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Original Paper

Orchidaceae in a fragment of restinga on the north coast of Bahia, Brazil

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Abstract
Área de Proteção Ambiental das Lagoas e Dunas do Abaeté (APA Abaeté) is an urban fragment of restinga in an environmentally protected area in the municipality of Salvador, Bahia, Brazil. The area is impacted by irregular disposal of solid waste, clandestine removal of sand from dunes, suppression and fragmentation of original vegetation cover and urban growth of neighborhoods. A recent floristic study revealed new records of orchid species for this conservation unit but highlighted strong threats to the orchid flora. In this context, a taxonomic study of Orchidaceae in APA Abaeté was undertaken with the aim of facilitating the recognition of species in the field and supporting the establishment of more effective local conservation actions for orchids, which should include the manual dispersion of seeds and the relocation of individuals. Orchidaceae is the sixth most represented family in APA Abaeté, with 15 genera and 19 species, including *Encyclia dichroma* and *Koellensteinia florida*, endemic species of the Atlantic Forest. The most relevant morphological characteristics for the identification of species in the area are: growth type; climbing habit; caulome thickness; shape and consistency of leaf blades; inflorescence type and position; and color and resupination of flowers.
Key words: Atlantic Forest, Conservation Unit, orchids, Salvador, taxonomy.

Resumo
A Área de Proteção Ambiental das Lagoas e Dunas do Abaeté (APA Abaeté) constitui um fragmento urbano de restinga no município de Salvador, estado da Bahia, Brasil. A área sofre com o descarte irregular de resíduos sólidos, a retirada clandestina de areia das dunas, a supressão e fragmentação da cobertura vegetacional original e o crescimento urbano dos bairros circundantes. Um estudo florístico recente revelou novos registros de espécies de orquídeas para esta Unidade de Conservação, mas destacou que a flora orquidológica está fortemente ameaçada. Neste contexto, foi realizado um estudo taxonômico das orquídeas da APA Abaeté, com o objetivo de facilitar o reconhecimento das espécies em campo e apoiar o estabelecimento de ações de conservação locais mais eficazes para as orquídeas, que devem abranger a dispersão manual de sementes e a realocação de indivíduos. Orchidaceae é a sexta família mais representativa na APA Abaeté, com 15 gêneros e 19 espécies, incluindo *Encyclia dichroma* e *Koellensteinia florida*, espécies endêmicas da Mata Atlântica. As características morfológicas mais relevantes na identificação das espécies da área são: tipos de crescimento; volubilidade e espessamento do cauloma; forma e consistência das lâminas foliares; tipo e posição da inflorescência; cor e ressupinação das flores.
Palavras-chave: Mata Atlântica, Unidade de Conservação, orquídeas, Salvador, taxonomia.

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Introduction

Orchidaceae has high species richness in the Brazilian Atlantic Forest, including dozens of ornamentals plus endangered and endemic species (Barberena *et al*. 2018, 2019a; Flora do Brasil 2020). The state of Bahia encompasses centers of endemism for fauna and flora of the Atlantic Forest (Silva & Casteleti 2003; Aguiar *et al.* 2005; Murray-Smith *et al.* 2009) represented by protected forest remnants, as well as priority landscapes for the establishment of restoration actions (Ribeiro *et al.* 2009; Tambosi 2014).

Orchidaceae is one of the most representative botanical families in Brazilian restingas, with 51 genera and 78 species occurring in restinga remnants of Bahia alone (Assis *et al.* 2004; Flora do Brasil 2020). Although several comprehensive floristic studies of phanerogamic flora have been carried out in restinga formations in the state (Britto *et al.* 1993; Queiroz 2007; Queiroz *et al.* 2012; Gomes & Guedes 2014; Fernandes & Queiroz 2015), taxonomic studies of Orchidaceae have been conducted exclusively in inland regions of Bahia, mainly in the region of Chapada Diamantina (Silva 2002; Smidt 2003; Ribeiro *et al.* 2005; Azevedo & van den Berg 2007; Vieira *et al.* 2014).

Barberena *et al.* (2019a) recently reported new records of orchid species for a fragment of restinga in the municipality of Salvador, but also highlighted that the orchid flora is strongly threatened due to intense environmental impacts, which reflects the population sizes and ecological specificities of the species. High rates of human population growth and expansion and drastic changes in the landscape have been reported for the north coast of Bahia over the last few decades, but especially in the metropolitan region of Salvador (Silva 1993; Queiroz 2007). In this context, we undertook a taxonomic study of Orchidaceae of the aforementioned restinga fragment, which is surrounded by the international airport of Salvador and expanding neighborhoods, with the aim of facilitating the recognition of species in the field and supporting the establishment of more effective local conservation actions for orchids.

Material & Methods

Study area

Área de Proteção Ambiental das Lagoas e Dunas do Abaeté (APA Abaeté) is an environmentally protected area located in the municipality of Salvador on the northern coast of the state of Bahia (12°54'–12°57'S, 38°18'–38º21'W; Ministério do Meio Ambiente do Brasil 2020) (Fig. 1). This conservation unit covers about 1,800 ha and was established for the preservation of its dune-lagoon ecosystem, which was strongly threatened by anthropic actions (Diário Oficial do Estado da Bahia 1987). The zoning of APA Abaeté was performed later with the delimitation of a permanent preservation zone and a controlled exploitation zone, predominantly for residential use (Diário Oficial do Estado da Bahia 1993). Currently, APA Abaeté encompasses two large and less anthropized vegetational remnants: Parque Metropolitano e Ambiental das Lagoas e Dunas do Abaeté, with about 270 ha, and the Parque Municipal das Dunas, with about 290 ha (Diário Oficial do Município de Salvador 2011).

