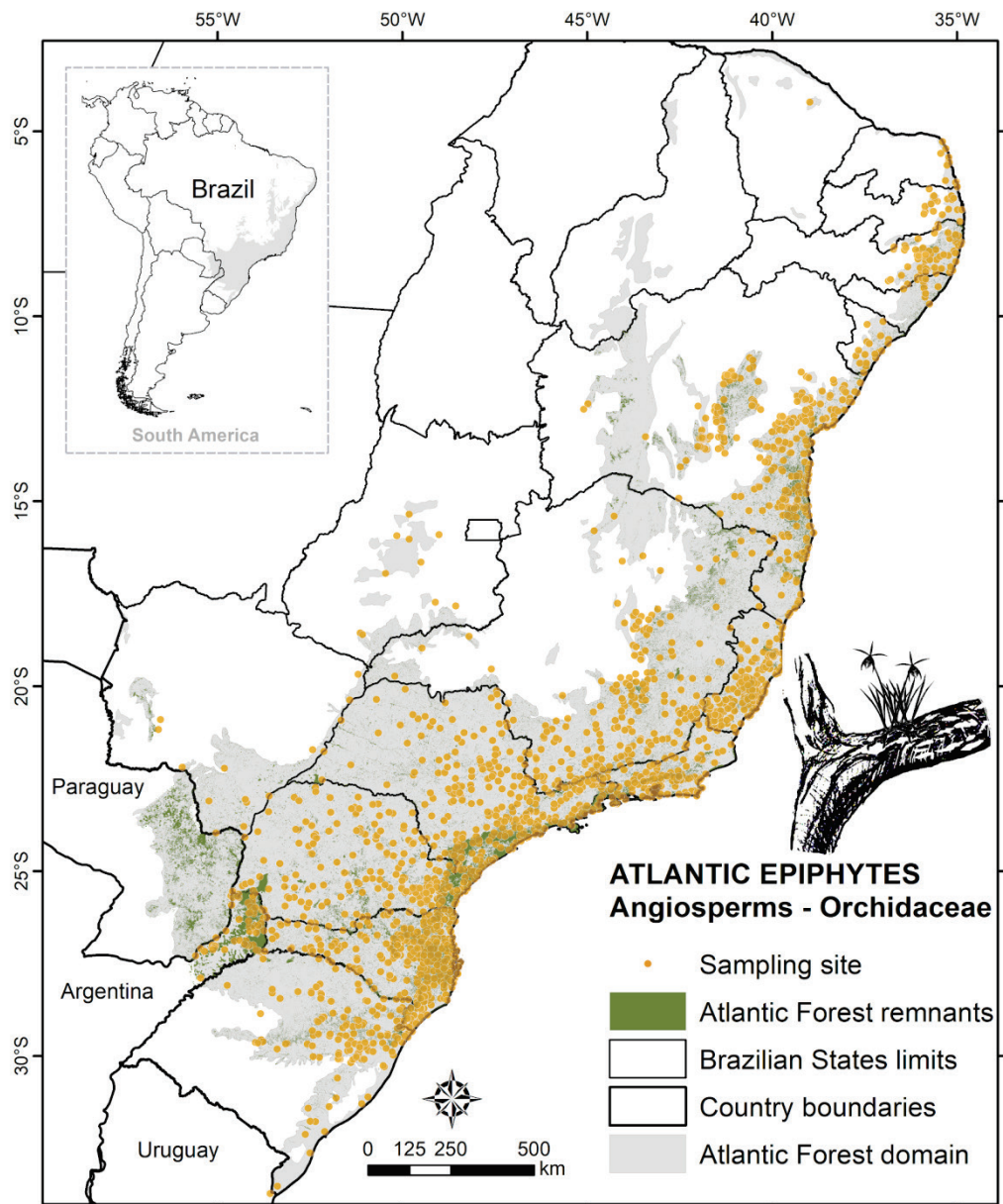


Figure 5: Distribution of epiphyte records from the Orchidaceae family (Angiosperms) in the Atlantic Forest. Atlantic Forest domain and remnants were defined according to Huang et al. (2007) and Ribeiro et al. (2009).

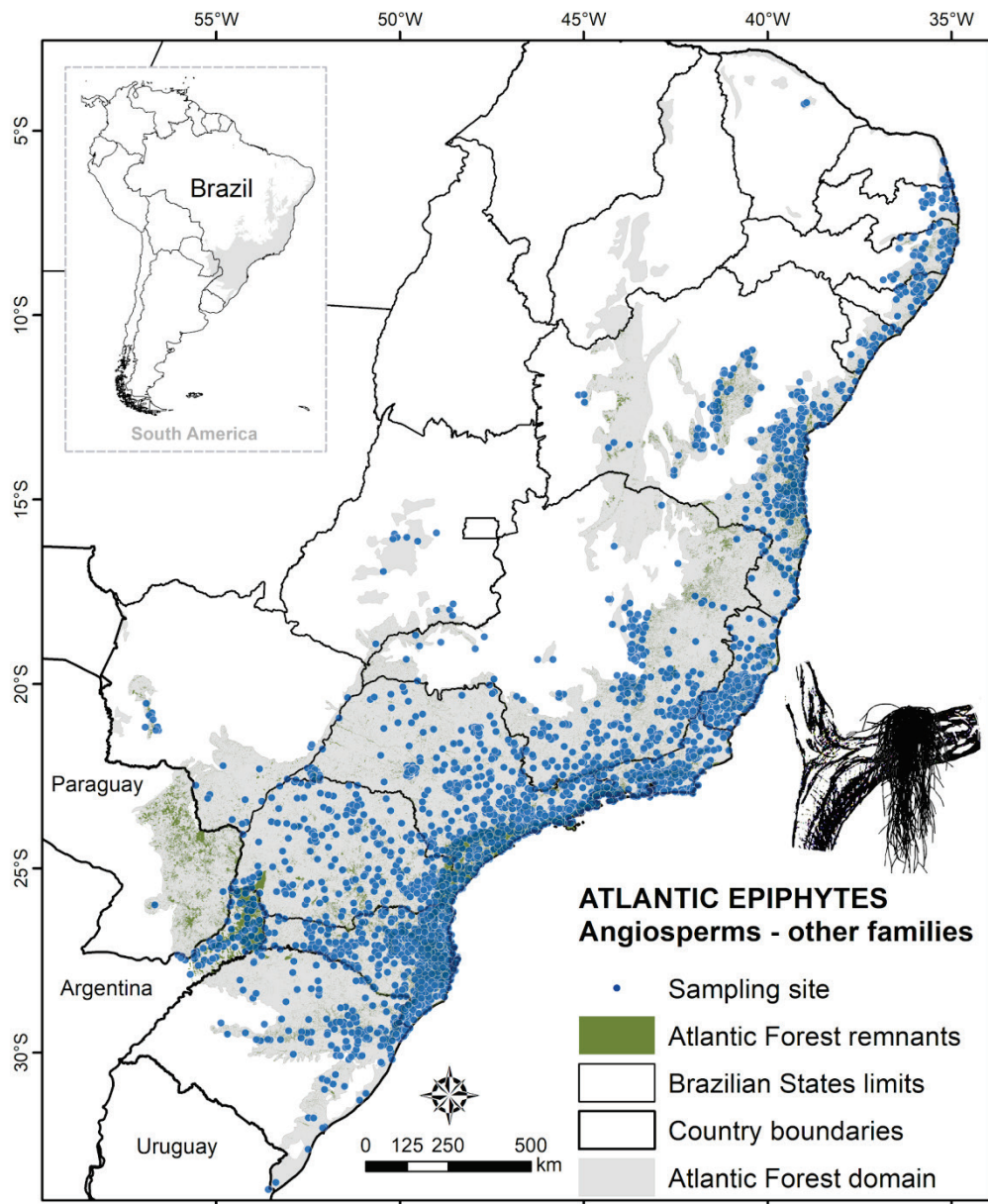


Figure 6: Distribution of epiphyte records from other Angiosperm families (excluding Bromeliaceae and Orchidaceae) in the Atlantic Forest. Atlantic Forest domain and remnants were defined according to Huang et al. (2007) and Ribeiro et al. (2009).

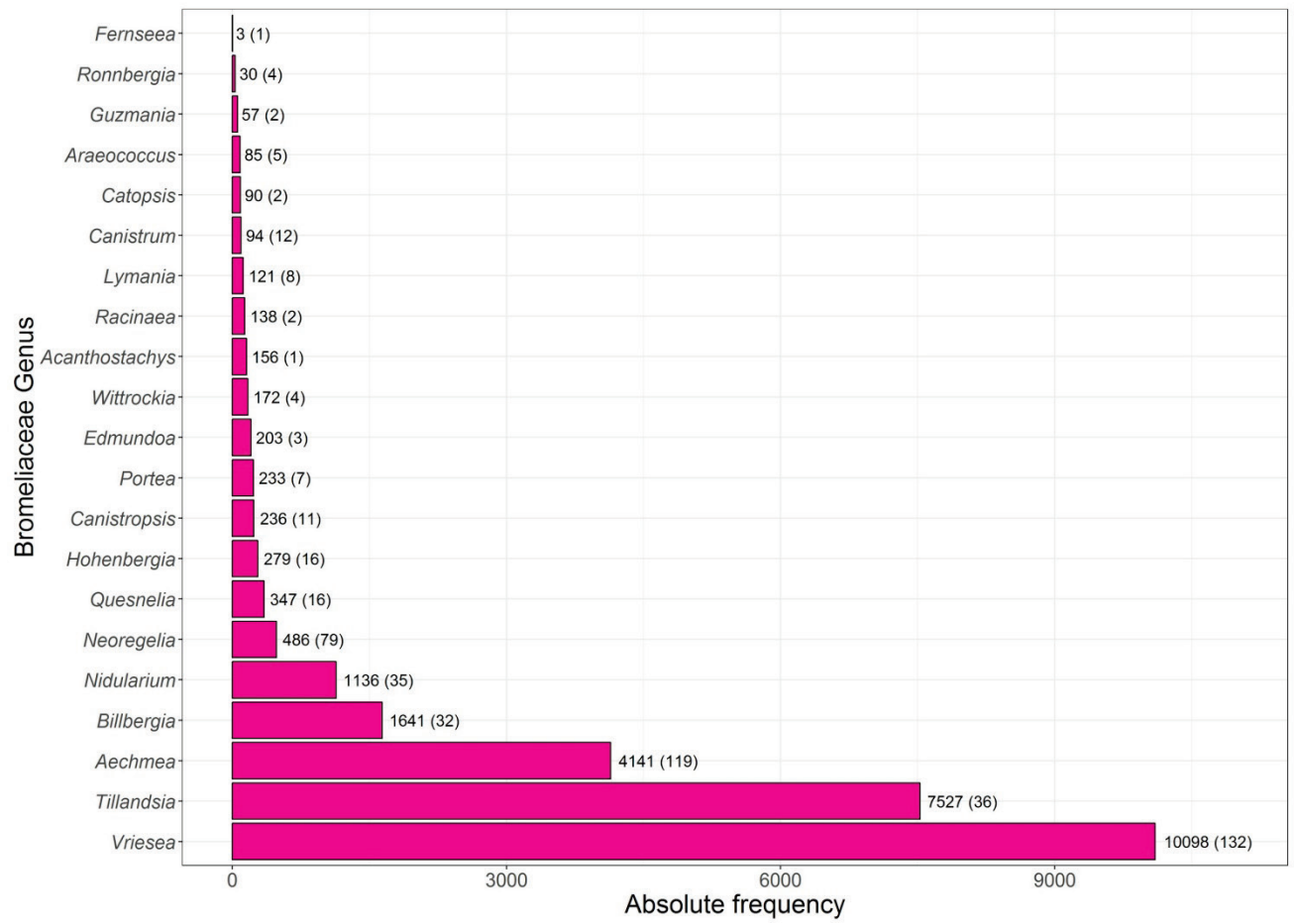


Figure 7: Frequency of records (and number of species) of the 30 Bromeliaceae (Angiosperms) genera with the greatest number of epiphyte records.

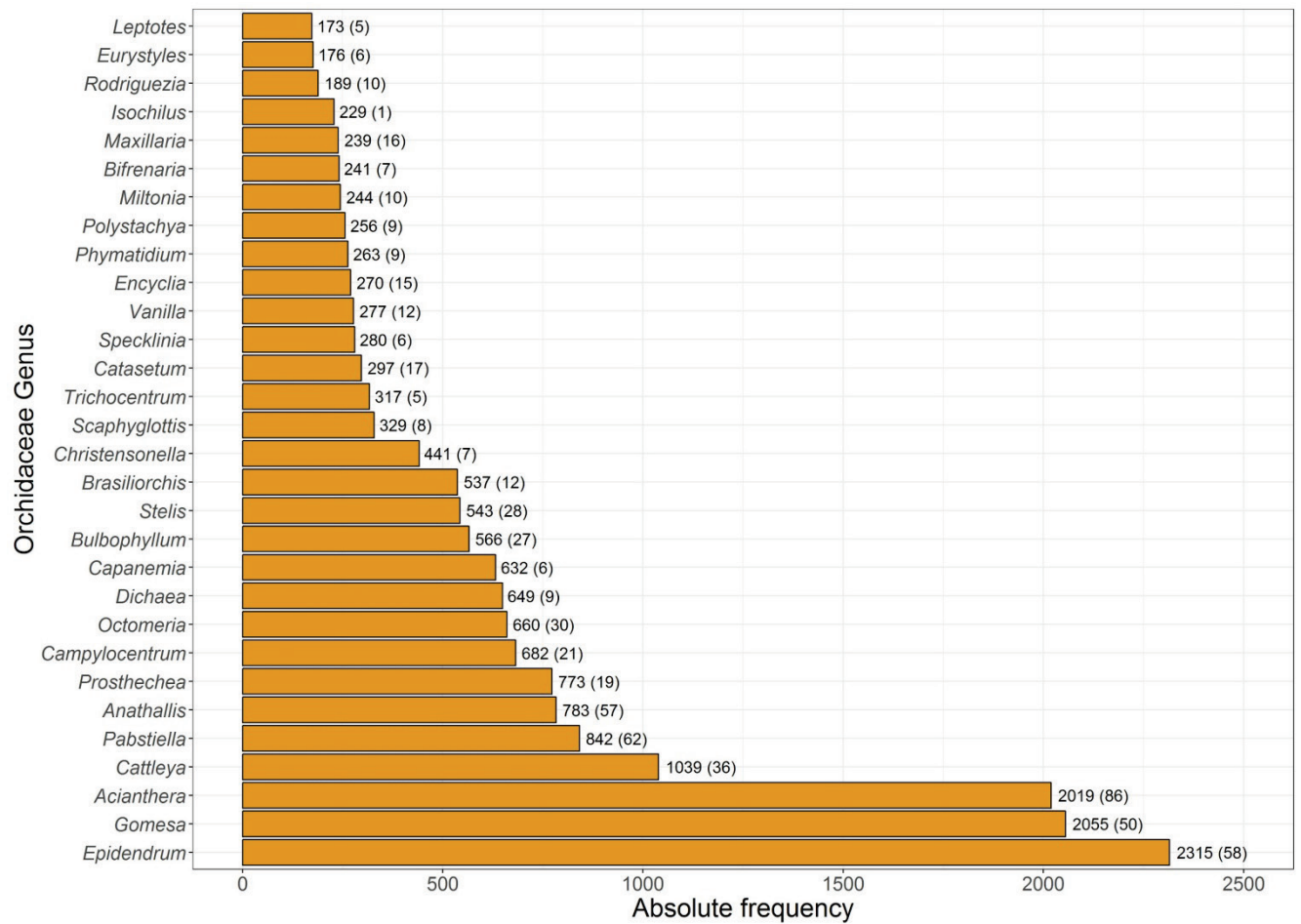


Figure 8: Frequency of records (and number of species) of the 30 Orchidaceae (Angiosperms) genera with the greatest number of epiphyte records.

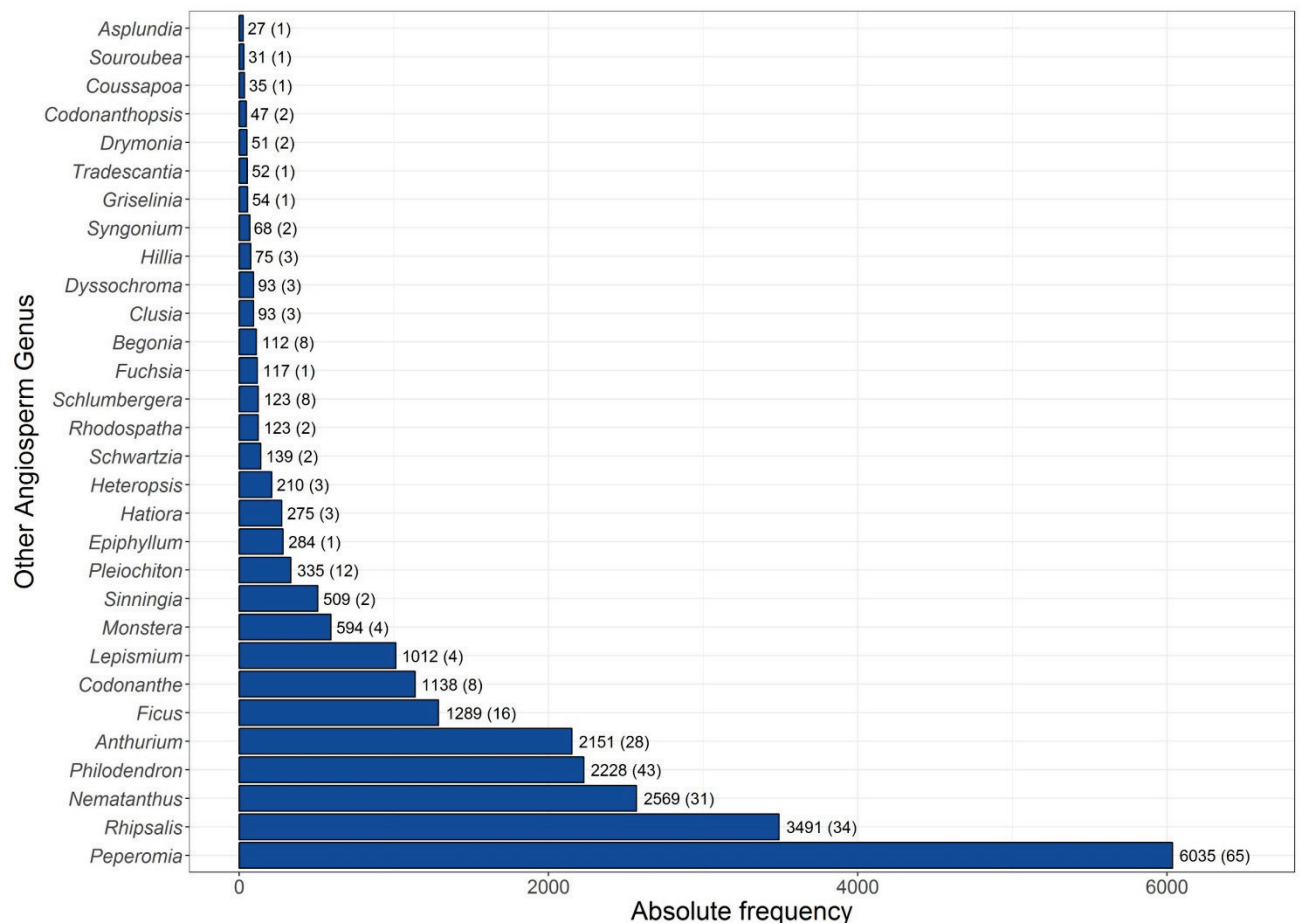


Figure 9: Frequency of records (and number of species) of the 30 genera of other Angiosperm families (i.e., excluding Bromeliaceae and Orchidaceae) with the greatest number of epiphyte records.