Even so, the area is impacted by irregular disposal of solid waste, clandestine removal of sand from dunes and concentrations of large numbers of tourists in certain localities, such as at Lagoa do Abaeté (Schiavone 2014). Also worrying is the suppression and fragmentation of the original vegetation cover due to urban growth in the surroundings, which includes residential buildings, airport development, paved roads and commercial establishments, as well as incipient predatory collection of plant specimens (Silva *et al.* 1993; Silva 2012; Barberena *et al.* 2019a).

The restinga of APA Abaeté consists of a phytophysiognomic mosaic formed by open areas interspersed with patches of herbaceous formations and a great number of shrubs of varying sizes (Silva 2012). There are also fragments of restinga forest formations with species up to 15 meters high and a predominance of *Attalea funifera* Mart. (Arecaceae), in addition to marsh areas and permanent and temporary lagoons (Fig. 2). The present study adopted the definitions of restinga phytophysiognomies proposed by CONAMA (2009). Complementary phytophysiographic data can be obtained from Barberena *et al.* (2019a).

Data collection and analysis

Field work was carried out ocasionally from October 2014 to November 2015, and monthly, uninterruptedly, from December 2015 to February 2018, by employing the walking survey method (Filgueiras *et al.* 1994). Collected specimens were herborized according to the usual techniques for taxonomic works (Peixoto & Maia 2013) and

deposited in the ALCB herbarium, with duplicates at the herbaria CEN, HUEFS, MBM, MBML and RB. Floral samples were also fixed in 70% ethanol, to facilitate morphological studies, and later deposited in the wet collection of the RB herbarium (RBspirit). Collections of the herbaria ALCB, CEPEC, HUEFS, HRB and RB were examined, while digitized materials available online from the herbarium F were also consulted (acronyms according to Thiers, continuously updated). The analyzed specimens were identified by comparison with specimens deposited in the ALCB herbarium and by consulting specific references in Orchidaceae, including original diagnoses.

Flowering and fruiting data, including fruit morphometry, and localities of occurrence of the species were mostly obtained in the field and complemented by information available on specimen labels. Details of *in situ* specimens and habitats were recorded using digital photographs. A stereoscopic microscope was used in the analysis and identification of material and an electronic digital caliper or a millimeter ruler were used to measure vegetative and reproductive structures. The morphological concepts of Pridgeon *et al.* (1999) were adopted for the description of taxa. The correct name, data about geographical distribution and threat categories of the species are in accordance with Flora do Brasil (2020). Complementary distribution data were obtained from Govaerts *et al.* (2020) and Tropicos (2020) for species with extra-Brazilian distributions. Epiphytic species were classified in the ecological categories proposed by Benzing (1990). A map of the area was elaborated using the ARC-GIS software version 10.2.

The taxonomic treatment presented here provides an identification key for the species and species accounts including descriptions, phenological data, taxonomic comments and ecological and conservation information. Also provided are photos and lists of material examined.

Results and Discussion

A total of 19 species of 15 genera were identified in APA Abaeté, which increases the

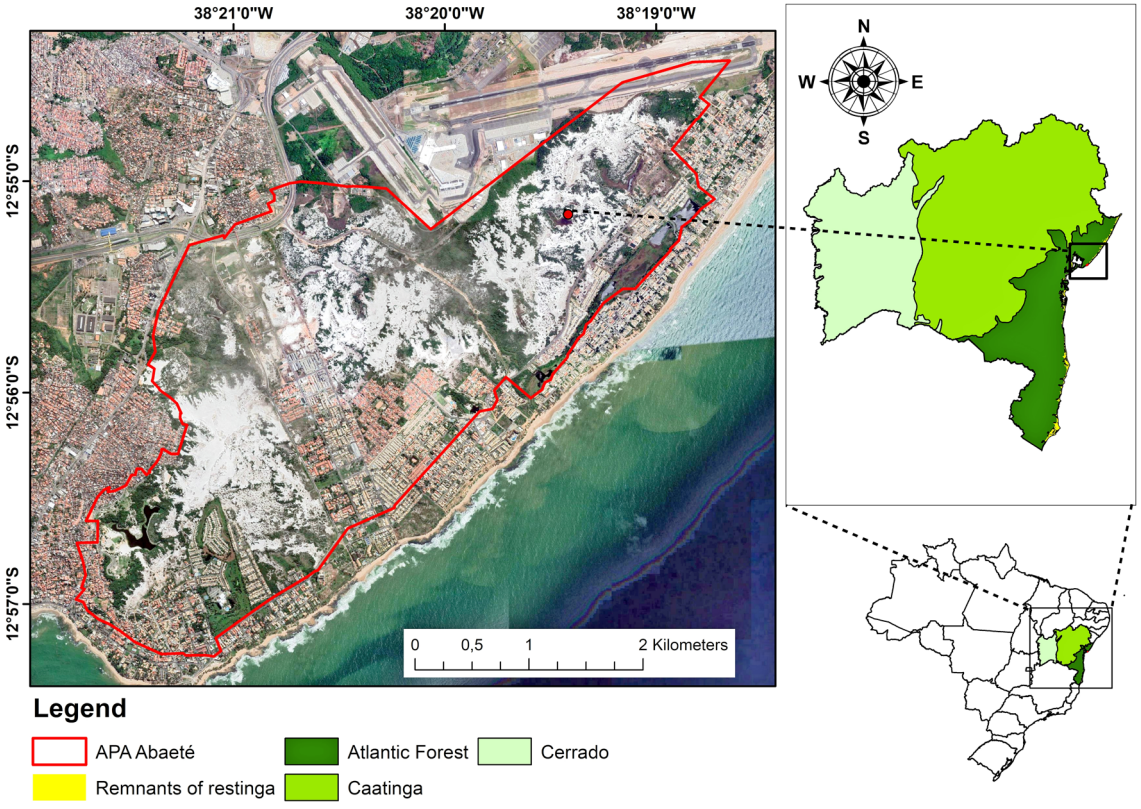

Figure 1 – Map showing Área de Proteção Ambiental das Lagoas e Dunas do Abaeté (APA Abaeté) in the municipality of Salvador, Bahia, Brazil. Map produced by José Antônio Lima Rocha Junior.

number of listed species by about 46% and makes Orchidaceae the sixth most representative family in the area (Britto *et al.* 1993; Silva 2012). Highlighted is the occurrence of *Encyclia dichroma* (Lindl.) Schltr. and *Koellensteinia florida* (Rchb.f.) Garay, two endemic species of the Atlantic Forest, in addition to nine species restricted to Brazil that occur in the Atlantic Forest and at least one other phytogeographic domain - *Cyrtopodium flavum* Link & Otto *ex*

Figure 2 – a-f. Área de Proteção Ambiental das Lagoas e Dunas do Abaeté (APA Abaeté) in the municipality of Salvador, Bahia, Brazil – a. Lagoa do Camarão (permanent lagoon) near the locality of Mata da Baronesa; b. shrub formation; c. boundaries of APA Abaeté near the airport; d. urban growth of neighborhoods near APA Abaeté; e. restinga forest formation; f. interior of a fragment of restinga forest formation. Photographs by Felipe Fajardo Villela Antolin Barberena.

Rchb.f., *Cyrtopodium holstii* L.C. Menezes, *Epidendrum cinnabarinum* Salzm., *Epistephium williamsii* Hook.f., *Galeandra montana* Hook.f., *Habenaria schenckii* Cogn., *Pelexia viridis* (Cogn.) Schltr., *Prescottia leptostachya* Lindl. and *Vanilla bahiana* Hoehne. Also registered were *Brassavola tuberculata* Hook., *Catasetum roseoalbum* (Hook.) Lindl., *Epidendrum orchidiflorum* (Salzm.) Lindl. and *Vanilla palmarum* (Salzm. *ex* Lindl.) Lindl., with South American distributions; *Cyrtopodium parviflorum* Lindl., with South and Central American distribution; *Eltroplectris calcarata* (Sw.) Garay & Sweet, with a distribution throughout the Americas; and the Pantropical species *Liparis nervosa* (Thumb.) Lindl. and *Oeceoclades maculata* (Lindl.) Lindl. (Figs. 3; 4).

Some species have restricted distributions in the state of Bahia, such as *C. roseoalbum*, which occurs exclusively in restingas (Bastos & van den Berg 2012), and *P. leptostachya* which has been found in rocky outcrop vegetation of Chapada Diamantina and in disjoint areas of restinga (Azevedo *et al.* 2014). Most species in the study area, until now that is, have been known to expressive populations of more than 50 individuals, but *E. williamsii*, *H. schenckii* and *V. palmarum* have been considered threatened due to low numbers of individuals and/or restricted distributions in the area, and thus require specific conservation actions (Barberena *et al.* 2019a). *Cyrtopodium parviflorum* and *K. florida* may have been suppressed locally or are restricted to the inaccessible area of the airport, as they have not been collected for decades, despite recent intense efforts (Barberena *et al.* 2019a). The orchid species of APA Abaeté are mainly established in restinga forest remnants (68%), areas known to be more shaded, although several species (58%) occur in shrub formations. Only *C. roseoalbum* and *G. montana* are ever found fully exposed to the sunlight in open areas.

The most relevant morphological characteristics for the identification of species in the area are: growth type; climbing habit; caulome thickness; number of leaves; shape, consistency, venation and presence/absence of macules on leaf blades; inflorescence type and position; presence/absence of calcar and trichomes on the flowers; color and resupination of flowers; shape of the apex of the sepals; division and shape of the lip; and margin of the central lobe.

Taxonomic treatment

Key to the species of Orchidaceae of APA Abaeté

1. Herb with monopodial growth; climber.
   2. Characteristic holoepiphyte; internodes 1–3.5 cm long; leaves peciolate, blades ovate to oval-lanceolate; sepals and petals yellow..... 19. *Vanilla palmarum*
   2’. Secondary hemiepiphyte; internodes (4–)7–15 cm long; leaves sessile, blades oblong; sepals and petals green .....18. *Vanilla bahiana*

1’. Herb with sympodial growth; erect (non-climber).
   3. Caulomes (secondary stems) thickened in pseudobulbs.
      4. Pseudobulbs homoblastic (composed of two or more internodes).
         5. Leaf blades membranaceous; lip genuflex (Fig. 4d) .....14. *Liparis nervosa*
         5’. Leaf blades chartaceous; lip straight.
            6. Flowers calcarate; inflorescence terminal .....11. *Galeandra montana*
            6’. Flowers ecalcarate; inflorescence lateral.
               7. Inflorescence a raceme; flowers unisexual, non-resupinate (Fig. 3c)..... ..... 2. *Catasetum roseoalbum*
               7’. Inflorescence a panicle; flowers bisexual, resupinate (Fig. 3d).
                  8. Sepals and petals maculate; lip with central lobe margin curly-verrucose .....4. *Cyrtopodium holstii*
                  8’. Sepals and petals immaculate; lip with central lobe margin slightly undulate.
                     9. Sepals and petals dark purple ..... 5. *Cyrtopodium parviflorum*
                     9’. Sepals yellow to greenish-yellow; petals yellow..... ..... 3. *Cyrtopodium flavum*