Ferns and Lycophytes had fewer records than Angiosperms (Table 1) and were more concentrated in the southern and southeastern regions in Brazil, near the coast. There was also a concentration of sampling sites with presence of species from this group in the Argentinian part of the Atlantic Forest (Figure 10). Polypodiaceae presented most of the records (70.6%) and species (42.2%; Figure 11). Within this fern family, the genera *Pleopeltis* (26%) and *Microgramma* (20%) concentrated most of the records, but *Elaphoglossum* (15%) and *Asplenium* (10.2%) presented greater richness (Figure 12). Among non-vascular plants and Lichens, very few and disjunctive records were included, and they were concentrated in the northeastern Brazilian region (Figure 13). Among these, the Lejeuneaceae (Liverworts) had the highest number of records (27.9%) and species (22.1%) (Figure 14). While genera *Lejeunea* (7.5%) and *Frullania* (6.7%) were those with more records, *Frullania* (4.6%) and *Heterodermia* (4.6%) were those with the greatest number of species (Figure 15).

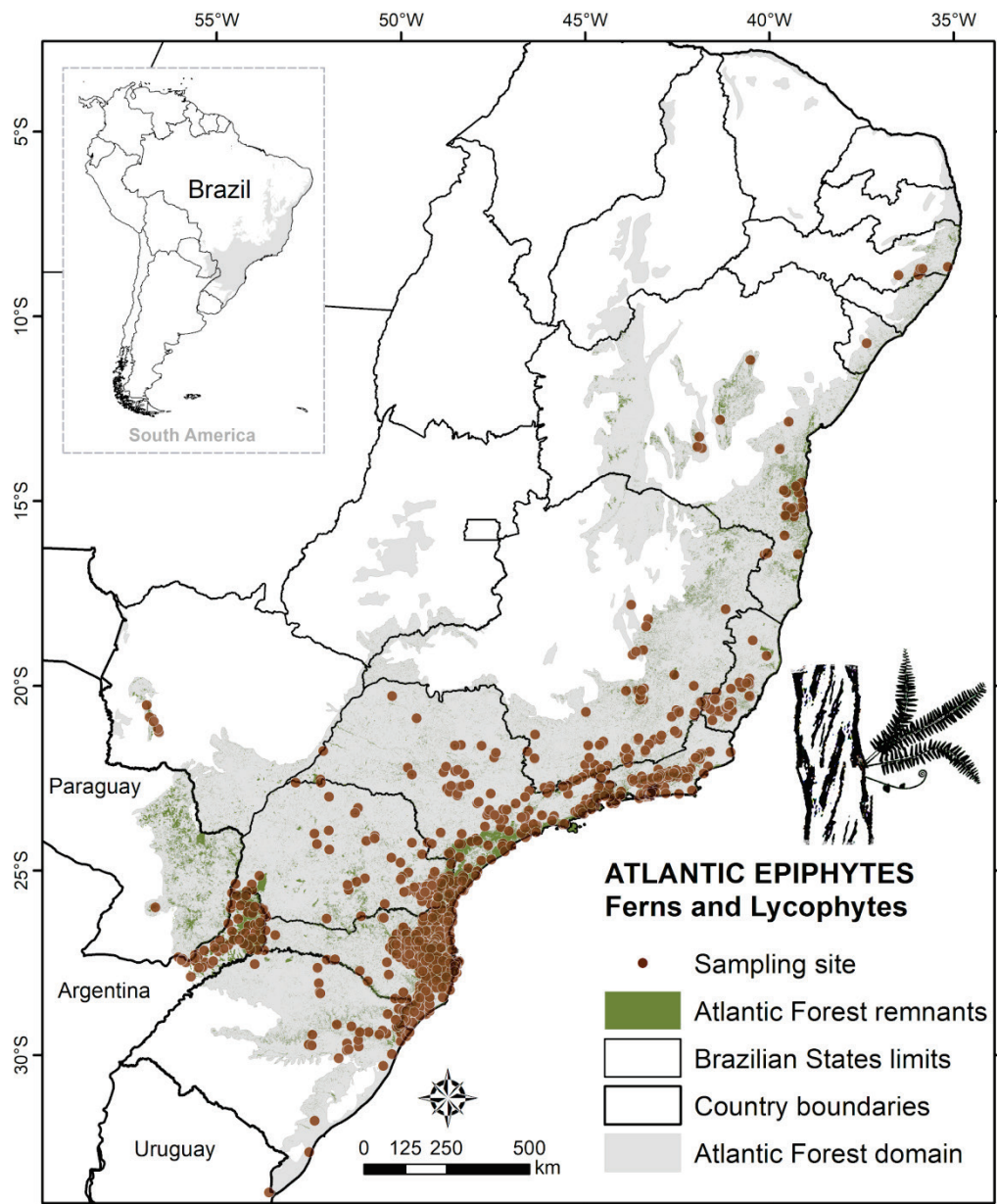


Figure 10: Distribution of epiphyte records of Ferns and Lycophytes in the Atlantic Forest. Atlantic Forest domain and remnants were defined according to Huang et al. (2007) and Ribeiro et al. (2009).

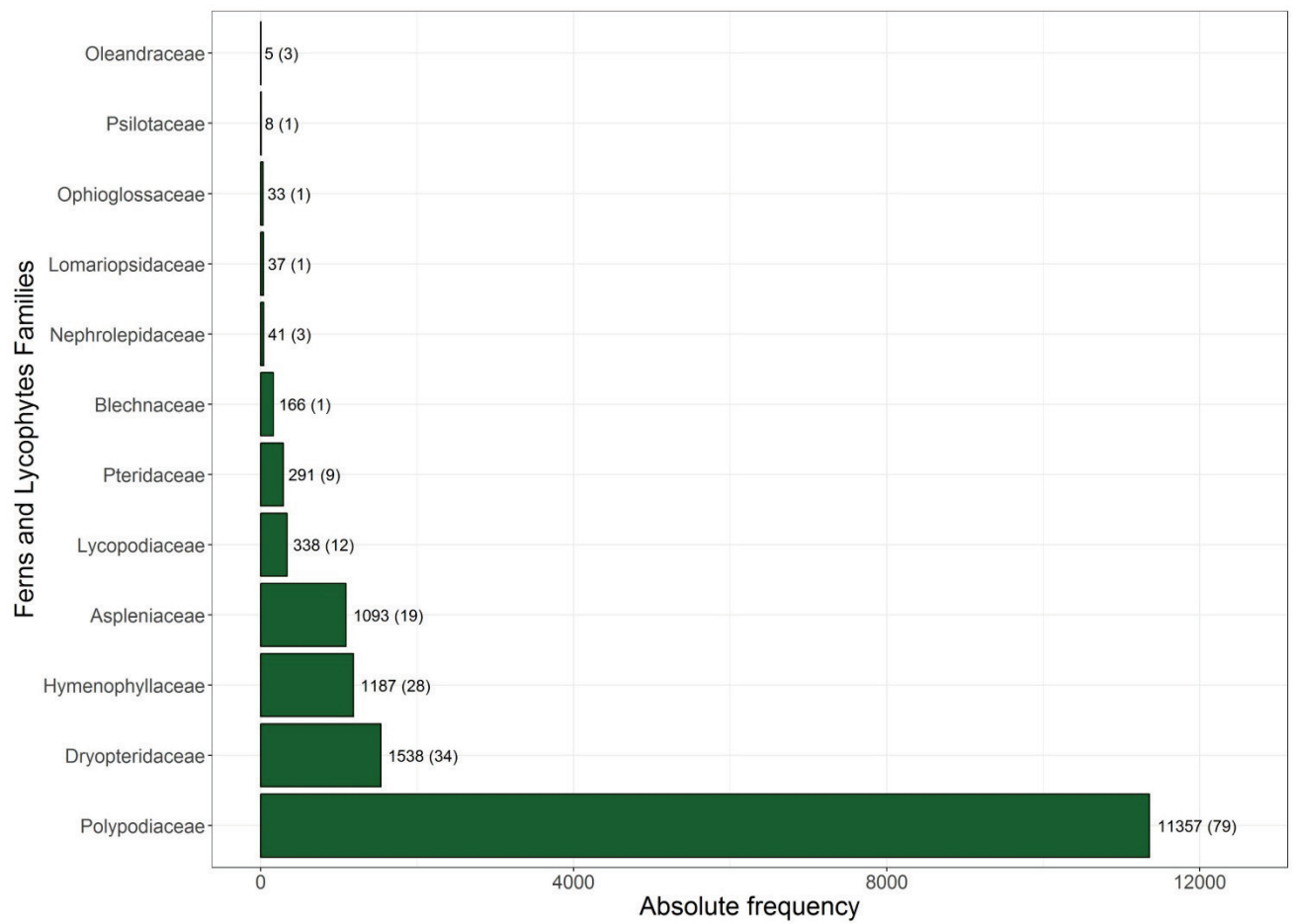


Figure 11: Frequency of records (and number of species) of the 15 Fern and Lycophyte families with the greatest number of epiphyte records.

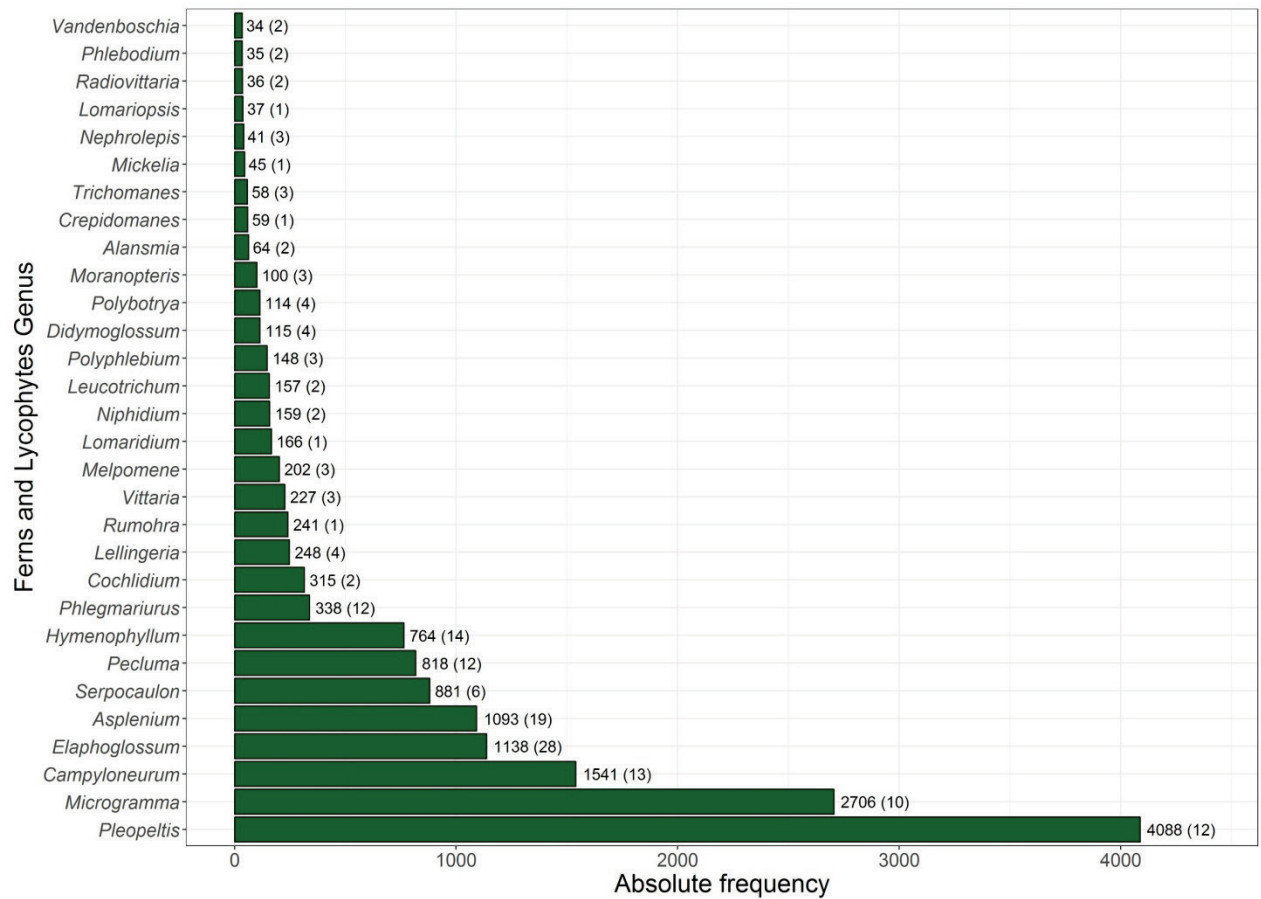


Figure 12: Frequency of records (and number of species) of the 30 Fern and Lycophyte genera with the greatest number of epiphyte records (and species number).

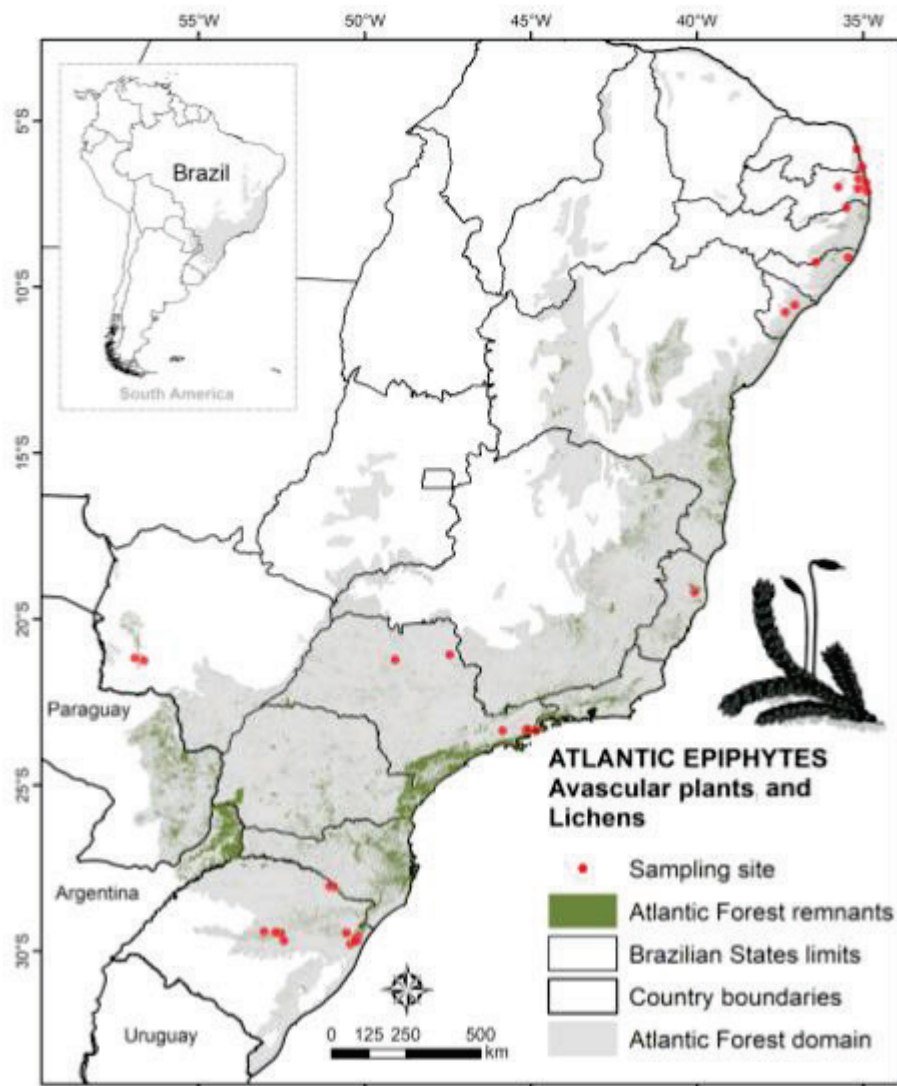


Figure 13: Distribution of epiphyte surveys of non-vascular plants and Lichens in the Atlantic Forest. Atlantic Forest domain and remnants were defined according to Huang et al. (2007) and Ribeiro et al. (2009).

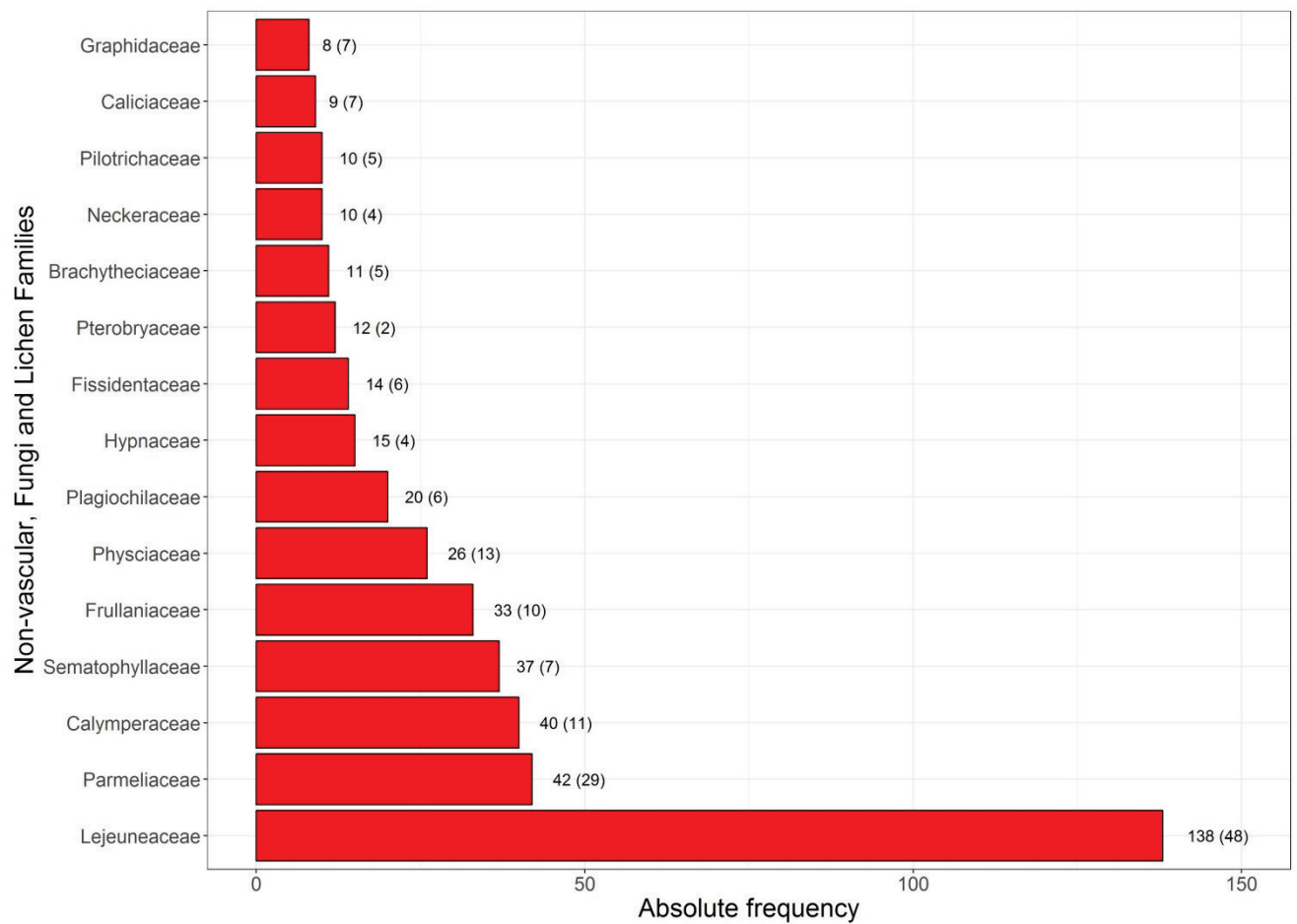


Figure 14: Frequency of records (and number of species) of the 15 non-vascular plants and Lichen families with the greatest number of epiphyte records.