4’. Pseudobulbs heteroblastic (composed of one internode).
10. Leaf blades maculate; flowers calcarate.....15. *Oeceoclades maculata*
10’. Leaf blades immaculate; flowers ecalcarate.
11. Leaf blades coriaceous, conduplicate; inflorescence terminal .....7. *Encylia dichroma*
11’. Leaf blades chartaceous, plicate; inflorescence lateral ..... 13. *Koellensteinia florida*
3’. Caulomes (secondary stems) not thickened in pseudobulbs.
12. Leaf blades cylindrical .....1. *Brassavola tuberculata*
12’. Leaf blades flat.
13. Leaf blades papyraceous or membranaceous.
14. Leaf blades silvery-green; flowers non-resupinate, ecalcarate .....
.....17. *Prescottia leptostachya*
14’. Leaf blades green or dark green; flowers resupinate, calcarate.
15. Leaves sessile; inflorescence glabrous; petals bifid .....12. *Habenaria schenckii*
15’. Leaves peciolate; inflorescence pilose; petals entire.
16. Leaf blades membranaceous, narrow-elliptical to ovate; flowers glabrous; sepals with long-acuminate apex; lip trilobed.....6. *Eltroplectris calcarata*
16’. Leaf blades papyraceous, oblong to linear-lanceolate; flowers pilose; sepals with acute to acuminate apex; lip entire.....16. *Pelexia viridis*
13’. Leaf blades subcoriaceous to coriaceous.
17. Leaf blades reticulate-veined; perianth with epicalyx ..... 10. *Epistephium williamsii*
17’. Leaf blades obscurely parallel-veined; perianth without epicalyx.
18. Sepals and petals green, resupinate; lip entire..... 9. *Epidendrum orchidiflorum*
18’. Sepals and petals orange to red-orange, non-resupinate; lip trilobed .....
.....8. *Epidendrum cinnabarinum*

Orchidaceae in APA Abaeté

1. *Brassavola tuberculata* Hook., Bot. Mag. 56: t. 2878. 1829. Fig. 3a

Facultative holoepiphytic, erect (non-climber) herb with sympodial growth. Caulomes 0.4–13.7 cm long, not thickened in pseudobulbs, cylindrical. Leaf 1, sessile, apical; blade (4.1–)6.4–29.1 × 0.1–0.4 cm, green, coriaceous, cylindrical, margin revolute, apex acute. Inflorescence 7.5–15.5 cm long, raceme, terminal, 1–3(–5)-flowered; bracts and floral bracts 0.4–0.5 cm long. Flowers bisexual, resupinate, ecalcarate; pedicel+ovary 4.1–11.2 cm long; sepals and petals brownish-yellow, margin entire; dorsal sepal 1.5–3.5 × 0.3–0.6 cm, narrow-elliptical to oblong-lanceolate, apex acute; lateral sepals 1.5–3 × 0.3–0.6 cm, oblong to oblong-lanceolate, falcate, apex acute; petals 1.5–3.2 × 0.2–0.4 cm, narrow-elliptical to lanceolate, falcate, apex acute; lip 1.7–2.4 × 1.3–1.8 cm, greenish-yellow at the base, white to the apex, entire, ovate to suborbicular, margin entire to slighlty undulate, apex apiculate, callus ca. 1.1 × 0.1 cm, 1, basal, lamellar; column 0.8–1.1 cm long, white; anther cap ca. 0.2 × 0.2 cm, cream, subquadrangular; pollinia 0.12–0.125 × ca. 0.07 cm, 8, obtriangular, laterally flattened. Capsules 7–7.5 × 1.2–1.9 cm, green, ellipsoid.

Examined material: 14.V.1961, *A.L. Costa 868*, *869* (ALCB); 24.V.1981, *A.M. Carvalho et al. 725* (HRB); 24.V.1981, *M.L. Guedes 202* (ALCB); 16.II.1982, *R. Ribeiro et al. 341* (HRB); 2.IV.1983, *L.P. Queiroz 531* (ALCB); 20.IV.1983, *L.P. Queiroz 536* (ALCB, HUEFS); 9.VIII.1986, *L.P. Queiroz 943* (HUEFS); IX.1998, *C. Longa* (ALCB 49039); 20.X.2000, *M.M. Silva et al. 506* (HUEFS); 12.XI.2005, *E.P. Queiroz & F.A. Queiroz 1245* (HRB); 3.X.2013, *D.N. Carvalho 370* (HUEFS); 25.X.2014, *F.F.V.A. Barberena et al. 329* (ALCB); 10.IV.2015, *A.M. Anjos & F.F.V.A. Barberena 2* (ALCB); 14.V.2016, *F.F.V.A. Barberena & T.S. Sousa 366* (ALCB, RBspirit).

Brassavola tuberculata occurs in Bolivia, Paraguay and Brazil, where it is found in the Atlantic Forest, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020; Govaerts *et al.* 2020; Tropicos 2020). It is easily recognized at APA Abaeté by having a 1-foliate caulome, cylindrical leaf blades, brownish-yellow sepals and the greenish-yellow lip at the base and white to the apex. The species has been observed with flowers from February to December, and with fruits in April, May, October and November.

In APA Abaeté, *B. tuberculata* occurs in shrub and restinga forest formations growing on *Guettarda platypoda* DC. (Rubiaceae) and *Vitex*

Figure 3 – a-i. Species of Orchidaceae of Área de Proteção Ambiental das Lagoas e Dunas do Abaeté (APA Abaeté) in the municipality of Salvador, Bahia, Brazil – a. *Brassavola tuberculata*; b-c. *Catasetum roseoalbum* – b. male flowers; c. female flowers; d. *Cyrtopodium flavum*; e. *Cyrtopodium holstii*; f. *Eltroplectris calcarata*; g. *Encyclia dichroma*; h. *Epidendrum cinnabarinum*; i. *Epidendrum orchidiflorum*. Photographs: a,c,e-i. Felipe Fajardo Villela Antolin Barberena; b,d. Leandro Vieira dos Santos Aguiar.

Figure 4 – a-i. Species of Orchidaceae of Área de Proteção Ambiental das Lagoas e Dunas do Abaeté (APA Abaeté) in the municipality of Salvador, Bahia, Brazil – a. *Epistephium williamsii*; b. *Galeandra montana*; c. *Habenaria schenckii*; d. *Liparis nervosa*; e. *Oeceoclades maculata*; f. *Pelexia viridis*; g. *Prescottia leptostachya*; h. *Vanilla bahiana*; i. *Vanilla palmarum*. Photographs: a,b,d-i. Felipe Fajardo Villela Antolin Barberena; c. Tailane Alves do Nascimento.

cymosa Bertero *ex* Spreng. (Lamiaceae) at 2.5 m from the soil. The species is not threatened in the area since it has a population of more than 200 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as Mata Fechada, along the Interpretative Trail and near Lagoa do Urubu, Lagoa da Alameda and Lagoa do Abaeté. Seedlings were observed in all localities of occurrence of the species.

2. *Catasetum roseoalbum* (Hook.) Lindl., Edwards's Bot. Reg. 26: Misc. 65. 1840. Fig. 3b-c

Accidental holoepiphytic, erect (non-climber) herb with sympodial growth. Caulomes 5–26.6 cm long, thickened in pseudobulbs, homoblastic, conical to narrow-conical. Leaves 5–7, sessile, distributed along the caulome; blades 4.3–34 × (1.4–)2–7.4 cm, dark green, chartaceous, flat, ovate to narrow-elliptical, margin entire, apex acute to acuminate. Inflorescence 28.5–83.3 cm long, raceme, lateral, 2–4 female flowers or 10–22 male flowers; bracts 0.8–1 cm long; floral bracts 0.5–1.2 cm long. Flowers unisexual, non-resupinate, ecalcarate. Female flowers with pedicel+ovary 1.8–3.2 cm long; sepals and petals pale green, margin entire; dorsal sepal 1.2–1.3 × ca. 0.5 cm, lanceolate, apex acute; lateral sepals ca. 1.6 × 0.5 cm, oblong, apex acute; petals ca. 1.5 × 0.5 cm, oblong, apex obtuse; lip 2.3–2.9 × 1.7–2.3 cm, green, entire, saciform, straight, margin fimbriate, apex rounded to acute; column 0.5–0.8 cm long, green. Male flowers with pedicel+ovary 2.3–2.7 cm long; sepals and petals pale yellow to greenish-yellow, oblong, apex obtuse; dorsal sepal 1.2–1.6 × 0.3–0.6 cm; lateral sepals 1.4–1.6 × 0.3–0.6 cm; petals 1.5–1.9 × 0.3–0.6 cm; lip trilobed, straight; lateral lobes 0.4–0.5 × 0.8–1, yellowish to yellowish-orange, transverse elliptical, margin fimbriate, apex irregular; central lobe ca. 0.6 × 0.8 cm, yellowish to yellowish-orange, saciform, margin fimbriate, apex emarginate; column 0.5–1.1 cm long, white; anther cap 0.35–0.4 × 0.35–0.5 cm, subquadrangular; pollinia ca. 0.2–0.33 × 0.1–0.16 cm, 2, elliptical; stipe 0.4–0.5 × 0.2–0.4 cm; viscide 0.1–0.15 × 0.1–0.13 cm. Capsules ca. 4 × 2 cm, greyish-green, ellipsoid.

Examined material: 11.XII.1985, *L.R. Noblick & I.C. Britto 4456* (HUEFS); 14.I.1986, *L.P. Queiroz 934* (HUEFS); 9.VIII.1986, *L.P. Queiroz 945* (HUEFS); 4.I.1987, *L.P. Queiroz 1401*, *1403* (HUEFS); 24.X.1999, *C.B. Nascimento & J. Costa 88, 89* (HRB); 15.XI.2014, *F.F.V.A. Barberena & L.V.S. Aguiar 332* (ALCB); 9.XII.2015, *F.F.V.A. Barberena & T.S. Sousa 341*, *343* (ALCB, RBspirit); 19.X.2016, *F.F.V.A. Barberena & T.S. Sousa 388* (ALCB).

Catasetum roseoalbum occurs in Colombia, Venezuela, Guyana, Suriname and Brazil, where it is found in the Atlantic Forest and Amazon phytogeographic domains (Flora do Brasil 2020; Govaerts *et al.* 2020; Tropicos 2020). In APA Abaeté, the species could be confused, when sterile, with specimens of *Cyrtopodium* R.Br.; however, it is distinghished from species of *Cyrtopodium* by having dark green and ovate to narrow-elliptical leaf blades (*vs.* pale green and linear leaf blades), in addition to racemous inflorescences (*vs.* paniculate inflorescences) and unisexual and non-resupinate flowers (*vs.* bisexual and resupinate flowers). The species has been observed with flowers in August and from October to January, and with fruits from October to March.

In APA Abaeté, *C. roseoalbum* occurs in open areas (bare sand) and in shrub and restinga forest formations (Barberena *et al.* 2019a), predominantly associated with patches of *Lagenocarpus rigidus* Nees (Cyperaceae). Six individuals were observed growing on *Syagrus schizophylla* (Mart.) Glassman (Areaceae) at 1.45–3 m from the soil, and a single individual was observed growing on *Ocotea notata* (Nees & Mart.) Mez (Lauraceae) at 5 cm from the soil. The species is not threatened in the area since it has a population of more than 200 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as along the Interpretative Trail and near Condomínio Petromar, Lagoa do Abaeté and Mata da Baronesa.