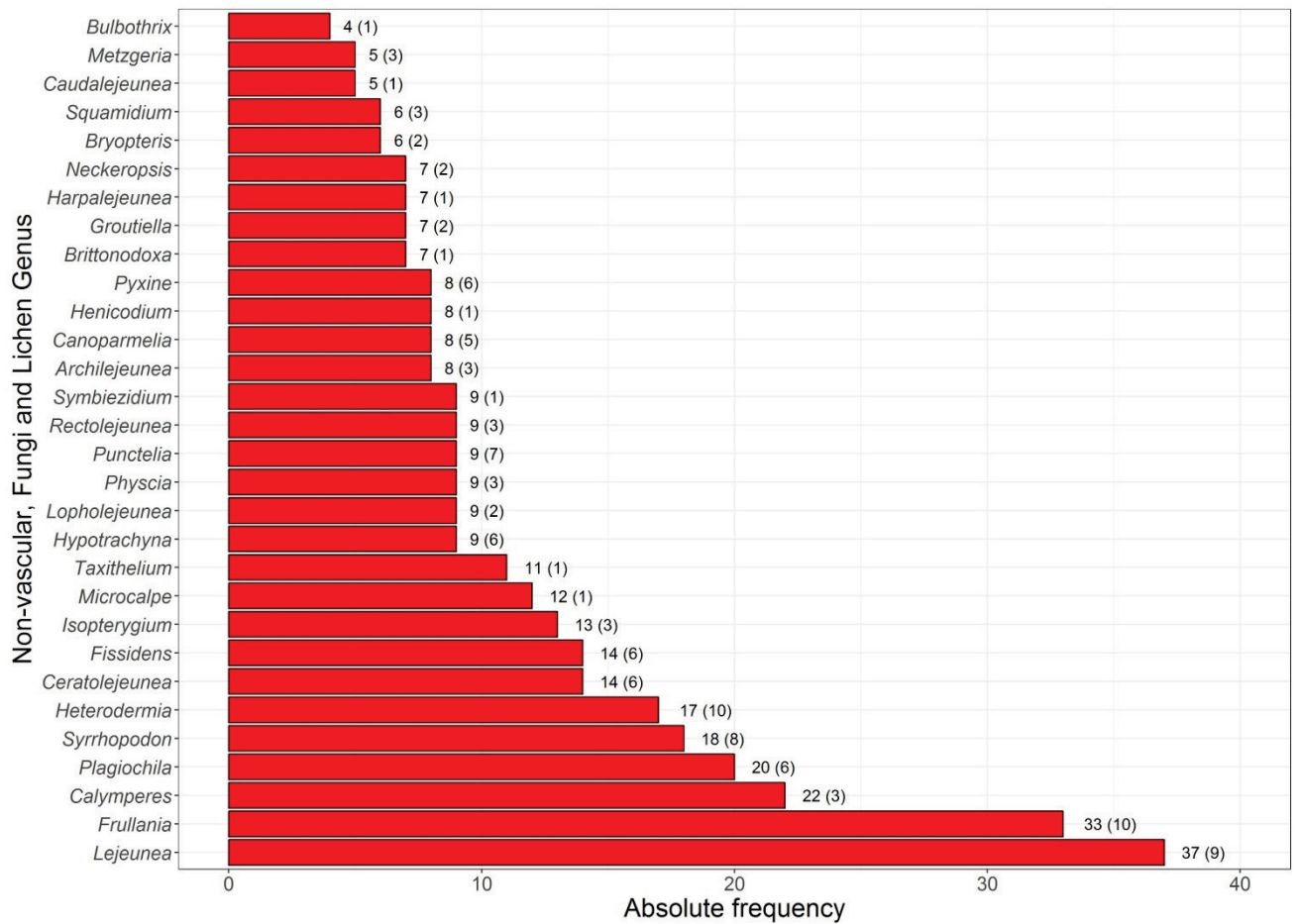


Figure 15: Frequency of records (and number of species) of the 30 non-vascular plants and Lichen genera with the greatest number of epiphyte records.

Epiphyte records can be divided into two main data types: (1) occurrence data, which include presence-only (78%) and presence-absence (10%), and (2) abundance data (12%) (Figure 16). For quantitative studies in which epiphyte abundance was recorded, the most common sample unit was individual trees (64%), followed by plot sampling (24%), and transect sampling (12%). Abundance was quantified by two methods: number of individuals (99% of abundance data) and coverage (1%). All data compiled in our data set came from three main sources: herbarium data, published sources (which comprised peer-reviewed articles, books and theses), and unpublished data (i.e. provided exclusively by the authors). Published data added up to 150 references (see in section II.B.4. Research Methods) being mostly from peer-reviewed articles (71%), followed by theses (24%), and books (5%).

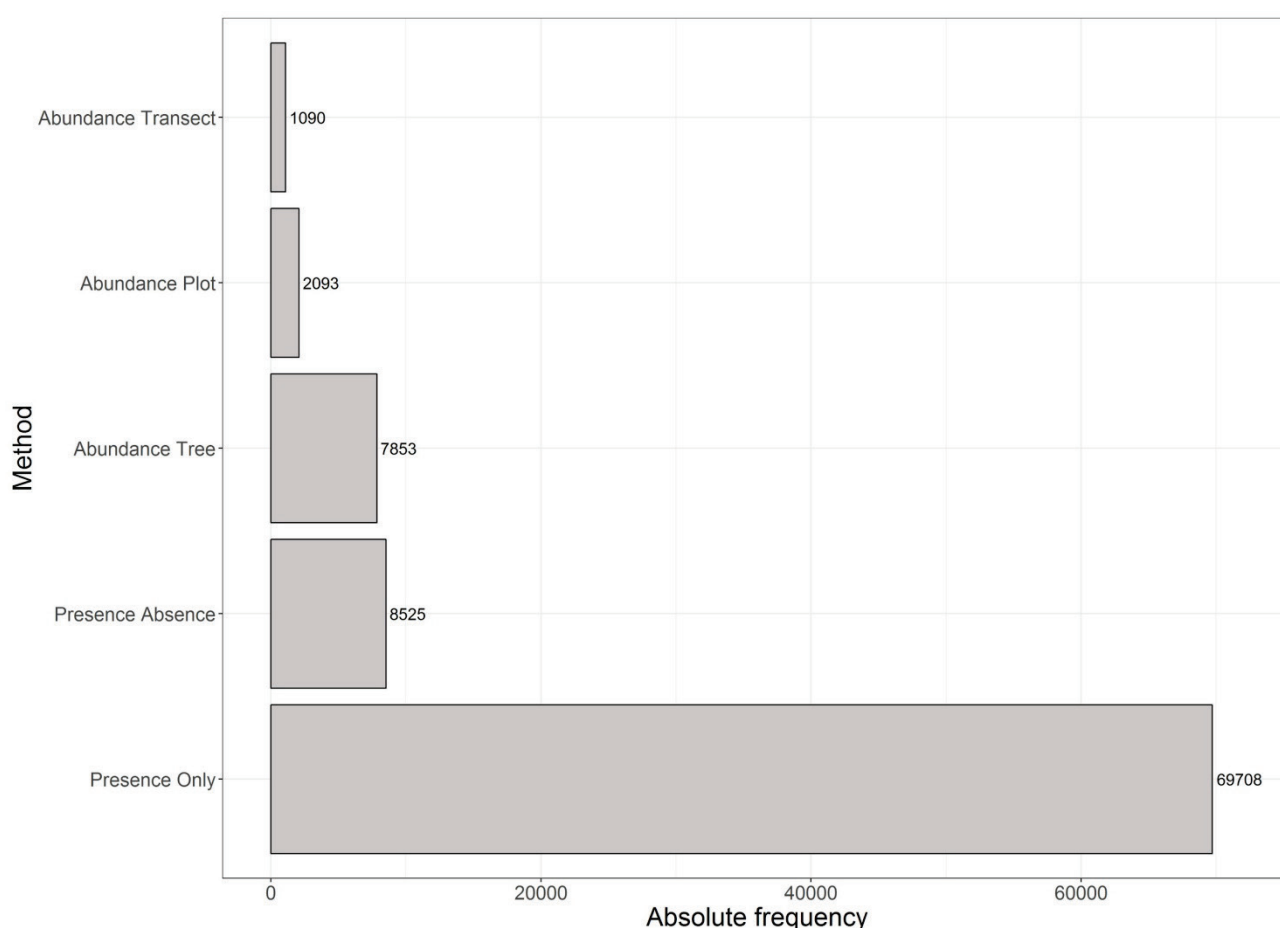


Figure 16: Number of epiphyte records of each data type and sampling method.

Among all 2,095 epiphyte species recorded here, the most frequent in the data set were: *Microgramma squamulosa* (Polypodiaceae, Ferns, 2.1% of the total number of records), *Tillandsia recurvata* (Bromeliaceae, Angiosperms, 2%), *Pleopeltis hirsutissima* (Polypodiaceae, Ferns, 1.7%), and *Tillandsia stricta* (Bromeliaceae, Angiosperms, 1.3%). We had 361 (17%) species with a single record in the data set, with those species being from all groups except Lycophytes. The subset of records in which researchers quantified abundance (12% of the total) encompassed 108,527 individuals of 448 species. Most abundant species in terms of number of individuals were: *Pleopeltis pleopeltidis* (Polypodiaceae, Ferns, 22% of the total number of individuals), *Microgramma squamulosa* (Polypodiaceae, Ferns, 13%), *Campyloneurum austrobrasillianum* (Polypodiaceae, Ferns, 5.5%), *Tillandsia stricta* (Bromeliaceae, Angiosperms, 2.5%), *Pleopeltis hirsutissima* (Polypodiaceae, Ferns, 2.4%) and *Pabstiella varellae* (Orchidaceae, Angiosperms, 2.1%). For the subset of records with abundance data, 35 species had only one individual.

Only 17% of the records (15,686) in our data base contain information on phorophyte identity, counting 410 species. The richest phorophyte families were Myrtaceae (14%), Fabaceae (10%), and Lauraceae (6%), which are amongst the dominant, species-rich families in the Atlantic

Forest (Stehmann et al. 2009). Most frequent phorophyte species were: *Guapira opposita* (Nyctaginaceae, 10.5%), *Podocarpus lambertii* (Podocarpaceae, 7%), *Gymnanthes klotzschiana* (Euphorbiaceae, 4.5%), and *Eugenia nutans* (Myrtaceae, 3.5%).

The oldest record of epiphyte in our dataset is from 1824, a species of Gesneriaceae, *Codonanthe cordifolia*, collected in Rio de Janeiro, RJ, Brazil. However, the majority of our records date from 1980 to 2018 (Figure 17). Before 1997, epiphyte studies were very scarce and most of the data (32%) are from 2014 to 2018.

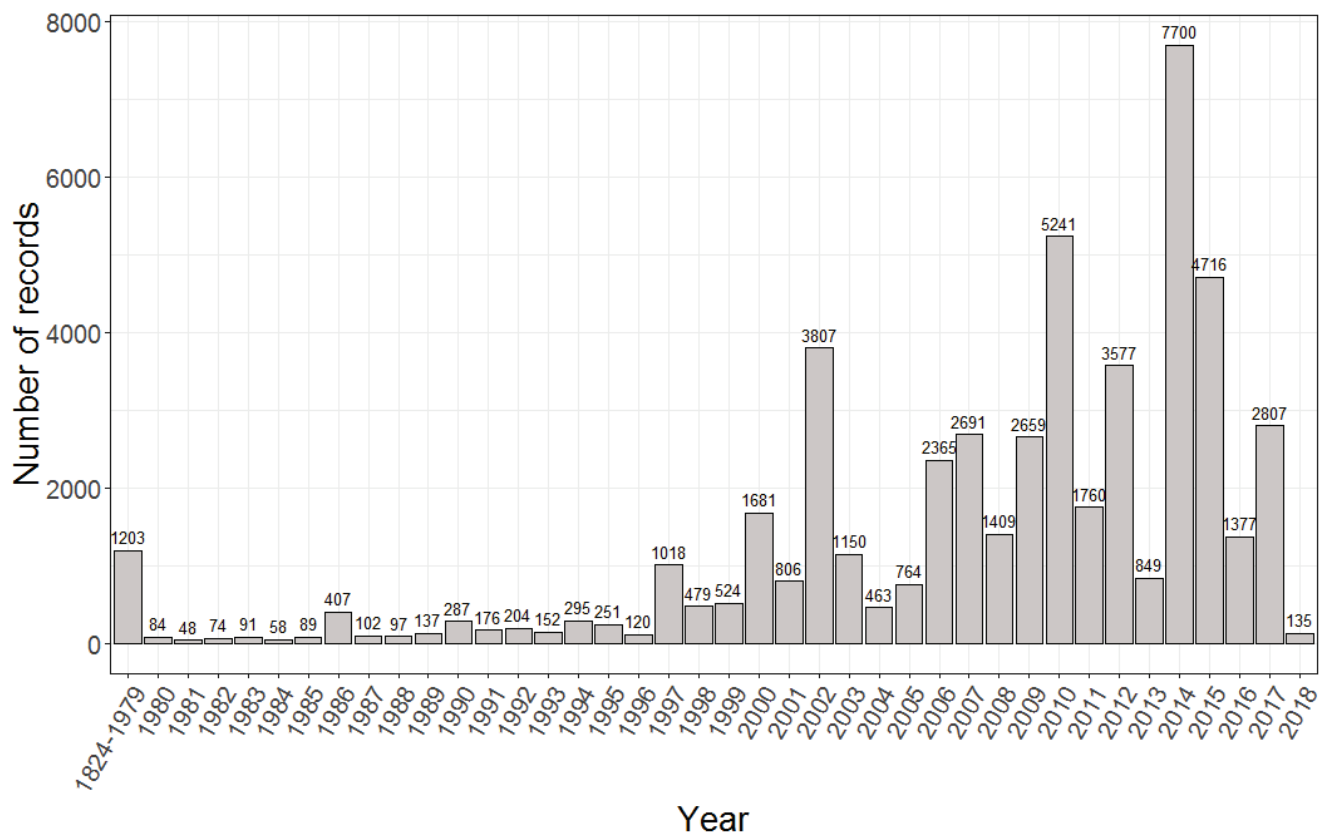


Figure 17: Number of epiphyte records per year from 1824 to 2018.

For each record in our data base, we extracted environmental variables from the WorldClim data base 1.4 (<http://www.worldclim.org/version1>). Annual precipitation in the record sites ranged from 375 to 3,719 mm/year with most records between 1,300 and 1,700 mm (Figure 18). Annual mean temperature varied from 11.5 to 27.7 °C with few sampling localities under 20°C (Figure 19). Epiphyte records ranged from sea level to 2,200 m a.s.l., with most records between sea level and 1,000 m a.s.l., with a decreasing trend of records as altitude increases (Figure 20).

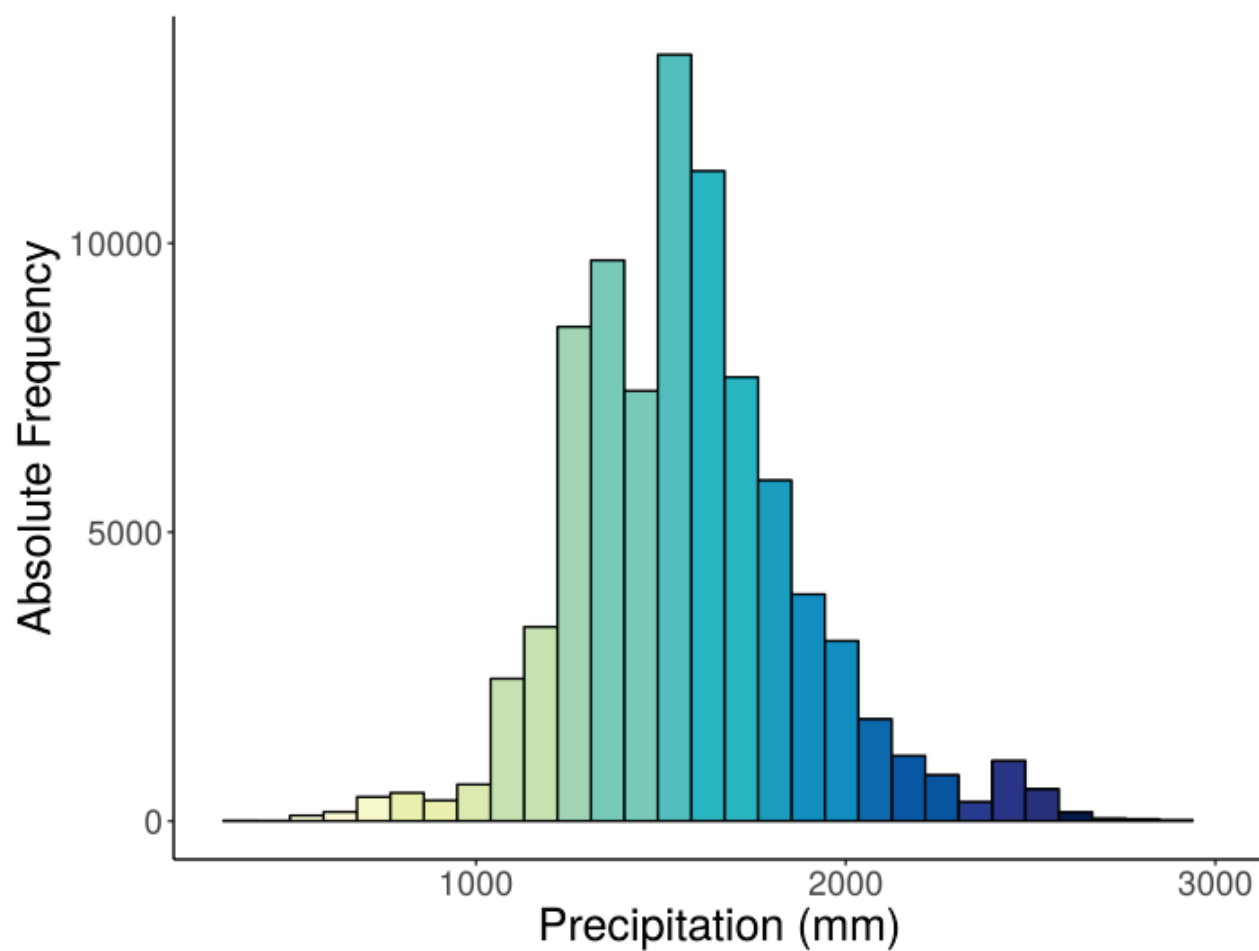


Figure 18: Frequency of precipitation values from each epiphyte record from the Atlantic Forest.