3. *Cyrtopodium flavum* Link & Otto *ex* Rchb.f., Iconogr. Bot. Exot. 3: 7, t. 214. 1830. Fig. 3d

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes 14–60 cm long, thickened in pseudobulbs, homoblastic, fusiform. Leaves 4–9, sessile, distributed along the caulome; blades 5.8–34.5 × 0.4–3.4 cm, pale green, chartaceous, flat, linear, margin entire, apex acute to acuminate. Inflorescence 33–150 cm long, panicle, lateral, 13–66-flowered; bracts 1.7–5.9 cm long; floral bracts 0.5–2.5 cm long. Flowers bisexual, resupinate, ecalcarate; pedicel+ovary 1–2.8 cm long; sepals and petals immaculate, margin entire to slighlty undulate; dorsal sepal 1.1–1.9 × 0.7–1 cm, yellow to greenish-yellow, ovate-elliptical, apex acute; lateral sepals ca. 1.1–1.8 × 0.7–0.9 cm, yellow to greenish-yellow, ovate, apex acute; petals 1.3–1.7 × 1–1.1 cm, yellow, obovate to elliptical, apex obtuse to rounded; lip trilobed, straight; disc 0.25–0.3 × ca. 0.1 cm, red lamellar calluses on the disc; lateral lobes 0.7–0.9 × 0.6–0.7

cm, yellow, oblong-obovate, margin entire, apex rounded; central lobe 0.8–0.9 × 1.3–1.4 cm, yellow, trapeziform, margin slightly undulate, apex retuse to emarginate; column 0.5–0.6 cm long, green; anther cap ca. 0.23 × 0.17 cm, obovoid; pollinia ca. 1.15 × 0.7–0.75 cm, 2, narrow-elliptical. Capsules 5.5–6.7 × 1.6–2 cm, brownish-green, ellipsoid, 6-ribbed.

Examined material: 20.XI.1983, *L.P. Queiroz 773* (ALCB); 11.XII.1985, *L.R. Noblick & I.C. Britto 4463* (HUEFS); XI.1996, *M.L. Guedes 982* (ALCB); 4.I.1987, *L.P. Queiroz 1405* (HUEFS); 30.X.1991, *L.P. Queiroz 2493* (HUEFS); 5.XI.1996, *B.F. Viana et al. 129* (HUEFS); 7.XII.1996, *M.L. Guedes et al. 3909* (ALCB); 12.XI.2005, *E.P. Queiroz & A.P. Queiroz 1246* (HRB); 30.XI.2012, *M.L. Guedes & Alunos da disciplina BIO043/2012 20282* (ALCB); 6.VII.2013, *M.L. Guedes & Alunos de Bot. III 2013.1 20712* (ALCB). 15.XI.2014, *F.F.V.A. Barberena* & *L.V.S. Aguiar 333* (ALCB, RB); 9.XII.2015, *F.F.V.A. Barberena & T.S. Sousa 342* (ALCB, RB, RBspirit).

Cyrtopodium flavum is restricted to Brazil where it is found in Atlantic Forest and Cerrado phytogeographic domains (Flora do Brasil 2020). It is vegetatively very similar to the other species of *Cyrtopodium* at APA Abaeté and can only be identified when fertile. *Cyrtopodium flavum* is distinghished from *C. holstii* by having immaculate sepals and petals with the central lobe of the lip having an undulate margin (*vs.* maculate sepals and petals and central lobe of the lip with curly-verrucose margin) and from *C. parviflorum* by yellow to greenish-yellow sepals and yellow petals (*vs.* dark purple sepals and petals). When sterile, it can also be confused with *C. roseoalbum* (see comments for the previous species). The species has been observed with flowers in July and from October to January, and with fruits from November to June.

In APA Abaeté, *Cyrtopodium flavum* occurs in shrub and restinga forest formations (Barberena *et al*. 2019a). The species is not threatened in the area since it has a population of more than 100 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as along the Interpretative Trail and near Lagoa Vitória, Lagoa do Urubu, Lagoa 2&2, Lagoa SOS, Lagoa do Abaeté and Mata da Baronesa. The species has been assessed as Least Concern at the national level (Flora do Brasil 2020).

4. *Cyrtopodium holstii* L.C. Menezes, Schlechteriana 4(4): 149. 1993. Fig. 3e

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes 20–39.6 × 3.5–6.5 cm long, thickened in pseudobulbs, homoblastic, fusiform. Leaves 6–10, sessile, distributed along the caulome; blades 37–63 × 5.4–7.7 cm, pale green, chartaceous, flat, linear, margin entire, apex acute to acuminate. Inflorescence 79–86 cm long, panicle, lateral, 55–60-flowered; bracts 2.7–5.6 cm long, vinaceous-brownish; floral bracts 0.8–2.7 cm long, green, with vinaceous macules. Flowers bisexual, resupinate, ecalcarate; pedicel+ovary 1.6–3.3 cm long; sepals brownish-green, with brown macules, elliptical, margin undulate; dorsal sepal 1.5–1.8 × 0.7–0.8 cm, apex obtuse; lateral sepals 1.5–1.8 × 0.7–1 cm, apex acute; petals 0.9–1.5 × 0.6–0.9 cm, brownish-green, with brown macules, spatulate, margin undulate, apex rounded; lip trilobed, straight, without fimbriae; disc ca. 0.3 × 0.35 cm, yellowish-white verrucous calluses, with brown spots; lateral lobes 0.8–0.9 × 0.8–0.9 cm, yellow at the base, red to the apex, orbicular, slighlty inflex, margin entire, apex rounded; lobe central 0.5–0.7 × 1–1.4 cm, yellow, with vinous macules, brownish at the apex, flabellate, margin curly-verrucous, apex retuse; column 0.5–0.6 cm long, green; anther cap ca. 0.3 × 0.17 cm, obovoid; pollinia ca. 0.125–0.13 × 0.075–0.085 cm, 2, narrow-elliptical. Capsules 4.7–6.6 × 1.5–3.4 cm, brownish-green, up to 10 per infrutescence, oblongoid to obovoid, 6-ribbed.

Examined Material: 14.I.2002, *J. Costa & C.B.N. Costa 331* (HUEFS); 12.I.2016, *F.F.V.A. Barberena & T.S. Sousa 344* (ALCB, HUEFS, HUESB, MBML, RBspirit), *347* (ALCB).