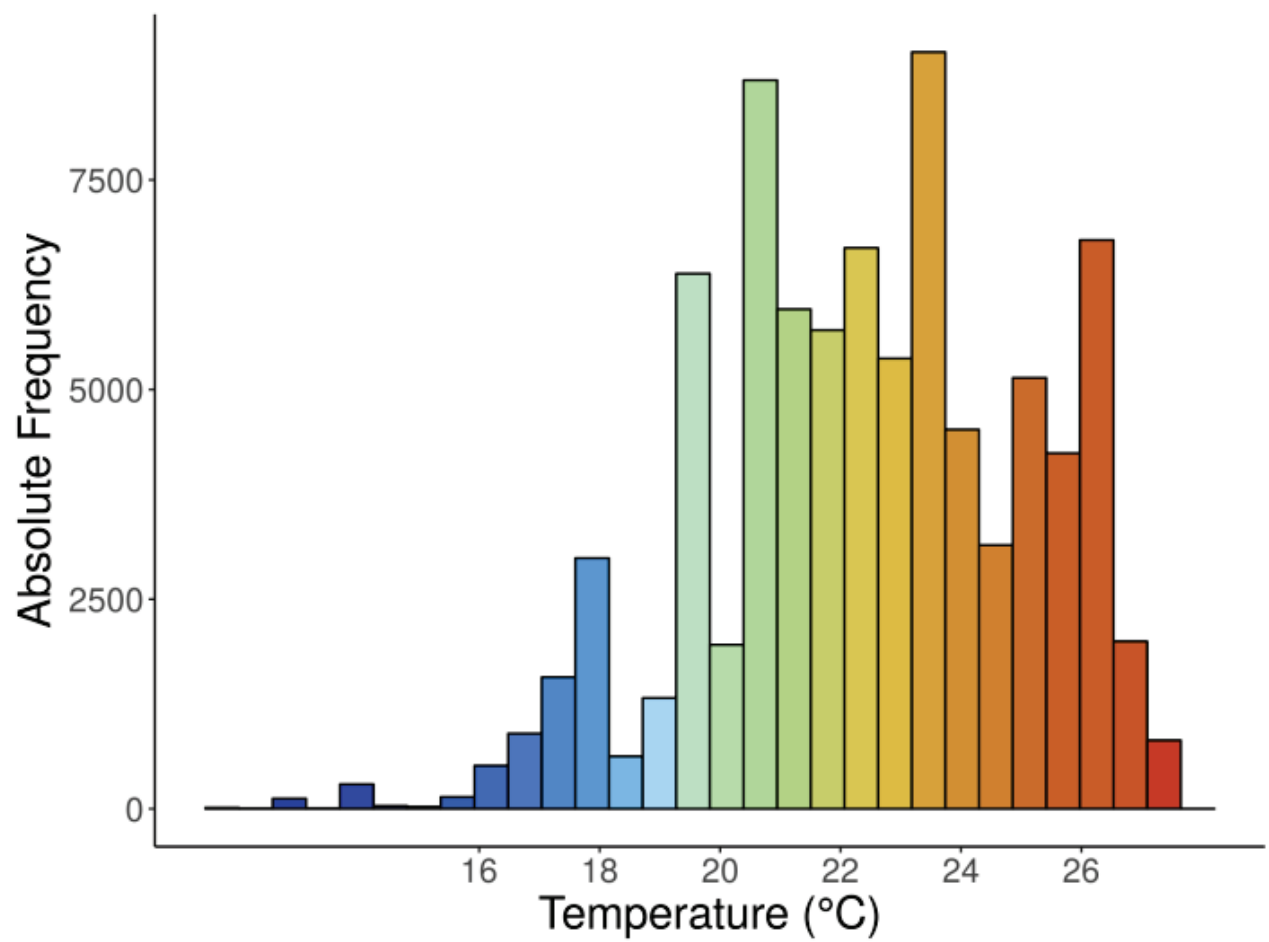


Figure 19: Frequency of temperature values from each epiphyte record from the Atlantic Forest.

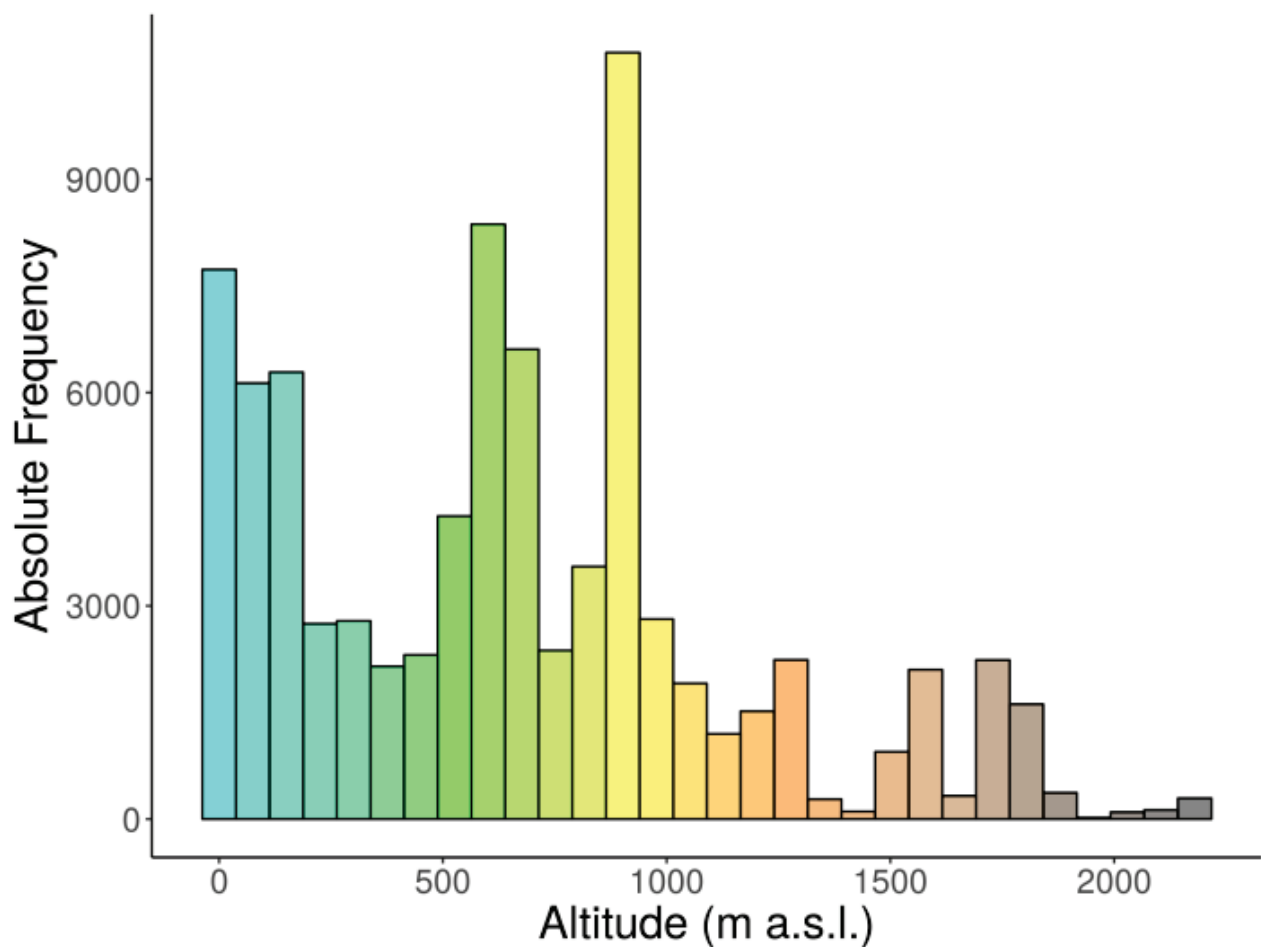


Figure 20: Frequency of altitude values (m a.s.l.) from each epiphyte record of the Atlantic Forest.

CLASS II. RESEARCH ORIGIN DESCRIPTORS

II.A. Overall project description:

II.A.1. Identity: A compilation of data on holo/hemiepiphyte occurrence and abundance sampled in the Atlantic Forest of South America.

II.A.2. Period of study: Study ranged from 1824 to 2018.

II.A.3. Objectives: We aimed to (1) compile an extensive Atlantic Forest data set on vascular, non-vascular, and Lichen epiphyte and hemiepiphyte species from occurrence and abundance available including data from published studies, gray literature and herbarium records; (2) describe the epiphyte distribution in the Atlantic Forest, in order to indicate future sampling efforts. Our work comprises the first epiphyte data set with information on abundance and occurrence of epiphyte phorophytes.

II.A.4. Abstract: Same as above.

II.A.5. Sources of funding:

The compilation of this dataset was supported by the Agencia Nacional de Investigación e Innovación (ANII), Agencia Nacional de Promoción Científica y Tecnológica (AGENCIA), Centro Nacional de Conservação da Flora (CNCFlora), Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Consejo Superior de Investigaciones Científicas (CSIC), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ), Fundação de Amparo ao Ensino e Pesquisa (FAEP), Fundação de Amparo à Pesquisa do Estado da Bahia (FAPESB), Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG), Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), Fundação de Amparo à Pesquisa e Inovação do Estado de Santa Catarina (FAPESC), Fundação de Apoio ao Desenvolvimento do Ensino, Ciência e Tecnologia do Estado de Mato Grosso do Sul (FUNDECT), Fundação Grupo Boticário de Proteção à Natureza, Pontifícia Universidade Católica do Paraná (PUCPR) and Universidad Nacional de La Plata (UNLP).

II.B.1. Specific subproject description:

II.B.2. Site description: The Atlantic Forest is the second largest tropical rainforest domain in South America with an original area of 150 million ha. It occurs over wide latitudinal (more than 27 degrees), altitudinal (0 - 2,800 m a.s.l.) and yearly rainfall (1,000 to 4,000 mm) ranges. The Atlantic Forest, therefore, includes a wide heterogeneity of habitats (Oliveira-Filho and Fontes 2000), with several vegetation types (such as forests, shrublands, marshes, mangroves and natural grassland) across environmental gradients (Oliveira-Filho et al. 2005). Coastal areas of the Atlantic Forest receives as much as 4,000 mm of rainfall over the year (Câmara 2003), and into the interior these forests receives less rainfall concentrated in only one season (~1,000 mm/year).

II.B.3. Data compilation:

We searched for any scientific literature, articles and gray literature publications (theses, reports, etc.) with epiphyte information from a wide search in online academic data bases (ISI Web of Knowledge, Scopus, Scielo, Scholar Google, and Research Gate). For the search, we used keywords in English [Epiphytes, Holoepiphytes, Hemiepiphytes, Accidental Epiphytes, Casual Epiphytes, Lichens, Bryophytes, Ferns, Lycophytes, Angiosperm, Atlantic Forest], combined in different ways, and their Portuguese translation. We then requested the data from the authors of those studies. Also, we invited authors from other studies not included in our original search that were recommended by the specialists. Therefore, our data set was obtained from (i) primary literature: peer-reviewed articles search, (ii) secondary (gray) literature search: theses, reports, etc., and (iii) indications from authors.

II.B.4. Research Methods:

We included records of vascular and non-vascular plants, and Lichen epiphytic species sampled in the Atlantic Forest of South America, regardless of sampling methods. We adopted species names validated by the Brazilian Flora 2020 and Mycobank. In order to standardize taxonomic names of epiphyte and phorophyte species we used “flora” (Carvalho 2017) and “taxize” (Chamberlain and Szocs 2013) packages in R environment (R Core Team 2018). After that, some of the specialists (Menini Neto L., Kersten R., Amorim A.M., Matos F.B, Freitas L., Nunes-Freitas A.F.) checked all species records in the dataset for nomenclatural and other inconsistencies. We included in the data base all holoepiphyte, primary hemiepiphyte (*sensu* Zotz 2013) and facultative epiphyte species. We excluded species classified as accidental epiphytes, alien, hybrids, lianas and vines, and those species that did not have an accepted taxonomic name (11,002 records). The boundary between facultative and accidental epiphytes are difficult to define, but we considered three characteristics: (i) occurrence in other substrate than trees, such as rocks and soil; (ii) the frequency of occurrence in tree trunks; (iii) the chance of the adult to survive and reproduce on tree trunks. Facultative epiphytes were defined as those that can occur in soil or rocks, but are more frequently found on tree trunks and can grow and reproduce as epiphytic species. Accidental epiphytes were defined as those that can occur on tree trunks but are more frequently found on other substrates and cannot reproduce as epiphytes (Zotz 2016). Classification of species into facultative and accidental categories was made by the team of epiphyte specialists. Specimens identified only to supra-specific levels (i.e., sp.) were excluded from our descriptive analyses (3,054 records), but we have maintained them in the final data set file, making them available to researchers for future investigations. Names of non-native phorophyte species were verified in The Plant List, Tropicos and SpeciesLink websites, and later checked by a specialist (Amorim, A.M). We maintained the non-native phorophyte species in the final data set file. In summary, a record, that was the unit base from data base, was a particular species recorded in a particular site, at any time. If there were several studies of epiphytes in the same area, there were several records of the same species altogether in one area.

For the records with no spatial coordinates, we used specific locations (such as municipality or protected area) described by authors. To define the Atlantic Forest boundaries we merged available geographic information from widely used limits: Atlantic Forest Law website (MMA 2006), World Wildlife Fund (WWF; Olson et al. 2001) and Ribeiro et al. (2009). Records that fell outside of the Atlantic Forest boundaries were excluded from our analyses and figure maps but maintained and identified in the data set file.

We organized all the data in one data base containing occurrence data (presence-absence and presence-only records) and abundance data (number of individuals, stands and coverage). We used the following literature to compile these records: Adenesky Filho et al.

(2013), Aguiar et al. (1981), Alberti and Zanin (2008), Alcantara et al. (2006), Almeida (2009), Almeida et al. (2010), Almeida et al. (2013), Alves (1997), Alves et al. (2000), Alvim (2016), Amorim et al. (2009), Araújo (1996), Araujo (2016), Araújo et al. (2004), Ariati and Kersten (2011), Azevedo (2010), Barbosa et al. (2015), Barbosa (2017), Bataghin (2013), Bataghin et al. (2008), Bataghin et al. (2017), Becker et al. (2013), Bianchi and Kersten (2014), Bianchi et al. (2012), Biganzoli and De Romero (2004), Blum (2010), Blum et al. (2011), Boelter et al. (2011), Bonin Jr. and Kersten (2016), Bonin Jr. and Kersten (2017), Bonnet et al. (2013), Borgo et al. (2002), Breier (2005), Britez et al. (1995), Buzato et al. (2000), Buzatto et al. (2007), Buzatto and Machado (2011), Buzatto et al. (2008), Buzatto et al. (2010), Camargo et al. (2002), Canela and Sazima (2003), Canêz and Marcelli (2007), Canêz and Marcelli (2010), Canêz et al. (2009), Carvalho (2017), Cecconello and Zanin (2004), Cervi and Borgo (2007), Cervi et al. (2007), Citadini-Zanette (1995), Coelho (2011), Coelho and Amorim (2014), Coelho et al. (2014), Costa et al. (2009), Costa et al. (2012), Costa (2017), Couto (2013), Couto et al. (2016a, 2016b), Couto et al. (2017), Cruz (2017), Devens et al. (2016), di Pasquo et al. (2016), Dias (2009), Dislich and Mantovani (1998), Dislich and Mantovani (2016), Dittrich et al. (1999), Dornelas (2016), Falkenberg (2003), Faxina et al. (2015), Ferreira (2011), Fischer and Araujo (1995), Fischer and Araújo (1996), Fontoura et al. (1997), Fontoura et al. (2009), Francisco (2017), Furtado (2016), Furtado and Menini Neto (2015a, 2015b), Furtado and Menini Neto (2016), Ganem et al. (2013), Geraldino et al. (2010), Giongo and Waechter (2004), Goetze et al. (2016a, 2016b), Goetze et al. (2017), Gomes-da-Silva and Costa (2011), Gomes-da-Silva (2013), Gonçalves and Waechter (2002), Gonçalves and Waechter (2003), Gonzaga (2016), Gonzaga et al. (2017), Guaraldo (2009), Guaraldo et al. (2013), Guimarães et al. (2008), Hefler and Faustioni (2004), Hekavey (2013), Hertel (1950), Höfling and Camargo (1999), Jungbluth and Marcelli (2011), Jungbluth et al. (2011), Kaehler et al. (2005), Kaffer et al. (2015), Keller and Tressens (2005), Kersten (2006), Kersten and Kuniyoshi (2009), Kersten and Rios (2013), Kersten and Silva (2001), Kersten and Silva (2002), Kersten and Silva (2005), Kersten and Silva (2006), Kersten and Waechter (2011), Kersten et al. (2009), Kessous and Costa (2017), Kessous et al. (2018), Koch et al. (2012), Koch et al. (2013), Koch et al. (2016), Labiak et al. (2017), Leitman et al. (2015), Leme (1999), Leme (2002), Lenzi et al. (2006), Liboni (2018), Lopes (2002), Machado and Semir (2006), Mai et al. (2016), Mania and Monteiro (2010), Marcelli and Canêz (2008), Marquez and Yañez (2012), Márquez et al. (2006), Martins (2017a, 2017b), Martínez et al. (2016), Matos and Mickel (2014), Matos and Mickel (2018), Matos et al. (2010), Mazziero and Nonato (2015), Mazziero et al. (2015), Mendes (2017), Menini Neto et al. (2016), Mesacasa (2017), Meza Torres et al. (2006), Meza Torres et al. (2008), Monalisa-Francisco (2017), Moreira (2016), Moura (2011), Muñoz et al. (2017), Nervo (2016), Nervo et al. (2016), Nunes-Freitas (2004), Padilha et al. (2015), Pereira et al. (2009), Petean (2003), Petean (2009), Piacentini and Varassin (2007), Pincheira-Ulbrich et al. (2012), Pincheira-Ulbrich et al. (2016), Reis and Fontoura (2009), Ribeiro (2009), Rocca-de-

Andrade (2006), Rodrigues et al. (2014), Rogalski (2002), Rogalski and Zanin (2003), Rosanelli (2007), Santos (2008), Sazima and Sazima (1999), Sazima et al. (1995), Schutz-Gatti (2000), Silva and Pôrto (2013), Silva and Pôrto (2015), Siqueira Filho (1998), Siqueira Filho and Leme (2006), Siqueira Filho and Machado (2001), Smith and Downs (1977), Snow and Snow (1986), Sota and Morbelli (1985), Spielmann and Marcelli (2008a, 2008b, 2008c), Staudt et al. (2012), Tressens et al. (2008), Valebella and Sager (2010), Varassin (2002), Varassin and Sazima (2012), Vasconcelos (2017), Vidal (2013), Vieira (2009), Waechter (1986), Waechter (1992), Waechter (1998), Wolowski et al. (2013), Yañez et al. (2011), Zandoná and Catharino (2015), Zanella (2013), Zanella et al. (2016), Zanotti et al. (2012) and Zorzanelli et al. (2017).

II.C. Data limitations and potential enhancements:

Epiphyte vascular and non-vascular plants and Lichens are the most diverse groups among those compiled in the ATLANTIC series until now, and presenting information of all species in a single document was very challenging for us. In this section, we list four main limitations of our data set regarding diversity of taxonomic groups, occurrence vs. abundance data, epiphyte classification, data duplicity and taxonomic uncertainty. We strongly recommend researchers using our data set to take these limitations into account. First, different methods are applied to sampling epiphyte communities of very distinct taxonomic groups. Each sampling method presents its pros and cons, imposing biases in the results of the surveys. Some taxonomic groups, such as Angiosperms, have been historically more extensively studied than Ferns, Lycophytes, non-vascular plants (Mosses and Liverworts), and Lichens. Our work represents an initial effort to highlight information gaps on epiphyte distribution across the Atlantic Forest. Efforts to increase our knowledge about the biology and environment requirements of epiphytes are also essential to conserve and restore threatened populations in the Atlantic Forest.

Second, most surveys included in our data set comprise information on species occurrence which is useful to diversity and biogeographical studies; however, it limits the studies under community and metacommunity approaches that require abundance data. Quantifying abundance of epiphytic specimens can be hard to do in the field and methods to quantify abundance can vary from group to group. For instance, counting of individuals or estimation of plant cover are common methods to quantify abundance of Angiosperms; however ferns are often sampled in terms of number of ramets. In addition, number of individuals is quantified either as number of ramets or number of stands, which makes it difficult to standardize abundance data. It is worth mentioning that most epiphyte sampling is restricted to the understory, where researchers can gain access, while tree canopies are usually under sampled. Finally, data on species occurrence are often easy to compile and standardize; hence, we believe some authors may have chosen to make available only occurrence data, even though they had quantitative data. This data set is the first effort to compile quantitative data on epiphyte abundance and can

support community studies in a regional scale.

Third, we recognize that data duplicity can occur within our data set. The same records can be included both from herbarium data as well as from data of published surveys. Fourth, although we put a lot of effort into standardizing species names and excluding non-epiphytic species as well as taxonomic names not validated, we recognize that we compiled data from surveys with different levels of taxonomic certainty. Fifth, the distinction between primary and secondary hemiepiphyte species (*sensu* Zotz 2013), as well as between holo- and facultative epiphyte species is difficult to make, since there is not sufficient information about all the species. Therefore, the classification of some species in this data base was non-consensual among specialists. We preferred to be more inclusive and let the user of the data base include or exclude them depending of their study aims.