Cyrtopodium holstii is restricted to Brazil, where it is widely distributed in the Northeast Region, being found in Amazon, Caatinga and Atlantic Forest phytogeographic domains (Flora do Brasil 2020). It is vegetatively very similar to the other species of *Cyrtopodium* at APA Abaeté, but is distinguished by maculate sepals and petals and the central lobe of the lip having a curled-verrucose margin (*vs*. immaculate sepals and petals and the central lobe of the lip with undulate margin). When sterile, it could also be confused with *C. roseoalbum* (see comments for the previous species). The species has been observed with flowers from January to March, and with fruits from February to August.

In APA Abaeté, *Cyrtopodium holstii* occurs exclusively in shrub formations (Barberena *et al.* 2019a). The species is not threatened in the area since it has a population of around 100 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as near Condomínio Petromar and

mainly near Lagoa Vitória and Mata da Baronesa. The species has been assessed as Least Concern at the national level (Flora do Brasil 2020).

5. *Cyrtopodium parviflorum* Lindl., London J. Bot. 2: 672. 1843.

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes 11.6–50 cm long, thickened in pseudobulbs, homoblastic, fusiform. Leaves 12, sessile, distributed along the caulome; blades 11.5–20 × 0.5–1 cm, pale green, chartaceous, flat, linear, margin entire, apex acuminate. Inflorescence ca. 52.8 cm long, panicle, lateral, 18–23-flowered; bracts 2.1–2.2 cm long; floral bracts 1.2–1.4 cm long. Flowers bisexual, resupinate, ecalcarate; pedicel+ovary 0.8–1.8 cm long; sepals and petals dark purple, immaculate, margin entire to slighlty undulate; dorsal sepal ca. 1 × 0.5 cm, ovate, apex acute; lateral sepals 1–1.1 × ca. 0.6 cm, ovate, apex acute; petals ca. 1 × 0.6 cm, elliptical, apex rounded; lip trilobed, straight, without fimbriae; disc not seen; lateral lobes 0.8–0.9 × 0.3–0.4 cm, dark purple, oblong, margin entire, apex rounded; central lobe ca. 0.6 × 0.9 cm, dark purple at the base, yellow to the apex, reniform, margin slightly undulate, apex retuse; column ca. 0.6 cm long; anther cap not seen; pollinia not seen. Capsules not seen.
Examined material: 12.XII.1985, *L.R. Noblick & I.C. Britto 4479* (HUEFS).
Additional examined material: BRAZIL. GOIÁS: Alto Paraíso, Chapada dos Veadeiros, área à esquerda da pista na GO-118, em direção à Teresina de Goiás, ca. 20 km após e ao norte de Alto Paraíso, na altura do km 187, ca. de 1-1,5 km antes do morro com o cruzeiro, *J.A.N. Batista & E.R. Pansarin 1154* (CEN).

Cyrtopodium parviflorum occurs in Trinidad & Tobago, Venezuela, Guyana, Suriname, French Guiana, Bolivia and Brazil, where it is found in the Atlantic Forest, Amazon, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020; Govaerts *et al.* 2020; Tropicos 2020). It can only be identified at APA Abaeté when in bloom by its dark purple sepals and petals and the dark purple lip at the base and yellow to the apex. When sterile, the species could be confused with the other species of *Cyrtopodium* and also with *C. roseoalbum* (see comments for the previous species). The species was collected with flowers in December. Description of leaf morphology was taken from an additional specimen examined (Batista *& Pansarin 1954*, CEN).

In APA Abaeté, *C. parviflorum* occurs exclusively in shrub formations, but it may have been suppressed locally (Barberena *et al.* 2019a), since the species, considered rare in the APA in the 1980s (Noblick & Britto 4479), has only been recorded at Lagoa do Urubu and has not been collected for 35 years, despite recent exhaustive field efforts. The species has been assessed as Least Concern at the national level (Flora do Brasil 2020).

6. *Eltroplectris calcarata* (Sw.) Garay & Sweet, J. Arnold Arbor. 53(3): 390. 1972. Fig. 3f

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes inconspicuous, not thickened in pseudobulbs. Leaves 1–4, peciolate, basal; pecioles 6–19 cm long; blades 6,7–17,8 × 3–6,3 cm, dark green, membranaceous, narrow-elliptical to ovate, margin entire, apex acute to slightly acuminate. Inflorescence 58–81 cm long, raceme, lateral, pilose, 6–12-flowered; bracts 2.1–4.4 cm long; floral bracts 2–2.5 cm long. Flowers bisexual, resupinate, calcarate, glabrous; pedicel+ovary 2–2.1 cm long; sepals and petals greenish-white at the base, white to the apex, margin entire, apex long-acuminate; dorsal sepals 2.7–3 × 0.5–0.6 cm, oval-lanceolate; lateral sepals 3.9–4.2 × 0, 3–0.4 cm, linear-lanceolate; petals 2.1–2.2 × ca. 0.3 cm, entire, narrow-elliptical to lanceolate; lip subtrilobed; lateral lobes ca. 0.5 × 0.1–0.2 cm, white, slightly semiorbicular, margin fimbriate, apex cleft; central lobe ca. 1 × 0.6 cm, white, triangular, margin fimbriate, apex acuminate; calcar 1.4–1.5 cm long, green, cylindrical; column ca. 1 cm long, rostrate; anther cap ca. 0.7 × 0.2 cm, oval-lanceolate; pollinia granular. Capsules 2–2.2 × 0.8–0.9 cm, green, oblongoid to narrow-ellipsoid.
Examined material: 8.XII.2003, *C. van den Berg 1057* (HUEFS); 23.IX.2016, *F.F.V.A. Barberena & T.S. Sousa 402* (ALCB).

Eltroplectris calcarata occurs in the United States, Caribbean, Ecuador, Colombia, Venezuela, Suriname, Peru, Bolivia, Paraguay and Brazil, where it is found in the Atlantic Forest and Cerrado phytogeographic domains (Flora do Brasil 2020; *Govaerts et al.* 2020; Tropicos 2020). It is distinguished from the other species at APA Abaeté by having greenish-white sepals and petals at the base and white to the apex, and linear-lanceolate lateral sepals with a long and acuminate apex. The species has been observed with flowers in September, and with fruits in September and December.