CLASS III. DATA SET STATUS AND ACCESSIBILITY

III.A. Status

III.A.1. Latest update: August 2018

III.A.2. Latest archive date: August 2018

III.A.3. Metadata status: Last updated August 2018, version submitted

III.A.4. Data verification: We excluded species classified as accidentals, aliens, hybrids, lianas and vines, and those species that have not been taxonomically corrected according to Flora do Brasil 2020 and MycoBank (11,002 records). Specimens identified only to supra-specific levels (i.e., sp. - 3,054 records) were excluded from both descriptive analyses and final data set file. To verify valid names of native phorophyte species we followed species names listed in Flora do Brasil 2020, but we have decided to maintain alien species and supra-specific records.

III.B. Accessibility:

III.B.1. Contact person(s): Flavio Nunes Ramos (fnramos@gmail.com) or Milton Cezar Ribeiro (miltinho.astronauta@gmail.com).

III.B.2. Copyright restrictions: None

III.B.3. Proprietary restrictions: Please cite this Ecology Data Paper if the data are used in publications and teaching events.

III.B.4. Storage locations: The original data set is available at Ecology Repository. The updated version and additional information can be accessed on the ATLANTIC SERIES GitHub Inc. repository https://github.com/LEECIab/Atlantic_series.

III.B.5. Costs: None

CLASS IV. Data structural descriptors:

IV.A. Data set file

IV.A.1. Identity:

- (1) ATLANTIC_EPIPHYTES_Abundance.csv
- (2) ATLANTIC_EPIPHYTES_Occurrence.csv
- (3) ATLANTIC_EPIPHYTES_References.csv

IV.A.2. Size:

- (1) ATLANTIC_EPIPHYTES_Abundance.csv, 3.86 MB
- (2) ATLANTIC_EPIPHYTES_Occurrence.csv, 26.6 MB
- (3) ATLANTIC_EPIPHYTES_References.csv, 57 KB

IV.A.3. Format and storage mode: data tables formatted as comma-separated values (*.csv)

IV.A.4. Header information: See column descriptions in section B.

IV.A.5. Alphanumeric attributes: Mixed

IV.A.6. Data anomalies: If no information is available for a cell, this is indicated as 'NA'. In this data set, we have NA values.

IV.B. Variable information

Table 2. Description of the fields related to the file ATLANTIC_EPIPHYTE_Occurrence.csv (all data). Description of the epiphyte data set obtained from (i) article search, (ii) gray literature search, and (iii) indications from authors.

Variables	Description	Levels	Examples
DATASET	Standardized identification of each record from all data sets in which letters represent authors and number represents data set line	Epiphyte data set comprises 89,269 data set IDs	ACGS_00001 GUAR_00200 MENE2_32124
DATASET_ACRONYM	Standardized identification for each data base within our data set	75 acronyms	AAMO KERB MENE
RECORD_ID	Record identification in each data set. Authors were free to use their own identification	Epiphyte data set comprises 89,269 record IDs	E0001
MUNICIPALITY	Sampled municipality	1,980 municipalities	Alfenas

STATE	Sampled state or province	23 states and provinces	MINAS GERAIS MISSIONES
STATE_ACRONYM	Acronym for each sampled state or province	23 acronyms for states and provinces	MG N
COUNTRY	Sampled country	4 Countries	Brazil Argentina
ID_CODLOC	Study site identification. Authors were free to use their own identification	2,511 study site identifications	1 P01
HABITAT	Description from the sampled area: forest edge, secondary forest, scattered tree in pasture, riparian forest, urban tree, etc. For a general description of vegetation type see column VEGETATION_TYPE	105 habitat descriptions	Cocoa Plantation Seasonal Forest Secondary Forest Urban Area
LATITUDE_Y	Nearest coordinate from the record	11,016 unique coordinates	-22.436553
LONGITUDE_X	Nearest coordinate from the record	10,022 unique coordinates	-46.1841
PRECISION	Precision of coordinates of each record. If numeric, values are in meters	59 precision descriptions	10 Plot Municipality
REGIONAL_NAME_OF_SAMPLED_AREA	Name of study site as known regionally given by authors. Written in Portuguese or English; favored Portuguese for local users. For a general description of vegetation type see column VEGETATION_TYPE	16,985 regional names	Garcias Morro dos Perdidos RPPN Serra Bonita
EPIPHYTE_GROUP	Name of general group to which epiphyte species belong	6 groups	Angiosperms Ferns Liverworts
EPIPHYTE_FAMILY	Name of epiphyte family	79 families	Bromeliaceae
EPIPHYTE_GENUS	Name of epiphyte genus	327 genera	<i>Tillandsia</i>
EPIPHYTE_EPITHET	Name of epiphyte epithet	1,719 epithets	<i>aeranthos</i>
EPIPHYTE_SPECIES	Species name	2,093 species names	<i>Tillandsia aeranthos</i>
EPIPHYTE_HABITAT	Classification of epiphyte species into: holoeipiphyte, hemieipiphyte and facultative	4 levels	holoeipiphyte hemieipiphyte

PHOROPHYTE_FAMILY	Name of phorophyte family	85 phorophyte families	<i>Araucariaceae</i>
PHOROPHYTE_GENUS	Name of phorophyte genus	236 genera	<i>Araucaria</i>
PHOROPHYTE_EPITHET	Name of phorophyte epithet	331 epithets	<i>angustifolia</i>
PHOROPHYTE_SPECIES	Species name	411 species	<i>Araucaria angustifolia</i>
YEAR_START	Year when study began	From 1824 to 2017	2003
YEAR_FINISH	Year when study ended	From 1824 to 2018	2013
DATA_TYPE	Type of epiphyte data sampled:	Presence_only, Presence_absence or Abundance	Presence_only
ALTITUDE	Altitude (m.a.s.l.) values for each record	1,324 unique values	44 915
ANNUAL_RAINFALL	Annual rainfall (mm) for each record	1,617 unique values	1,190 1,806
ANNUAL_TEMPERATURE	Annual temperature (°C) for each record	146 unique values	23.1 26.7
VEGETATION_TYPE	Vegetation type for each record	4 vegetation types	Ombrophilous Forest Seasonal Forest Savana
ATLANTIC_FOREST_LIMIT	Identify whether the record is inside the Atlantic Forest shapefile or not	Binary	YES or NO
OBS	Observation. Any comments from the authors of the data set		Course of Field Botany 2011 - master's in plant biology.

Table 3: Description of the fields related to the file ATLANTIC_EPIPHYTE_Abundance.csv. This data set is a subset of the data set ATLANTIC_EPIPHYTE_Occurrence.csv which includes only records in which abundance was quantified.

Variables	Description	Levels	Examples
DATASET	Standardized identification of each record from all data sets in which letters represent authors and number represents data set line	Epiphyte data set comprises 11,036 data set IDs	ACLA_00001 CROS_00241
DATASET_ACRONYM	Standardized identification for each data base within our data set	20 acronyms	ACLA BERE
RECORD_ID	Record identification in each data set. Authors were free to use their own identification	Epiphyte data set comprises 89,269 record IDs	E0001
MUNICIPALITY	Sampled municipality	63 municipalities	Alfnas
STATE	Sampled state or province	8 states and provinces	MINAS GERAIS BAHIA
STATE_ACRONYM	Acronym for each sampled state or province	8 acronyms for states and provinces	MG BA
COUNTRY	Sampled country	1 Country	Brazil
ID_CODLOC	Study site identification. Authors were free to use their own identification	295 study site identifications	F01 PA3
HABITAT	Description from sampled area: forest edge, secondary forest, scattered tree in pasture, riparian forest, urban tree, etc. For a general description of vegetation type see column VEGETATION_TYPE	31 habitat descriptions	Urban Area Secondary Forest
LATITUDE_Y	Nearest coordinate from the record	381 unique coordinates	-22.2491
LONGITUDE_X	Nearest coordinate from the record	395 unique coordinates	-47.82413

PRECISION	Precision of coordinates of each record. If numeric, values are in meters	59 precision descriptions	10 Sampled tree
REGIONAL_NAME_OF STUDY_SITE	Name of study site as known regionally given by the authors. Written in Portuguese or English, focused local users. For a general description of vegetation type see column VEGETATION_TYPE	117 regional names	RPPN Serra Bonita Floresta Nacional de Sao Francisco de Paula
EPIPHYTE_GROUP	Name of general group to which epiphyte species belong	3 groups	Angiosperms Ferns Lycophytes
EPIPHYTE_FAMILY	Name of epiphyte family	25 families	Polypodiaceae
EPIPHYTE_GENUS	Name of epiphyte genus	117 genera	<i>Asplenium</i>
EPIPHYTE_EPITHET	Name of epiphyte epithet	423 epithets	<i>fee</i>
EPIPHYTE_SPECIES	Species name	448 species names	<i>Asplenium fee</i>
EPIPHYTE_HABITAT	Classification of epiphyte species into: holoepiphyte, hemiepiphyte and facultative	Holoepiphyte, hemiepiphyte, facultative or not possible to confirm	holoepiphyte hemiepiphyte
PHOROPHYTE_FAMILY	Name of phorophyte family	54 phorophyte families	Araucariaceae
PHOROPHYTE_GENUS	Name of phorophyte genus	124 genera	<i>Araucaria</i>
PHOROPHYTE_EPITHET	Name of phorophyte epithet	175 epithets	<i>angustifolia</i>
PHOROPHYTE_SPECIES	Species name	204 species	<i>Araucaria angustifolia</i>
YEAR_START	Year when study began	From 1989 to 2017	2015
YEAR_FINISH	Year when study ended	From 1992 to 2018	2017
DATA_TYPE	Type of epiphyte data sampled. All abundance data.	One level: abundance	Abundance
ALTITUDE	Altitude (m.a.s.l.) values for each record	116 unique values	44 915

ANNUAL_RAINFALL	Annual rainfall (mm) for each record	1,617 unique values	1,190 1,806
ANNUAL_TEMPERATURE	Annual temperature (°C) for each record	146 unique values	23.1 26.7
VEGETATION_TYPE	Vegetation type for each record	4 vegetation types	Ombrophilous Forest Seasonal Forest Savana
ATLANTIC_FOREST_LIMIT	Identify whether the record is inside the Atlantic Forest shapefile or not. All inside Atlantic Forest.	One level: yes	YES
ABUNDANCE_NUMBER_OF_INDIVIDUALS	Epiphyte abundance quantified as number of ramets or genets	76 unique values	11 108
ABUNDANCE_COVERAGE_CLASS	Epiphyte abundance quantified as number of a particular coverage class	9 unique values	1 43
COVERAGE_CLASS_METHOD	Reference used to classify coverage class	4 references	Kersten, R. de A., Y. S. Kuniyoshi, and C. V. Roderjan. 2009. Epífitas vasculares em duas formações ribeirinhas adjacentes na bacia do rio Iguaçu – Terceiro Planalto Paranaense. Iheringia - Série Botânica 64:33–43.
SAMPLE_UNIT	Sampled unity: tree, plot, transect	3 levels	plot
FREQUENCY	Total number of trees where epiphytes were registered. For Abundance Data_Type only	38 unique values	1 17
TREE_TOTAL_EFFORT	Total number of trees sampled in the study	54 unique values	8 800
PLOT_SIZE	Sampled plot area (m ²)	20 unique values	20000

PLOT_TOTAL_EFFORT	Sum (m ²) of all sampled plots in the study	68 unique values	300000
TRANSECT_N_POINTS	Number of points in each transect sampled	4 unique values	10 30
TRANSECT_D_POINTS	Distance (m) between points in transect sampled	3 unique values	10
TRANSECTS_NUMBER	Number of transects sampled	4 unique values	7
TRANSECTS_TOTAL_EFFORT	Total number of trees sampled in all transects	8 unique values	60
OBS	Observation. Any comments from authors of data set	806 unique observations	Course of Field Botany 2011 - Master in Plant Biology.

Table 4: Description of the fields related to the file ATLANTIC_EPIPHYTE_Reference.csv. We listed all references where the data comes from .

Variables	Description	Levels	Examples
CITATION	References citations where the data comes from, quoted throughout the text	197 citations	Alcantara et al. (2006)
REFERENCE_TYPE	Categories of data sources: article, thesis or dissertation and book	3 categories	Article
REFERENCE	Reference where the data comes from	197 references	Alcantara, S., J. Semir, and V. N. Solferini. 2006. Low Genetic Structure in an Epiphytic Orchidaceae (<i>Oncidium hookeri</i>) in the Atlantic Rainforest of South-eastern Brazil. <i>Annals of Botany</i> 98:1207–1213.
FILENAME	Standardized dataset filename for each data base within our data set	61 filenames	ATLANTIC_EPIPHYTES_Alcantara_Padilha_2018_03_d22_validchar.txt
DATASET_ACRONYM	Standardized identification for each data base within our data set	61 acronyms	APAD

IV.C. Data anomalies: If no information is available for a given record, this is indicated by “NA”.

CLASS V. SUPPLEMENTAL DESCRIPTORS

V.A. Data acquisition: Our data set was obtained from (i) article search, (ii) gray literature search, and (iii) indications from authors.

V.B. Data request history: None

V.C. Data set updates history: None

V.D. Data entry/verification procedures: In order to standardize the taxonomy of epiphyte and phorophyte species we used “flora” (Carvalho 2017) and “taxize” (Chamberlain and Szocs 2013) packages in R environment (R Core Team 2018). Later, specialists in taxonomy (Menini Neto L., Kersten R., Amorim A. M., Matos F.B, Freitas L., Nunes-Freitas, A. N.) checked and confirmed all species reported in the data set.

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References

- Adenesky Filho, E., C. Michelon, L. A. Perret, V. Cotarelli, F. E. C. Marinero, T. B. S. Braga, R. A. Bonaldi, V. Ariati, A. Sooler, B. K. Canestrato, E. D. Lozano, J. Dias, J. Carneiro, L. E. M. Pukanski, M. Rosendo, M. A. Selusniaki, and T. A. Elmor. 2013. Programas ambientais de fauna e flora da UHE Mauá, no Rio Tibagi, entre os municípios de Telêmaco Borba e Ortigueira, no estado do Paraná. Volume 2. Itercoop - Cooperativa Interdisciplinar de serviços técnicos, Curitiba, PR.
- Aguiar, L. W., V. Citadini-Zanette, L. Martau, and A. Backes. 1981. Composição florística de epífitos vasculares numa área localizada nos municípios de Montenegro e Triunfo, Rio Grande do Sul, Brasil. *Iheringia, Série Botânica* 28:55-93.
- Alberti, M. S., and E. M. Zanin. 2008. Epífitas vasculares no Parque Municipal Longines Malinowski-Erechim, RS. *Revista Perspectiva* 32:161-169.
- Alcantara, S., J. Semir, and V. N. Solferini. 2006. Low Genetic Structure in an Epiphytic Orchidaceae (*Oncidium hookeri*) in the Atlantic Rainforest of South-eastern Brazil. *Annals of Botany* 98:1207-1213.
- Almeida, O. J. G. 2009. Morfoanatomia dos órgãos reprodutivos e da plântula de *Epiphyllum phyllanthus* (L.) Haw. (Cactaceae). Universidade Estadual Paulista.
- Almeida, O. J. G., A. A. S. Paoli, and L. A. Souza. 2010. Morfo-anatomía de la flor de *Epiphyllum phyllanthus* (Cactaceae). *Revista mexicana de biodiversidad* 81:65-80.
- Almeida, O. J. G., J. H. Cota-Sánchez, and A. A. S. Paoli. 2013. The systematic significance of floral morphology, nectaries, and nectar concentration in epiphytic cacti of tribes Hylocereeae and Rhipsalideae (Cactaceae). *Perspectives in Plant Ecology, Evolution and Systematics* 15:255-268.
- Alves, T. F. 1997. Estrutura da comunidade epífita das matas seca e periodicamente inundada da

- Reserva Ecológica Estadual de Jacarepiá, Saquarema, Rio de Janeiro. Universidade Federal do Rio de Janeiro.
- Alves, M. A. S., C. F. D. Rocha, M. Van Sluys, H. G. Bergallo, M. A. S. Alves, J. D. Silva, and C. F. D. Rocha. 2000. Guildas de beija-flores polinizadores de quatro espécies de Bromeliaceae de Mata Atlântica da Ilha Grande, RJ, Brasil: composição e taxas de visitação. Pages 171–185 in M. A. S. Alves, J. M. C. da Silva, M. Van Sluys, H. G. Bergallo, and C. F. D. Rocha, ed. *A ornitologia no Brasil: pesquisa atual e perspectivas*, 1st ed. Universidade Estadual do Rio de Janeiro, Rio de Janeiro.
- Alvim, F. S. 2016. *Ecologia de epífitas vasculares em áreas verdes de Juiz de Fora, Minas Gerais, Brasil*. Centro de Ensino Superior de Juiz de Fora.
- Amorim, A. M., J. G. Jardim, M. M. M. Lopes, P. Fiaschi, R. A. X. Borges, R. de O. Perdiz, and W. W. Thomas. 2009. Angiospermas em remanescentes de floresta montana no sul da Bahia, Brasil. *Biota Neotropica* 9:313–348.
- Angelini, C., and B. R. Silliman. 2014. Secondary foundation species as drivers of trophic and functional diversity: Evidence from a tree-epiphyte system. *Ecology* 95:185–196.
- Araújo, A. C. de. 1996. Beija-flores e seus recursos florais numa área de planície costeira do litoral norte de São Paulo. Universidade Estadual de Campinas.
- Araújo, A. C., E. A. Fischer, and M. Sazima. 2004. As bromélias na região do Rio Verde. Pages 194–210 in *Estação ecológica Juréia-Itatins: ambiente físico, flora e fauna*, 1st ed. Holos Editora, Rio de Janeiro.
- Araújo, E. A. 2016. *Estrutura, composição florística e relação vegetação-ambiente em Floresta Ombrófila Densa no Parque Nacional do Caparaó, Espírito Santo*. Universidade Federal do Espírito Santo.
- Ariati, V., and R. Kersten. 2011. Epífitas vasculares em um gradiente altitudinal da Floresta Ombrófila Densa do Pico Caratua - Parque Estadual Pico Paraná. Pontifícia Universidade Católica do Paraná.
- Azevedo, D. B. 2010. Epífitas vasculares ocorrentes em três espécies de forófitos na área urbana da Ilha da Marambaia - Mangaratiba/RJ. Universidade Federal Rural do Rio de Janeiro.
- Barbosa, D. E. F. 2017. *Composição florística e ecologia de epífitas vasculares em fragmentos de Floresta Estacional Semidecidual na Serra da Mantiqueira, Minas Gerais, Brasil*. Universidade Federal de Juiz de Fora.
- Barbosa, D. E. F., G. A. Basílio, F. R. da Silva, and L. Menini Neto. 2015. Vascular epiphytes in a remnant of seasonal semideciduous forest in zona da mata of Minas Gerais, Brazil. *Bioscience Journal* 31:623–633.
- Bataghin, F. A. 2013. Epifitismo vascular e estado de conservação de fragmentos florestais na Bacia Hidrográfica do Sorocaba/Médio Tietê, São Paulo, Brasil. Universidade Federal de São Carlos.
- Bataghin, F. A., J. S. R. Pires, F. de Barros, and A. Muller. 2017. Epífitas vasculares da Estação Ecológica Barreiro Rico: diversidade, abundância e estratificação vertical. *Hoehnea* 44:158–169.
- Bataghin, F. A., A. Fiori, and R. H. Toppa. 2008. Efeito de borda sobre epífitos vasculares em floresta ombrófila mista, Rio Grande do Sul, Brasil. *O Mundo da Saúde São Paulo* 32:329–338.
- Batke, S. P., A. Cascante-Marín, and D. L. Kelly. 2016. Epiphytes in Honduras: A geographical analysis of the vascular epiphyte flora and its floristic affinities to other Central American countries. *Tropical Ecology* 57:663–675.
- Becker, D. F. P., S. Cunha, M. S. Marchioretto, and J. L. Schmitt. 2013. Riqueza, estrutura comunitária e distribuição vertical de epífitos vasculares do Parque Natural Municipal Tupancy, Arroio do Sal, RS, Brasil. *Pesquisa, Botânica* 64:127–139.
- Bello, C., M. Galetti, D. Montan, M. A. Pizo, T. C. Mariguela, L. Culot, F. Bufalo, F. Labecca, F. Pedrosa, R. Constantini, C. Emer, W. R. Silva, F. R. da Silva, O. Ovaskainen, and P. Jordano. 2017. Atlantic-Frugivory: A plant- frugivore interaction dataset for the Atlantic Forest. *Ecology* 98:1729.
- Benzing, D. 1987. Vascular epiphytism: taxonomic participation and adaptive diversity. *Annals of the Missouri Botanical Garden* 74:183–204.

- Benzing, D. H. 1990. Vascular Epiphytes. Cambridge University Press, Ohio.
- Bianchi, J. S., C. M. Bento, and R. de A. Kersten. 2012. Epífitas vasculares de uma área de ecótono entre as Florestas Ombrófilas Densa e Mista, no Parque Estadual do Marumbi, PR. *Estudos de Biologia* 34:37-44.
- Bianchi, J., and R. Kersten. 2014. Edge effect on vascular epiphytes in a subtropical Atlantic Forest. *Acta Botanica Brasilica* 28:120–126.
- Biganzoli, F., and M. E. Múlgura de Romero. 2004. Inventario florístico del Parque Provincial Teyú Cuaré y alrededores (Misiones, Argentina). *Darwiniana* 42:1–24.
- Blum, C. T. 2010. Os componentes epifítico vascular e herbáceo terrícola da Floresta Ombrófila Densa ao longo de um gradiente altitudinal na Serra da Prata, Paraná. Universidade Federal do Paraná.
- Blum, C. T., Roderjan, C. V., and F. Galvão. 2011. Composição florística e distribuição altitudinal de epífitas vasculares da Floresta Ombrófila Densa na Serra da Prata, Morretes, Paraná, Brasil. *Biota Neotropica* 11:141-159.
- Boelter, C. R., C. E. Zartman, and C. R. Fonseca. 2011. Exotic tree monocultures play a limited role in the conservation of Atlantic Forest epiphytes. *Biodiversity and Conservation* 20:1255–1272.
- Bonin Jr, P., and R. Kersten. 2016. Epífitas de uma área de Floresta Ombrófila Mista Alterada na Fazenda Gralha Azul - Paraná. Pontifícia Universidade Católica do Paraná.
- Bonin Jr, P., and R. Kersten. 2017. Comunidade de epífitas vasculares de uma área de Floresta Ombrófila Mista da Fazenda Gralha Azul, PR. Pontifícia Universidade Católica do Paraná.
- Bonnet, A., E. Caglioni, J. L. Schmitt, T. J. Cadorin, A. L. de Gasper, S. de Andrade, B. Grosh, C. Cristofolini, C. P. L. de Oliveira, D. V. Lingner, A. Uhlmann, L. Sevegnani, and A. C. Vibrans. 2013. Epífitos Vasculares da Floresta Ombrófila Densa de Santa Catarina. Pages 23–67 in D. V. Vibrans, A. C.; Bonnet, A.; Caglioni, E.; Gasper, A. L. de; Lingner, ed. *Epífitos Vasculares da Floresta Ombrófila Densa*, 1st ed. Edifurb, Blumenau.
- Borgo, M., S. M. Silva, and M. P. Petean. 2002. Epífitos vasculares em um remanescente de floresta estacional semidecidual, município de Fênix, PR. Brasil. *Acta Biologica Leopoldensia* 24:121–130.
- Bovendorp, R. S., N. Villar, E. F. de Abreu-Junior, C. Bello, A. L. Regolin, A. R. Percequillo, and M. Galetti. 2017. Atlantic small-mammal: a dataset of communities of rodents and marsupials of the Atlantic forests of South America. *Ecology* 98:2226-2226.
- Breier, T. B. 2005. O epifitismo vascular em florestas do sudeste do Brasil. Universidade Estadual de Campinas.
- Britez, R. M., S. M. Silva, W. E. S. de Souza, and J. T. W. Motta. 1995. Floristic inventory in Mixed Ombrophilous Forest, São Mateus Do Sul, Parana, Brazil. *Arquivos de Biologia E Tecnologia* 38:1147–1161.
- Bruijnzeel, L. A., M. Mulligan, and F. N. Scatena. 2011. Hydrometeorology of tropical montane cloud forests: Emerging patterns. *Hydrological Processes* 25:465–498.
- Buzato, S., M. Sazima, and I. Sazima. 2000. Hummingbird-Pollinated Floras at Three Atlantic Forest Sites. *Biotropica* 32:824–841.
- Buzatto, C. R., and M. C. Machado. 2011. *Capanemia* Barb. Rodr. (Orchidaceae: Oncidiinae), a new record from Bahia state, Brazil. *Acta Botanica Brasilica* 25:249–251.
- Buzatto, C. R., B. M. A. Severo, and J. L. Waechter. 2008. Composição florística e distribuição ecológica de epífitos vasculares na Floresta Nacional de Passo Fundo, Rio Grande do Sul. *Iheringia, Série Botânica* 63:213–229.
- Buzatto, C. R., P. P. A. Ferreira, C. A. D. Welker, G. D. S. Seger, A. Hertzog, and R. B. Singer. 2010. O gênero *Cattleya* Lindl. (Orchidaceae: Laeliinae) no Rio Grande do Sul, Brasil. *Revista Brasileira de Biociências* 8:388–398.
- Buzatto, C. R., E. M. Freitas, A. P. M. Silva, and L. F. P. Lima. 2007. Levantamento florístico das Orchidaceae ocorrentes na Fazenda Sao Maximiano, Municipio de Guaiba, Rio Grande do Sul. *Revista Brasileira de Biociências* 5:19-25.
- Buzatto, C., R. Singer, and C. van den Berg. 2010. O gênero *Capanemia* Barb. Rodr. (Oncidiinae: Orchidaceae). *Revista Brasileira de Biociências* 8:309–323.
- Callaway, R. M., Reinhart, K. O., Moore, G. W., Moore, and D. J., Pennings, S. C. 2002. Epiphyte

- host preferences and host traits: mechanisms for species-specific interactions. *Oecologia* 132:221-230.
- Câmara, I. de G. 2003. Brief history of conservation in the Atlantic Forest. Pages 31–42 in C. G. Leal and I. G. Câmara. *The Atlantic Forest of South America : biodiversity status, threats, and outlook*, 1st ed. Island Press, Washington D.C.
- Camargo, E. H., J. M. Torezan, and R. Kersten. 2002. Florística e Estrutura da Comunidade de Epífitas do Parque Estadual Mata do Godoy, Londrina, PR. Universidade Estadual de Londrina.
- Canela, M. B. F., and M. Sazima. 2003. *Aechmea pectinata*: A Hummingbird-dependent bromeliad with inconspicuous flowers from the rainforest in south-eastern Brazil. *Annals of Botany* 92:731–737.
- Canêz, L. da S., and M. P. Marcelli. 2010. *Punctelia osorioi*, a new species of Parmeliaceae from South Brazil. *Mycotaxon* 111:45–49.
- Canêz, L. S., and M. P. Marcelli. 2007. Two new species of *Punctelia* (Parmeliaceae) from southern Brazil. *Mycotaxon* 99:211–216.
- Canêz, L., M. P. Marcelli, and J. A. Elix. 2009. New Brazilian species of *Canoparmelia* with medullary olivetric, anziaic, and sekikaic complexes. *Mycotaxon* 110:465–472.
- Carvalho, R. G. 2017. Influência de características locais e da paisagem sobre a diversidade de epífitas em fragmentos florestais de Mata Atlântica. Universidade Federal de Alfenas.
- Cecconello, E. F., and E. M. Zanin. 2004. Florística e estrutura do componente epifítico vascular em Floresta Ombrófila Mista na U.C. do Município de Sertão, RS, Brasil. Universidade Regional Integrada do Alto Uruguai e das Missões.
- Cervi, A. C., L. von Linsingen, G. Hatschbach, and O. S. Ribas. 2007. A vegetação do Parque Estadual de Vila Velha, Município de Ponta Grossa, Paraná, Brasil. *Boletim do Museu Botânico Municipal* 69:1-52.
- Cervi, A., and M. Borgo. 2007. Epífitos vasculares no Parque Nacional do Iguaçu, Paraná (Brasil). Levantamento preliminar. *Fontqueria* 55:415–422.
- Chamberlain, S. A., and E. Szöcs. 2013. taxize - taxonomic search and retrieval in R. *F1000Research* 2:191. URL: <http://f1000research.com/articles/2-191/v2>.
- Citadini-Zanette, V. 1995. Florística, fitossociologia e aspectos da dinâmica de um Remanescente de Mata Atlântica na Microbacia do Rio Novo, Orleans, SC. Universidade Federal de São Carlos.
- Coelho, L. F. M. 2011. Ecologia de figueiras, *Ficus* (Moraceae) em três paisagens fragmentadas no interior paulista. Universidade de São Paulo.
- Coelho, M. M., and A. M. Amorim. 2014. Floristic composition of the Montane Forest in the Almadina-Barro Preto axis, Southern Bahia, Brazil. *Biota Neotropica* 14:1:41.
- Condit, R., N. Pitman, E. G. Leigh, J. Chave, J. Terborgh, R. B. Foster, P. Núñez, S. Aguilar, R. Valencia, G. Villa, H. C. Muller-Landau, E. Losos, S. P. Hubbell, J. Harte, S. McCarthy, K. Taylor, A. Kinzig, M. L. Fisher, J. Harte, A. Kinzig, J. Green, J. S. Clark, T. Nagylaki, R. Condit, S. Harrison, S. J. Wright, O. Calderón, E. Ribbens, J. A. Silander, S. W. Pacala, J. S. Clark, M. Silman, R. Kern, E. Macklin, J. HilleRisLambers, K. E. Harms, R. Condit, S. P. Hubbell, and R. B. Foster. 2002. Beta-diversity in tropical forest trees. *Science* 9:295-666.
- Costa, L. M. S. 2017. Hibridação de três espécies de pétalas amarelas de *Aechmea* subgênero *Orgiesia* (Bromeliaceae). Universidade Federal do Rio Grande do Sul.
- Costa, A. F., T. Fontoura, and A. M. Amorim. 2012. Novelties in Bromeliaceae from the northeastern Brazilian Atlantic Rainforest. *The Journal of the Torrey Botanical Society* 1:34-45.
- Costa, A. F., P. J. F. P. Rodrigues, and M. G. L. Wanderley. 2009. Morphometric analysis of *Vriesea paraibica* Wawra complex - Bromeliaceae. *Botanical Journal of the Linnean Society* 159:163181.
- Couto, D. R. 2013. Epífitos vasculares sobre *Pseudobombax* aff. *campestre* (Malvaceae) em complexos rupestres de granito no sul do ES. Universidade Federal do Espírito Santo.
- Couto, D. R., H. M. Dias, M. C. A. Pereira, C. N. Fraga, and J. E. M. Pezzopane. 2016a. Vascular epiphytes on *Pseudobombax* (Malvaceae) in rocky outcrops inselbergs in Brazilian Atlantic Rainforest: basis for conservation of a threatened ecosystem. *Rodriguésia* 67:583-601.
- Couto, D. R., A. P. Fontana, L. Jean, and C. Kollmann. 2016b. Vascular epiphytes in seasonal

- semideciduous forest in the State of Espírito Santo and the similarity with other seasonal forests in Eastern Brazil. *Acta Scientiarum* 38:169–177.
- Couto, D. R., F. P. Uribe, S. S. Jacques, T. M. Francisco, and R. C. Lopes. 2017. Vascular epiphytes in the Grumari Restinga, RJ: Floristic and similarities between restingas in Eastern Brazil. *Rodriguésia* 68:337–346.
- Coxson, D., and N. Nadkarni. 1995. Ecological roles of epiphytes in nutrient cycles of forest ecosystems *in* Lowman, M. E., and N. M. Nadkarni, ed. *Forest canopies*, 1st ed. Academic Press, San Diego.
- Cruz, A. C. R. 2017. Epífitas vasculares da Ilha Grande: protocolo para amostragem rápida aplicado a estrutura da comunidade em áreas de Mata de Restinga. Universidade Federal Rural do Rio de Janeiro.
- Devens, K. U., A. P. B. Geraldini, R. M. Amadeo, M. G. Caxambu, and P. H. J. Magnoni. 2016. Levantamento de epífitas na arborização urbana do município de Luiziana - Paraná. *Revista da Sociedade Brasileira de Arborização Urbana* 10:1–11.
- Di Pasquo, M., E. Rodríguez, N. N. Otaño, N. Muñoz, and L. Silvestri. 2016. Esporas de helechos (monilofitas) y licofitas presentes en el Parque Nacional El Palmar (Entre Ríos, Argentina). *Boletín de la Sociedad Argentina de Botánica* 51:1–32.
- Dias, A. dos S. 2009. Ecologia de epífitas vasculares em uma área de Mata Atlântica do Parque Nacional da Serra dos Órgãos, Teresópolis, RJ. Universidade Federal Rural do Rio de Janeiro.
- Dislich, R., and W. Mantovani. 1998. A flora de epífitas vasculares da Reserva da Cidade Universitária Armando de Salles Oliveira, São Paulo, Brasil. *Boletim de Botânica da Universidade de São Paulo* 17: 61-83.
- Dislich, R., and W. Mantovani. 2016. Vascular epiphyte assemblages in a Brazilian Atlantic Forest fragment: investigating the effect of host tree features. *Plant Ecology* 217:1–12.
- Dittrich, A. V. D. O., C. Kozera, and S. S. Menezes. 1999. Floristic survey of vascular epiphytes of the Parque Barigui, Curitiba, Paraná, Brazil. *Iheringia, Série Botânica* 52:11–21.
- Dornelas, T. A. F. 2016. Epífitas vasculares do Parque Natural Municipal do Curió, Paracambi, RJ: riqueza, composição de espécies, conservação e relação com outras localidades. Universidade Federal Rural do Rio de Janeiro.
- Eisenlohr, P. V., L. F. Alves, L. C. Bernacci, M. C. G. Padgurschi, R. B. Torres, E. M. B. Prata, F. A. M. dos Santos, M. A. Assis, E. Ramos, A. L. C. Rochelle, F. R. Martins, M. C. R. Campos, F. Pedroni, M. Sanchez, L. S. Pereira, S. A. Vieira, J. A. M. A. Gomes, J. Y. Tamashiro, M. A. S. Scaranello, C. J. Caron, and C. A. Joly. 2013. Disturbances, elevation, topography and spatial proximity drive vegetation patterns along an altitudinal gradient of a top biodiversity hotspot. *Biodiversity and Conservation* 22:2767–2783.
- Falkenberg, D. B. 2003. Matinhas nebulares e vegetação rupícola dos Aparados da Serra Geral (SC/RS), Sul do Brasil. Universidade Estadual de Campinas.
- Faxina, C., E. Fischer, and A. Pott. 2015. Flora of inland Atlantic riparian forests in southwestern Brazil. *Biota Neotropica* 15:1–12.
- Ferreira, M. T. M. 2011. Composição florística e distribuição vertical de epífitas vasculares sobre indivíduos de *Guapira opposita* (Vell.) Reitz (Nyctaginaceae) em um fragmento florestal na Serra da Brígida, Ouro Preto, MG. Universidade Federal de Ouro Preto.
- Fischer, A. E. and A. C. Araújo. 1996. A flora de bromélias no estuário do Rio Verde (Juréia, São Paulo): uma comparação com outras comunidades neotropicais. *Bromélia* 3:19–25.
- Fischer, E. A., and A. C. Araujo. 1995. Spatial organization of a bromeliad community in the Atlantic rainforest, south-eastern Brazil. *Journal of Tropical Ecology* 11:559–567.
- Flora do Brasil 2020 - Algas, Fungos e Plantas. Rio de Janeiro, Brazil. <http://floradobrasil.jbrj.gov.br/reflora/listaBrasil/PrincipalUC/PrincipalUC.do#CondicaoTaxonCP>
- Flores-Palacios, A. 2016. Does structural parasitism by epiphytes exist? A case study between *Tillandsia recurvata* and *Parkinsonia praecox*. *Plant Biology* 18:463–470.
- Fontoura, T., L. Sylvestre, A. M. S. F. Vaz, and C. M. Vieira. 1997. Epífitas vasculares, hemiepífitas e hemiparasitas da Reserva Ecológica de Macaé de Cima. *in* H. C. Lima and R. R. Guedes-Bruni, ed. *Serra de Macaé de Cima: Diversidade florística e conservação em Mata Atlântica*. Jardim Botânico do Rio de Janeiro, Rio de Janeiro.

- Fontoura, T., M. A. Rocca, A. C. Schilling, and F. Reinert. 2009. Epífitas da Floresta Seca da Reserva Ecológica Estadual de Jacarepiá, Sudeste do Brasil: relações com a comunidade arbórea. *Rodriguésia* 60:171–185.
- Fontoura, T., V. V. Scudeller, and A. F. Costa. 2012. Floristics and environmental factors determining the geographic distribution of epiphytic bromeliads in the Brazilian Atlantic Rainforest. *Flora: Morphology, Distribution, Functional Ecology of Plants* 207:662–672.
- Fontoura, T., L. Sylvestre, A. M. S. da F. Vaz, and C. M. Vieira. 1997. Epífitas vasculares, hemiepífitas e hemiparasitas da Reserva Ecológica de Macaé de Cima. *in* H. C. de Lima, R.R. Guedes-Bruni. ed. *Serra de Macaé de Cima: Diversidade florística e conservação em Mata Atlântica*, 1st ed. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro.
- Francisco, T. M. 2017. Interação entre epífitas vasculares e forófitos: estrutura e padrões de distribuição. Universidade Estadual do Norte Fluminense Darcy Ribeiro.
- Freitas, L., A. Salino, L. Menini Neto, T. Almeida, S. R. Mortara, J. Stehmann, A. M. Amorim, E. Guimarães, M. A. Nadruz Coelho, A. Zanin, and R. Forzza. 2016. A comprehensive checklist of vascular epiphytes of the Atlantic Forest reveals outstanding endemic rates. *PhytoKeys* 58:65–79.
- Furtado, S. G. 2016. Ecologia de epífitas vasculares nas florestas nebulares do Parque Estadual do Ibitipoca, Minas Gerais, Brasil.
- Furtado, S. G., and L. Menini Neto. 2015a. Diversity of vascular epiphytes in two high altitude biotopes of the Brazilian Atlantic Forest. *Revista Brasileira de Botânica* 38:295–310.
- Furtado, S. G., and L. Menini Neto. 2015b. Diversity of vascular epiphytes in urban environment: a case study in a biodiversity hotspot, the Brazilian Atlantic Forest. *CES Revista* 29:82–101.
- Furtado, S. G., and L. Menini Neto. 2016. Vascular epiphytic flora of a high montane environment of Brazilian Atlantic Forest: composition and floristic relationships with other ombrophilous forests. *Acta Botanica Brasilica* 30:422–436.
- Ganem, M. A., M. L. Luna, and G. E. Giudice. 2013. Estudio palinológico en especies de *Asplenium* (Aspleniaceae) de Argentina. *Bulletin of the Botanical Society of Argentina* 48:465–476.
- Gentry, A. H. 1982. Neotropical Floristic Diversity: Phytogeographical Connections Between Central and South America, Pleistocene Climatic Fluctuations, or an Accident of the Andean Orogeny? *Annals of the Missouri Botanical Garden* 69:557.
- Gentry, A. H. 1988. Tree species richness of upper Amazonian forests. *Proceedings of the National Academy of Sciences* 85:156–159.
- Gentry, A. H., and C. Dodson. 1987a. Contribution of Nontrees to Species Richness of a Tropical Rain Forest. *Biotropica* 19:149.
- Gentry, A. H., and C. H. Dodson. 1987b. Diversity and Biogeography of Neotropical Vascular Epiphytes. *Annals of the Missouri Botanical Garden* 74:205.
- Geraldino, H. C. L., M. G. Caxambu, and D. C. Souza. 2010. Composição florística e estrutura da comunidade de epífitas vasculares em uma área de ecótono em Campo Mourão, PR, Brasil. *Acta Botanica Brasilica* 24:469–482.
- Giongo, C., and J. L. Waechter. 2004. Composição florística e estrutura comunitária de epífitos vasculares em uma floresta de galeria na Depressão Central do Rio Grande do Sul. *Revista Brasileira de Botânica* 27:563–572.
- Goetze, M., C. M. Zanella, C. Palma-Silva, M. V. Büttow, and F. Bered. 2017. Incomplete lineage sorting and hybridization in the evolutionary history of closely related, endemic yellow-flowered *Aechmea* species of subgenus *Orgiesia* (Bromeliaceae). *American Journal of Botany* 104:1073–1087.
- Goetze, M., C. Palma-Silva, C. M. Zanella, and F. Bered. 2016a. East-to-west genetic structure in populations of *Aechmea calyculata* (Bromeliaceae) from the southern Atlantic rainforest of Brazil. *Botanical Journal of the Linnean Society* 181:477–490.
- Goetze, M., K. Schulte, C. Palma-Silva, C. M. Zanella, M. V. Büttow, F. Capra, and F. Bered. 2016b. Diversification of Bromelioideae (Bromeliaceae) in the Brazilian Atlantic rainforest: A case study in *Aechmea* subgenus *Orgiesia*. *Molecular Phylogenetics and Evolution* 98:346–357.
- Gomes-da-Silva, J. 2013. Análise filogenética de *Vriesea* Lindl. (Bromeliaceae: Tillandsioideae),

- baseada em dados morfológicos e moleculares. Universidade Federal do Rio de Janeiro.
- Gomes-da-Silva, J., and A. F. Costa. 2011. A taxonomic revision of *Vriesea corcovadensis* group (Bromeliaceae: Tillandsioideae) with description of two new species. *Systematic Botany* 36:291-309.
- Gonçalves, C. N., and J. L. Waechter. 2002. Epífitos vasculares sobre espécimes de *Ficus organensis* isoladas no norte da planície costeira do Rio Grande do Sul: padrões de abundância e distribuição. *Acta Botanica Brasilica* 16:429-441.
- Gonçalves C. N., and J. L. Waechter. 2003. Aspectos florísticos e ecológicos de epífitos vasculares sobre figueiras isoladas. *Acta Botanica Brasilica* 17:89-100.
- Gonçalves, F., R. S. Bovendorp, G. Beca, C. Bello, R. Costa-Pereira, R. L. Muylaert, R. R. Rodarte, N. Villar, R. Souza, M. E. Graipel, J. J. Cherem, D. Faria, J. Baumgarten, M. R. Alvarez, E. M. Vieira, N. Cáceres, R. Pardini, Y. L. R. Leite, L. P. Costa, M. A. R. Mello, E. Fischer, F. C. Passos, L. H. Varzinczak, J. A. Prevedello, A. P. Cruz-Neto, F. Carvalho, A. R. Percequillo, A. Paviolo, A. Nava, J. M. B. Duarte, N. U. de la Sancha, E. Bernard, R. G. Morato, J. F. Ribeiro, R. G. Becker, G. Paise, P. S. Tomasi, F. Vélez-Garcia, G. L. Melo, J. Sponchiado, F. Cerezer, M. A. S. Barros, A. Q. S. de Souza, C. C. dos Santos, G. A. F. Giné, P. Kerches-Rogeri, M. M. Weber, G. Ambar, L. V. Cabrera-Martinez, A. Eriksson, M. Silveira, C. F. Santos, L. Alves, E. Barbier, G. C. Rezende, G. S. T. Garbino, É. O. Rios, A. Silva, A. T. A. Nascimento, R. S. de Carvalho, A. Feijó, J. Arrabal, I. Agostini, D. Lamattina, S. Costa, E. Vanderhoeven, F. R. de Melo, P. de Oliveira Laroque, L. Jerusalinsky, M. M. Valença-Montenegro, A. B. Martins, G. Ludwig, R. B. de Azevedo, A. Anzóategui, M. X. da Silva, M. Figuerêdo Duarte Moraes, A. Vogliotti, A. Gatti, T. Püttker, C. S. Barros, T. K. Martins, A. Keuroghlian, D. P. Eaton, C. L. Neves, M. S. Nardi, C. Braga, P. R. Gonçalves, A. C. Srбек-Araujo, P. Mendes, J. A. de Oliveira, F. A. M. Soares, P. A. Rocha, P. Crawshaw, M. C. Ribeiro, and M. Galetti. 2018. Atlantic Mammal Traits: a data set of morphological traits of mammals in the Atlantic Forest of South America. *Ecology* 99:498-498.
- Gonzaga, D. R. 2016. Cactaceae na Serra da Mantiqueira, Brasil: taxonomia, biogeografia e conservação. Escola Nacional de Botânica Tropical.
- Gonzaga, D. R., L. Menini Neto, and A. L. Peixoto. 2017. Cactaceae no Parque Nacional do Itatiaia, Serra da Mantiqueira, Brasil. *Rodriguésia* 68:1397-1410.
- Gotsch, S. G., N. Nadkarni, and A. Amici. 2016. The functional roles of epiphytes and arboreal soils in tropical montane cloud forests. *Journal of Tropical Ecology* 32:455-468.
- Guaraldo, A. C., B. De O. Boeni, and M. A. Pizo. 2013. Specialized Seed Dispersal in Epiphytic Cacti and Convergence with Mistletoes. *Biotropica* 45:465-473.
- Guaraldo, A. C. 2009. Fenologia reprodutiva, distribuição espacial e frugivoria em *Rhipsalis* (Cactaceae). Universidade Estadual Paulista.
- Guimarães, J. C. C., E. Van Den Berg, G. C. Castro, E. L. M. Machado, and A. T. Oliveira-Filho. 2008. Dinâmica do componente arbustivo-arbóreo de uma floresta de galeria aluvial no planalto de Poços de Caldas, MG, Brasil. *Revista Brasileira de Botânica* 31:621-632.
- Hasui, É., J. P. Metzger, R. G. Pimentel, L. F. Silveira, A. A. d. A. Bovo, A. C. Martensen, A. Uezu, A. L. Regolin, A. Â. Bispo de Oliveira, C. A. F. R. Gatto, C. Duca, C. B. Andretti, C. Banks-Leite, D. Luz, D. Mariz, E. R. Alexandrino, F. M. de Barros, F. Martello, I. M. d. S. Pereira, J. N. da Silva, K. M. P. M. d. B. Ferraz, L. N. Naka, L. dos Anjos, M. A. Efe, M. A. Pizo, M. Pichorim, M. S. S. Gonçalves, P. H. C. Cordeiro, R. A. Dias, R. d. L. Muylaert, R. C. Rodrigues, T. V. V. da Costa, V. Cavarzere, V. R. Tonetti, W. R. Silva, C. N. Jenkins, M. Galetti, and M. C. Ribeiro. 2018. Atlantic Birds: a data set of bird species from the Brazilian Atlantic Forest. *Ecology* 99:497-497.
- Hefler, S., and P. Faustioni. 2004. Levantamento florístico de epífitos vasculares do bosque São Cristóvão-Curitiba-Paraná-Brasil. *Revista Estudos de Biologia* 26:11-19.
- Hekavey, C. D. S. 2013. Componente epifítico vascular da Reserva Nhandara Guaricana - Paraná. Pontifícia Universidade Católica do Paraná.
- Hertel, R. J. G. 1950. Contribuição à ecologia da flora epifítica da Serra do Mar - vertente oeste - do Paraná. *Arquivos do Museu Paranaense* 8:3-63.
- Höfling, E., and H. D. A. Camargo. 1999. Aves no campus. Universidade São Paulo.
- Huang, C., S. Kim, A. Altstatt, J. R. Townshend, P. Davis, K. Song, and J. Musinsky. 2007. Rapid

- loss of Paraguay's Atlantic forest and the status of protected areas - A Landsat assessment. *Remote sensing of Environment* 106:460–466.
- INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA - IBGE. 2012. Manual técnico da vegetação brasileira: sistema fitogeográfico, inventário das formações florestais e campestres, técnicas e manejo de coleções botânicas, procedimentos para mapeamentos, 2nd ed. IBGE-Diretoria de Geociências, Rio de Janeiro.
- Jarvis, A. 2000. Measuring and modelling the impact of land-use change in tropical hillsides: The role of cloud interception to epiphytes. *Journal of Environmental Monitoring*:118–148.
- Johansson, D. 1974. Ecology of vascular epiphytes in West African rainforest, 1st ed. *Acta Phytogeographica Suecia*, Uppsala.
- Jungbluth, P., and M. P. Marcelli. 2011. The *Pyxine pungens* complex in São Paulo State, Brazil. *The Bryologist* 114:166–177.
- Jungbluth, P., M. P. Marcelli, and K. Kalb. 2011. A new species and a new record of *Pyxine* (Physciaceae) with norstictic acid from São Paulo State, Brazil. *Mycotaxon* 115:435–442.
- Kaehler, M., I. G. Varassin, and R. Goldenberg. 2005. Polinização em uma comunidade de bromélias em Floresta Atlântica Alto-montana no Estado do Paraná, Brasil. *Revista Brasileira de Botânica* 4:219–228.
- Käffer, M. I., N. M. Koch, A. Aptroot, and S. M. de A. Martins. 2015. New records of corticolous lichens for South America and Brazil. *Plant Ecology and Evolution* 148:111–118.
- Keller, H. A., and S. G. Tressens. 2005. Novedades en *Peperomia* (Piperaceae) para la Argentina, con una clave para las especies de Misiones. *The Bulletin of the Botanical Society of Argentina* 40:297–306.
- Kersten, R. D. A. 2006. Epifitismo Vascular na Bacia do Alto Iguaçu, Paraná. Universidade Federal do Paraná.
- Kersten, R. D. A. 2010. Epífitas vasculares – Histórico, participação taxonômica e aspectos relevantes, com ênfase na Mata Atlântica. *Hoehnea* 37:9–38.
- Kersten, R. A., and L. A. Acra. 2012. Ralph João George Hertel. *Estudos de Biologia* 34:269–279.
- Kersten, R. de A., and Y. S. Kuniyoshi. 2009. Conservação das florestas na bacia do alto Iguaçu, Paraná – Avaliação da comunidade de epífitas vasculares em diferentes estágios serais. *Floresta* 39:51–66.
- Kersten, R. de A., and R. C. Rios. 2013. Epífitas vasculares em áreas de ecótono entre Floresta Ombrófila Mista e Estacional Semidecidual em Misiones, Argentina. *Estudos de Biologia* 35:49.
- Kersten, R. D. A., and S. M. Silva. 2001. Composição florística e estrutura do componente epifítico vascular em floresta da planície litorânea na Ilha do Mel, Paraná, Brasil. *Revista Brasileira de Botânica* 24:213–226.
- Kersten, R. A., and S. M. Silva. 2002. Florística e estrutura do componente epifítico vascular em floresta ombrófila mista aluvial do rio Barigüi, Paraná, Brasil. *Revista Brasileira de Botânica* 25:259–267.
- Kersten, R. de A., and S. M. Silva. 2005. Florística e estrutura de comunidades de epífitas vasculares da planície litorânea. Pages 125–144 in M. C. M. Marques and R. M. Britez, ed. *História natural e conservação da Ilha do Mel*. Editora da UFPR, Curitiba.
- Kersten, R. A., and S. M. Silva. 2006. The floristic compositions of vascular epiphytes of a seasonally inundated forest on the coastal plain of Ilha do Mel Island, Brazil. *Revista de Biologia Tropical* 54:935–942.
- Kersten, R., and J. L. Waechter. 2011. Florística e Estrutura das epífitas vasculares em zona ecotonal entre as Florestas Ombrófilas Mista e Densa, vertente oeste da Serra do Mar paranaense. *Fitossociologia no Brasil: métodos e estudos de caso*:479–503.
- Kersten, R. D. A., Y. S. Kuniyoshi, and C. V. Roderjan. 2009. Vascular epiphytes of two nearby riverside forests, Iguaçu River Basin, Paraná. *Iheringia, Série Botânica* 64:33–43.
- Kessous, I. M., D. R. Couto, F. P. Uribe, and A. F. Costa. 2018. New records of *Vriesea agostiniana* E. Pereira, and *Vriesea saltensis* Leme & L. Kollmann (Bromeliaceae, Tillandsioideae) from southeastern Brazil. *Check List*, 14:37–41.
- Kessous, I. M., and A. F. Costa. 2017. A New Name and New Status in *Vriesea* (Bromeliaceae) from Brazil. *Novon: A Journal for Botanical Nomenclature* 25(4):434–435.

- Knops, J. M. H., T. H. Nash, and W. H. Schlesinger. 1996. The influence of epiphytic lichens on the nutrient cycling of an Oak Woodland. *Ecological Monographs* 66:159–179.
- Koch, N. M., C. Branquinho, P. Matos, P. Pinho, F. Lucheta, S. M. A. Martins, and V. M. F. Vargas. 2016. The application of lichens as ecological surrogates of air pollution in the subtropics: a case study in South Brazil. *Environmental Science and Pollution Research* 23:20819–20834.
- Koch, N. M., R. W. Maluf, and S. M. A. Martins. 2012. Comunidade de líquens foliosos em *Piptocarpha angustifolia* Dusén ex Malme (Asteraceae) em área de Floresta Ombrófila Mista no estado do Rio Grande do Sul. *Iheringia* 67:47–57.
- Koch, N. M., S. M. D. A. Martins, F. Lucheta, and S. C. Müller. 2013. Functional diversity and traits assembly patterns of lichens as indicators of successional stages in a tropical rainforest. *Ecological Indicators* 34:22–30.
- Kreft, H., N. Köster, W. Küper, J. Nieder, and W. Barthlott. 2004. Diversity and biogeography of vascular epiphytes in Western Amazonia, Yasuní, Ecuador. *Journal of Biogeography* 31:1463–1476.
- Küper, W., H. Kreft, J. Nieder, N. Köster, and W. Barthlott. 2004. Large-scale diversity patterns of vascular epiphytes in Neotropical montane rain forests. *Journal of Biogeography* 31:1477–1487.
- Labiak, P. H., F. B. Matos, G. Rouhan, J. G. Hanks, and R. C. Moran. 2017. Notes on the Taxonomy and Growth Habits of Three Species of *Campyloneurum* (Polypodiaceae) from Southeastern Brazil. *American Fern Journal* 107:1–20.
- Lasky, J. R., and T. H. Keitt. 2012. The Effect of Spatial Structure of Pasture Tree Cover on Avian Frugivores in Eastern Amazonia. *Biotropica* 44:489–497.
- Leitman, P., A. M. Amorim, J. B. B. Sansevero, and R. C. Forzza. 2015. Floristic patterns of epiphytes in the Brazilian Atlantic Forest, a biodiversity hotspot. *Botanical Journal of the Linnean Society* 179:587–601.
- Leme, E. M. 1999. New species of Brazilian Bromeliaceae: a tribute to Lyman B. Smith. *Harvard Papers in Botany* 4:135–168.
- Leme, E. M. C. 2002. Two new additions to the genus *Vriesea* from Bahia, Brazil. *Journal Bromeliad Society* 52:216–221.
- Lenzi, M., J. Z. de Matos, and A. I. Orth. 2006. Variação morfológica e reprodutiva de *Aechmea lindenii* (E. Morren) Baker var. *lindenii* (Bromeliaceae). *Acta Botanica Brasilica* 20:487–500.
- Liboni, A. P. 2018. Florestas secundárias em paisagens agrícolas com matriz de cana-de-açúcar: diversidade florística e implicações para estratégias de conservação da biodiversidade. Universidade Estadual de Campinas.
- Lima, F., G. Beca, R. L. Muylaert, C. N. Jenkins, M. L. L. Perilli, A. M. O. Paschoal, R. L. Massara, A. P. Paglia, A. G. Chiarello, M. E. Graipel, J. J. Cherem, A. L. Regolin, L. G. R. Oliveira Santos, C. R. Brocardo, A. Paviolo, M. S. Di Bitetti, L. M. Scoss, F. L. Rocha, R. Fusco-Costa, C. A. Rosa, M. X. Da Silva, L. Hufnagell, P. M. Santos, G. T. Duarte, L. N. Guimarães, L. L. Bailey, F. H. G. Rodrigues, H. M. Cunha, F. M. Fantacini, G. O. Batista, J. A. Bogoni, M. A. Tortato, M. R. Luiz, N. Peroni, P. V. De Castilho, T. B. Maccarini, V. P. Filho, C. De Angelo, P. Cruz, V. Quiroga, M. E. Iezzi, D. Varela, S. M. C. Cavalcanti, A. C. Martensen, E. V. Maggiorini, F. F. Keesen, A. V. Nunes, G. M. Lessa, P. Cordeiro-Estrela, M. G. Beltrão, A. C. F. De Albuquerque, B. Ingberman, C. R. Cassano, L. C. Junior, M. C. Ribeiro, and M. Galetti. 2017. Atlantic-Camtraps: a dataset of medium and large terrestrial mammal communities in the Atlantic Forest of South America. *Ecology* 98:2979.
- Lopes, A. V. F. 2002. Polinização por beija-flores em remanescente da Mata Atlântica pernambucana, nordeste do Brasil. Universidade Estadual de Campinas.
- Machado, C. G., and J. Semir. 2006. Fenologia da floração e biologia floral de bromeliáceas ornitófilas de uma área da Mata Atlântica do Sudeste brasileiro. *Revista Brasileira de Botânica* 29:163–174.
- Mai, P., A. Rossado, J. M. Bonifacino, and J. L. Waechter. 2016. Taxonomic revision of *Peperomia* (Piperaceae) from Uruguay. *Phytotaxa* 244:125–144.
- Mania, L. F., and R. Monteiro. 2010. Florística e ecologia de epífitas vasculares em um fragmento

- de floresta de restinga, Ubatuba, SP, Brasil. *Rodriguésia* 61:705–713.
- Marcelli, M. P., and L. S. Canêz. 2008. Novelties on Southern Brazilian Parmeliaceae. *Mycotaxon* 105:225–234.
- Márquez, G. J., and A. Yañez. 2012. Helechos epífitos de *Alsophila setosa* (Cyatheaceae, Pteridophyta) en la provincia de Misiones, Argentina. *Boletín de la Sociedad Argentina de Botánica* 47:435–442.
- Márquez, G., G. E. Giudice, and M. M. Ponce. 2006. Pteridofitas de la Reserva “Valle del Arroyo Cuña Pirú” (Misiones, Argentina). *Darwiniana* 44:108–126.
- Martínez, O. G., F. C. Assis, E. I. Meza Torres, D. A. Cacharani, and D. G. Jaimez. 2016. El género *Pecluma* (Polypodiaceae) en Argentina. *Darwiniana* 4:234–251.
- Martins, L. N. 2017a. A comunidade de epífitas vasculares na palmeira *Acrocomia aculeata* (Jacq.) Lodd. Mart. isoladas em área de pastagem: composição, riqueza e estrutura. Universidade Federal Rural do Rio de Janeiro.
- Martins, C. 2017b. Biologia reprodutiva e nichos de polinização em cactos epífitos. Universidade Federal do Rio de Janeiro.
- Matos, F. B., A. M. Amorim, and P. H. Labiak. 2010. The ferns and lycophytes of a montane Tropical forest in Southern Bahia, Brazil. *Journal of the Botanical Research Institute of Texas* 4:333–346.
- Matos, F. B., and J. T. Mickel. 2014. The Brazilian species of *Elaphoglossum* section Polytrichia (Dryopteridaceae). *Brittonia* 66:371–395.
- Matos, F. B., and J. T. Mickel. 2018. The Brazilian species of *Elaphoglossum* section Setosa (Dryopteridaceae). *Brittonia* 2:173–205.
- Mazziero, F. F. F., and F. R. Nonato. 2015. Ferns and lycophytes from Jaú, São Paulo, Brazil. *Check List* 11:1–10.
- Mazziero, F. F. F., P. H. Labiak, and M. L. B. Paciencia. 2015. Checklist of ferns and lycophytes from the Parque Estadual Turístico do Alto Ribeira, Iporanga, São Paulo, Brazil. *Check List* 11:1–9.
- Mendes, A. 2017. Determinação de fatores locais e de paisagem que influenciam a abundância e diversidade de epífitas em florestas secundárias situadas na bacia hidrográfica do rio Corumbataí. Universidade de São Paulo.
- Menini Neto, L., S. G. Furtado, D. C. Zappi, A. T. de Oliveira-Filho, and R. C. Forzza. 2016. Biogeography of epiphytic Angiosperms in the Brazilian Atlantic forest, a world biodiversity hotspot. *Revista Brasileira de Botânica* 39:261–273.
- Mesacasa, L. 2017. Florística e distribuição espacial de epífitas vasculares em fragmentos de Ombrófila Mista, município de Nova Alvorada, RS. Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Sul.
- Meza-Torres, E. I., G. J. Marquez, E. R. de la Sota, and M. S. Ferrucci. 2008. Nuevas citas en *Argyroschisma* y *Vittaria* (Pteridophyta) del NE Argentino. *Darwiniana* 46:360–366.
- Meza-Torres, E. I., M. S. Ferrucci, H. Keller, and G. J. Marquez. 2006. Presencia de *Doryopteris lomariacea* (Pteridaceae, Pteridophyta) en Argentina. *Bonplandia* 15:3–4.
- Ministério do Meio Ambiente - MMA. 2006. Law nº 11.428, from 22. dec. 2006. Brazil, DF.
- Mittermeier, R. A., P. P. van Dijk, A. G. J. Rhodin, and S. D. Nash. 2004. Hotspots Revisited: Earth's Biologically Richest and Most Endangered Ecoregions, 2nd ed. The University of Chicago Press, Chicago.
- Monalisa-Francisco, N. 2017. Influência de parâmetros locais e da paisagem sobre comunidades de epífitas vasculares em pastagens. Universidade Federal de Alenas.
- Moreira, D. M. 2016. Levantamento florístico das angiospermas na Estação Ecológica Estadual Wenceslau Guimarães, Bahia, Brasil. Cruz das Almas, Bahia.
- Moura, R. L. 2011. Revisão Taxonômica do Grupo *Vriesea platynema* Gaudich. (Bromeliaceae). Universidade Federal do Rio de Janeiro.
- Morellato, L. P. C., and C. F. B. Haddad. 2000. Introduction: The Brazilian Atlantic Forest. *Biotropica* 32:786–792.
- Muñoz, N. E., M. Di Pasquo, F. Biganzoli, and W. B. Batista. 2017. Análisis aeropalínológico en tres áreas de vegetación dentro del parque Nacional el Palmar (colón, entre ríos) y su relación con la vegetación local y regional. *Boletín de la Sociedad Argentina de Botánica* 52:473–496.

- Muyllaert, R. D. L., R. D. Stevens, C. E. Esbérard, M. A. Mello, G. S. Garbino, L. H. Varzinczak, D. Faria, M. D. M. Weber, P. Kerches Rogeri, A. L. Regolin, and H. F. D. Oliveira, 2017. ATLANTIC BATS: a data set of bat communities from the Atlantic Forests of South America. *Ecology* 98:3227–3227.
- Mycobank Databse. Fungal data base, Nomenclature & Species Bank. 2018. International Mycological Association. Exeter, United Kingdom. <http://www.mycobank.org/>.
- Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. Fonseca, and J. Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403:853–858.
- Nervo, M. H. 2016. Padrões de diversidade de samambaias e licófitas em um gradiente altitudinal na floresta atlântica no sul do Brasil. Universidade Federal do Rio Grande do Sul.
- Nervo, M. H., F. V. da Silva Coelho, P. G. Windisch, and G. E. Overbeck. 2016. Fern and lycophyte communities at contrasting altitudes in Brazil's subtropical Atlantic Rain Forest. *Folia Geobotanica* 51:305–317.
- Nieder, J., S. Engwald, and W. Barthlott. 1999. Patterns of Neotropical Epiphyte Diversity. *Selbyana* 20:66–75.
- Nunes-Freitas, A. F. 2004. Bromeliáceas da Ilha Grande: variação inter-habitats na composição, riqueza e diversidade da comunidade. Universidade do Estado do Rio de Janeiro.
- Oliveira-Filho, A. T., W. A. C. Carvalho, E. Tameirão-Neto, E. Tameirão-Neto, W. A. C. Carvalho, M. Werneck, M. Werneck, A. E. Brina, A. E. Brina, C. V. Vidal, C. V. Vidal, S. C. Rezende, S. C. Rezende, J. A. A. Pereira, and J. A. A. Pereira. 2005. Análise florística de compartimento arbóreo de áreas de floresta atlântica sensu lato da região das bacias do leste (Bahia, Minas Gerais, Espírito Santo e Rio de Janeiro). *Rodriguésia* 56:185–235.
- Oliveira-Filho, A. T., and M. A. L. Fontes. 2000. Patterns of Floristic Differentiation among Atlantic Forests in Southeastern Brazil and the Influence of Climate. *Biotropica* 32:793–810.
- Oliveira, A. A. de, and D. Daly. 1999. Geographic distribution of tree species in the region of Manaus, Brazil: implications for regional diversity and conservation. *Biodiversity and Conservation* 8:1219–1244.
- Olson, D.M., E. Dinerstein, E. D. Wikramanayake, N. D. Burgess, G. V. N. Powell, E. C. Underwood, J. A. D'amico, I. Itoua, H. E. Strand, J. C. Morrison, C. J. Loucks, T. F. Allnutt, T. H. Ricketts, Y. Kura, J. F. Lamoreux, W. W. Wettengel, P. Hedao, and K. R. Kassem. 2001. Terrestrial Ecoregions of the World: A New Map of Life on Earth: A new global map of terrestrial ecoregions provides an innovative tool for conserving biodiversity, *BioScience* 51:933–938.
- Padilha, P. T., R. S. Santos Junior, S. Z. Custódio, L. C. Oliveira, R. Santos and V. Citadini-Zanette. 2015. Comunidade epifítica vascular do Parque Estadual da Serra Furada, sul de Santa Catarina, Brasil. *Ciências e Natura* 37:64–78.
- Pereira, A. R., A. C. S. de Andrade, T. S. Pereira, R. C. Forzza, and A. S. Rodrigues. 2009. Comportamento germinativo de espécies epífitas e rupícolas de Bromeliaceae do Parque Estadual do Ibitipoca, Minas Gerais, Brasil. *Revista Brasileira de Botânica* 32:827–838.
- Petean, M. P. 2003. Florística e estrutura dos epífitos vasculares em uma área de Floresta Ombrófila Densa Altomontana no Parque Estadual do Pico do Marumbi, Morretes, Paraná, Brasil. Universidade Federal do Paraná.
- Petean, M. 2009. As epífitas vasculares em uma área de Floresta Ombrófila Densa em Antonina, PR. Universidade Federal do Paraná.
- Piacentini, V. de Q., and I. G. Varassin. 2007. Interaction network and the relationships between bromeliads and hummingbirds in an area of secondary Atlantic rain forest in southern Brazil. *Journal of Tropical Ecology* 23:663–671.
- Pike, L. H. 1978. The importance of epiphytic lichens in mineral cycling. *Bryologist* 81:247–257.
- Pincheira-Ulbrich, J., C. E. Hernández, A. Saldaña, F. Peña-Cortés, and F. Aguilera-Benavente. 2016. Assessing the completeness of inventories of vascular epiphytes and climbing plants in Chilean swamp forest remnants. *New Zealand Journal of Botany* 54:458–474.
- Pincheira-Ulbrich, J., J. R. Rau, and C. Smith-Ramírez. 2012. Diversidad de plantas trepadoras y epífitas vasculares en un paisaje agroforestal del sur de Chile: Una comparación entre fragmentos de bosque nativo. *Boletín de la Sociedad Argentina de Botánica* 47:411–426.
- Pitman, N. C. A., J. W. Terborgh, M. R. Silman, P. Núñez V., D. A. Neill, C. E. Cerón, W. A.

- Palacios, and M. Aulestia. 2002. A comparison of tree species diversity in two upper Amazonian Forests. *Ecology* 83:3210–3224.
- Pitman, N. C. A., J. W. Terborgh, M. R. Silman, P. V. Núñez, D. A. Neill, C. E. Cerón, W. A. Palacios, and M. Aulestia. 2001. Dominance and distribution of tree species in upper Amazonian terra firme forests. *Ecology* 82:2101–2117.
- R Core Team. 2018. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.
- Reis, J. R. de M., and T. Fontoura. 2009. Diversidade de bromélias epífitas na Reserva Particular do Patrimônio Natural Serra do Teimoso - Jussari, BA. *Biota Neotropica* 9:73–79.
- Ribeiro, D. C. A. 2009. Estrutura e composição de epífitas vasculares em duas formações vegetais na Ilha da Marambaia - Mangaratiba, RJ. Universidade Federal Rural do Rio de Janeiro.
- Ribeiro, M. C., J. P. Metzger, A. C. Martensen, F. J. Ponzoni, and M. M. Hirota. 2009. The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservation. *Biological Conservation* 142:1141–1153.
- Rocca-de-Andrade, M. A. 2006. Recurso floral para aves em uma comunidade de Mata Atlântica de encosta. Universidade Estadual de Campinas.
- Rodrigues, A. R. P., R. C. Forzza, and A. C. S. Andrade. 2014. Physiological characteristics underpinning successful cryopreservation of endemic and endangered species of Bromeliaceae from the Brazilian Atlantic Forest. *Botanical Journal of the Linnean Society* 176:567–578.
- Rogalski, J. M. 2002. Distribuição espacial de bromélias e aráceas epifíticas em diferentes situações topográficas de Floresta Ombrófila Densa, Ilha de Santa Catarina/SC. Universidade Federal de Santa Catarina.
- Rogalski, J. M., and E. M. Zanin. 2003. Composição florística de epífitos vasculares no estreito de Augusto César, Floresta Estacional Decidual do Rio Uruguai, RS, Brasil. *Revista Brasileira de Botânica* 26:551–556.
- Rosanelli, R. L. 2007. Florística e estrutura comunitária de epífitos vasculares em uma Floresta Estacional Decidual do sul do Brasil. Universidade do Oeste de Santa Catarina.
- Santos, A. C. L. 2008. Composição florística e estrutura da comunidade de epífitas vasculares associadas a trilhas no Parque Estadual das Fontes do Ipiranga, São Paulo, SP, Brasil. Instituto de Botânica da Secretaria de Estado do Meio Ambiente.
- Sazima, I., S. Buzato, and M. Sazima. 1995. The Saw-Billed Hermit *Ramphodon naevius* and its flowers in Southeastern Brazil. *Journal Fur Ornithologie* 136:195–206.
- Sazima, M., and I. Sazima. 1999. The perching bird *Coereba flaveola* as a co-pollinator of bromeliad flowers in southeastern Brazil. *Canadian Journal of Zoology* 77:47–51.
- Scheffers, B. R., B. L. Phillips, and L. P. Shoo. 2014. *Asplenium* bird's nest ferns in rainforest canopies are climate-contingent refuges for frogs. *Global Ecology and Conservation* 2:37–46.
- Schutz-Gatti, A. L. 2000. O componente epifítico vascular na Reserva Salto Morato, Guaraqueçaba, PR. Universidade Federal do Paraná.
- Silva, M. P. P., and K. C. Pôrto. 2013. Bryophyte communities along horizontal and vertical gradients in a human-modified Atlantic Forest remnant. *Botany* 91:155–166.
- Silva, M. P. P., and K. C. Pôrto. 2015. Diversity of bryophytes in priority areas for conservation in the Atlantic forest of northeast Brazil. *Acta Botanica Brasilica* 29:16–23.
- Siqueira-Filho, J. A., and E. M. C. Leme. 2006. Fragmentos de Mata Atlântica do Nordeste: biodiversidade, conservação e suas bromélias, 1st ed. Andrea Jakobsson Estúdio, Rio de Janeiro.
- Siqueira-Filho, J. A. de, and I. C. S. Machado. 2001. Biologia reprodutiva de *Canistrum aurantiacum* E. Morren (Bromeliaceae) em remanescente da Floresta Atlântica, Nordeste do Brasil. *Acta Botanica Brasilica* 15:427–443.
- Siqueira-Filho, J. D. 1998. Biologia floral de *Hohenbergia ridleyi* (Baker) Mez. *Bromélia* 5:1–4.
- Smith, L. B. and R. J. Downs. 1977. Tillandsioideae (Bromeliaceae). *Flora Neotropica Monograph* 14:663–1492.
- Snow, D. W., and B. K. Snow. 1986. Feeding ecology of hummingbirds in the Serra do Mar, south-eastern Brazil. *El Hornero* 12:286–296.

- Sota, E. R., and M. A. Morbelli. 1985. *Pteris longifolia* L. o *P. vittata* L. (Adiantaceae, Pteridophyta). Lo que ocurre en Argentina. Physis, Secciones A, B y C:73–83.
- Spielmann, A. A., and M. P. Marcelli. 2008a. *Bulbothrix viatica*, a new species of Parmeliaceae from Brazil. Mycotaxon 103:201–205.
- Spielmann, A. A., and M. P. Marcelli. 2008b. *Punctelia* (Parmeliaceae, lichenized Ascomycota) from roadsides and slopes in the Serra Geral of Rio Grande do Sul, Brazil. Biociências 16:79–91.
- Spielmann, A. A., and M. P. Marcelli. 2008c. Parmeliaceae (Ascomycota liquenizados) nos barrancos e peraus da encosta da Serra Geral, Vale do Rio Pardo, Rio Grande do Sul, Brasil. II. Gêneros *Canoparmelia*, *Hypotrachyna*, *Myelochroa*, *Parmelinopsis* e *Relicina*. Iheringia, Série Botânica 63(2):193–212.
- Stanton, D. E., J. Huallpa Chávez, L. Villegas, F. Villasante, J. Armesto, L. O. Hedin, and H. Horn. 2014. Epiphytes improve host plant water use by microenvironment modification. Functional Ecology 28:1274–1283.
- Staudt, M.G., A. P. U. Lippert, S. Cunha S, D. F. P. Becker, M. S. Marchioreto, and J. L. Schmitt. 2012. Composição florística de epífitos vasculares do Parque Natural Municipal Tupancy, Arroio do Sal, RS, Brasil. Pesquisas, Botânica 63:177–188.
- Stehmann, J. R., R. C. Forzza, A. Salino, M. Sobral, D. P. Costa, and L. H. Y. Kamino. 2009. Plantas da Floresta Atlântica, 1st ed. Jardim Botânico do Rio de Janeiro, Rio de Janeiro.
- Stuntz, S., C. Ziegler, U. Simon, and G. Zotz. 2002. Diversity and structure of the arthropod fauna within three canopy epiphyte species in central Panama. Journal of Tropical Ecology 18:161–176.
- ter Steege, H., and J. H. C. Cornelissen. 1989. Distribution and Ecology of Vascular Epiphytes in Lowland Rain Forest of Guyana. Biotropica 21:331.
- ter Steege, H., N. Pitman, D. Sabatier, H. Castellanos, P. Van Der Hout, D. C. Daly, M. Silveira, O. L. Phillips, R. Vásquez Martínez, T. van Andel, J. Duivenvoorden, A. Adalardo de Oliveira, R. Ek, R. Lilwah, R. Thomas, J. van Essen, C. Baider, P. Maas, S. Mori, J. Terborgh, P. Núñez Vargas, H. Mogollón, and W. Morawetz. 2003. A spatial model of tree alpha-diversity and tree density for the Amazon. Biodiversity and Conservation 12:2255–2277.
- The Plant List. Version 1.1. 2013. www.theplantlist.org.
- Tressens, S. G., H. A. Keller, and V. Revilla. 2008. Las plantas vasculares de la reserva de uso múltiple Guaraní, Misiones (Argentina). Boletín de la Sociedad Argentina de Botánica 43:273–293.
- Tropicos. 2018. Missouri Botanical Garden. Saint Louis, EUA. <http://www.tropicos.org>.
- Valebella, M., and M. Sager. 2010. *Oncidium hians* (Orchidaceae), nueva especie para la flora de Argentina. Bonplandia 19:65–69.
- Varassin, I. G. 2002. Estrutura Espacial e Temporal de uma Comunidade de Bromeliaceae e seus polinizadores em Floresta. Universidade Estadual de Campinas.
- Varassin, I. G., and M. Sazima. 2012. Spatial heterogeneity and the distribution of bromeliad pollinators in the Atlantic Forest. Acta Oecologica 43:104–112.
- Vasconcelos, L. V. 2017. Cactaceae no Parque Estadual Serra da Tiririca, Rio de Janeiro, Brasil. Universidade Estácio de Sá.
- Vidal, M. G. 2013. Diversidade e Estratificação Vertical de Bromélias Epífitas em área de Mata Atlântica, Sul da Bahia. Universidade Estadual de Santa Cruz.
- Vieira, P. R. 2009. Distribuição espacial de epífitos vasculares em uma formação savanóide de *Butia capitata* (Arecaceae) no sul do Brasil. Universidade Federal do Rio Grande do Sul.
- Waechter, J. W. 1986. Epífitos vasculares da mata paludosa do Faxinal, Torres, Rio Grande do Sul, Brasil. Iheringia, Série Botânica 34:39–49.
- Waechter, J. L. 1992. O epifitismo vascular na Planície Costeira do Rio Grande do Sul. Universidade Federal de São Carlos.
- Waechter, J. L. 1998. Epifitismo vascular em uma floresta de restinga do Brasil subtropical. Ciência & Natura 20:43–66.
- Wagner, K., Mendieta-Leiva, G., Zotz, G., 2015. Host specificity in vascular epiphytes: a review of methodology, empirical evidence and potential mechanisms. AoB Plants 7:1–25.
- Wolowski, M., T. L. Ashman, and L. Freitas. 2013. Community-wide assessment of pollen

- limitation in hummingbird-pollinated plants of a tropical montane rain forest. *Annals of Botany* 112:903–910.
- World Wide Fund for Nature. WWF-Brasil. 1996. Brasília, Brazil. https://www.wwf.org.br/wwf_brasil/.
- Yañez, A., G. Marquez, and A. Ganem. 2011. *Asplenium uniseriale* (Aspleniaceae): Una nueva cita para la flora argentina y novedades respecto a su hábito. *Boletín de la Sociedad Argentina de Botánica* 46:355–359.
- Yanoviak, S. P., N. M. Nadkarni, and R. Solano J. 2007. Arthropod assemblages in epiphyte mats of Costa Rican cloud forests. *Biotropica* 39:202–210.
- Zandoná, L.R., and E. L. M. Catharino. 2015. Orchidaceae no Parque Estadual da Cantareira e sua conservação. *Revista do Instituto Florestal* 27:83-101.
- Zanella, C. M. 2013. Padrões históricos e processo de hibridação entre duas espécies simpátricas de bromélias da Mata Atlântica. Universidade Federal do Rio Grande do Sul.
- Zanella, C. M., C. Palma-Silva, M. Goetze, and F. Bered. 2016. Hybridization between two sister species of Bromeliaceae: *Vriesea carinata* and *V. incurvata*. *Botanical Journal of the Linnean Society* 181:491–504.
- Zanotti, C. A., M. A. Suescún, and G. Mathieu. 2012. Sinopsis y novedades taxonómicas de *Peperomia* (Piperaceae) en la Argentina. *Darwiniana* 50:124–147.
- Zorzanelli, J. P. F., H. M. Dias, A. G. da Silva, and S. H. Kunz. 2017. Vascular plant diversity in a Brazilian hotspot: floristic knowledge gaps and tools for conservation. *Revista Brasileira de Botânica* 40:819–827.
- Zotz, G. 2013. The systematic distribution of vascular epiphytes-a critical update. *Botanical Journal of the Linnean Society* 171:453–481.
- Zotz, G. 2016. *Plants on Plants – The Biology of Vascular Epiphytes*, 1st ed. Springer, Berlin.