In APA Abaeté, *E. calcarata* occurs exclusively in restinga forest formations (Barberena *et al.* 2019a). The species is not threatened in

the area since it has a population of about 150 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as near the airport, Lagoa do Urubu, Mata Fechada and Mata da Baronesa. The species has been assessed as Least Concern at the national level (Flora do Brasil 2020).

7. *Encyclia dichroma* (Lindl.) Schltr., Orchideen 1(2): 29. 1914. Fig. 3g

Facultative holoepiphytic, erect (non-climber) herb with sympodial growth. Caulomes 3.5–10.5 cm long, thickened in pseudobulbs, heteroblastic, conical. Leaves 1–3, sessile, apical; blades 11,5–34,6 × 1–2,3 cm, yellow to green, immaculate, coriaceous, linear, conduplicate, margin entire, apex obtuse, rare acute. Inflorescence 30.4–90.5 cm, raceme, terminal, 4–10-flowered. Flowers bisexual, resupinate, ecalcarate; pedicel + ovary 1.9–3.8 cm long; sepals pink to white-lilac, margin entire, apex acute; dorsal sepal 2.3–2.6 × 0.4–0.9 cm, lanceolate; lateral sepals 2.1–2.5 × 0.5–0, 9 cm, oblong to lanceolate; petals 2.3–2.7 × 0.9–1.5 cm, pink to white-lilac, spatulate, margin entire, apex obtuse to slightly mucronate; lip trilobed, isthmus 0.4–0.5 cm long; lateral lobes ca. 1.3 × 0.4–0.7 cm, white at the base, pink at 2/3-apical, rectangular to slightly obovate, retroflex, apex obtuse, margin entire; central lobe 0.8–1 × 0.8–1.4 cm, white at the base, pinkish-dark to vinous at 3/4-apical, with pinkish-blackish veins, spatulate, noticeably revolute, margin undulate, apex emarginate; column 1.3–1.5 × 0.4–0.5 cm, white to white-green, clavate, column wings ca. 0.2 × 0.1 cm, oblong, inflex, apex obtuse; anther cap ca. 0.23 × 0.24 cm, yellow, subquadratic; pollinia 0.14–0.15 × 0.1–0.11 cm, 4, obtriangular, laterally flattened. Capsules 2–2.5 × 1–1.1 cm, green, subgloboid.

Examined material: 10.I.1970, *Carlinda & Zélia* (ALCB 15223); 10.II.1980, *L.R. Noblick 1673* (ALCB, HUEFS); 2.I.1982, *A.M. Carvalho et al. 1094* (CEPEC); 27.I.1983, *T. Plowman 12765* (CEPEC, F); 2.IV.1983, *M.L. Guedes 614* (ALCB); 27.II.1983, *L.P. Queiroz 500* (ALCB, HUEFS); 27.III.1983, *L.P. Queiroz 513* (ALCB, HUEFS); 12.XII.1985, *L.R. Noblick & I.C. Britto 4478* (CEPEC, HUEFS); 12.II.1987, *L.P. Queiroz 1410* (HUEFS); 21.I.1987, *R.M. Harley & M.L. Guedes 24100* (ALCB); 2.III.1990, *M. Campos et al.* (ALCB 21876); *B.F. Viana et al. 131* (HUEFS); 5.III.1996, *B.F. Viana 132a* (HUEFS); 11.X.2001, *M.L. Guedes et al. 8961* (ALCB); 10.IV.2015, *A.M. Anjos & F.F.V.A. Barberena 1* (ALCB); 16.XII.2015, *F.F.V.A. Barberena & T.S. Sousa 351* (ALCB, CEN, RB, RBspirit); 20.II.2016, *F.F.V.A. Barberena & T.S. Sousa 352* (ALCB); 13.III.2016, *F.F.V.A. Barberena & T.S. Sousa 356* (ALCB).

Encyclia dichroma is restricted to Brazil (occurring only in the states of Pernambuco, Sergipe and Bahia) and is endemic to the Atlantic Forest (Flora do Brasil 2020). It can be easily recognized in APA Abaeté by the caulome thickened in conical pseudobulbs and spatulate petals and central lobe of the lip. The species has been observed with flowers in October and from December to April, and with fruits in February and March.

In APA Abaeté, the species occurs in shrub and restinga forest formations (Barberena *et al.* 2019a). The species was observed growing on *Leptolobium bijugum* (Fabaceae) at 5 cm from the soil, and also on *Ouratea* sp. (Ochnaceae) (HUEF 166). *Encyclia dichroma* is not threatened in the area since it has a population of almost 200 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as near Lagoa da Vitória, Lagoa da Alameda, Lagoa do Urubu, Lagoa 2&2 and Mata Fechada.

8. *Epidendrum cinnabarinum* Salzm., Bot. Mus. Leafl. 106. 1831. Fig. 3h

Accidental holoepiphytic, erect (non-climber) herb with sympodial growth. Caulomes 5.5–45.8 cm long, not thickened in pseudobulbs, cylindrical. Leaves 3–11, sessile, distributed along the caulome; blades 2.5–13.5 cm × 1–2.5 cm, green, coriaceous, oblong, rare ovate, obscurely parallel-veined, margin entire, apex obtuse to acute. Inflorescence 18.3–91.5 cm long, raceme, terminal, laxa, 4–17-flowered. Flowers bisexual, non-resupinate, ecalcarate, perianth without epicalyx; pedicel+ovary 2.4–4.5 cm long; sepals orange to red-orange, margin entire; dorsal sepal 3–3.1 × ca. 0.7 cm, oblong, apex acute; lateral sepals 2.8–2.9 × ca. 0.7 cm, oblong, falcate, apex acute; petals 2.9–3 × 0.7–1 cm, orange to red-orange, elliptical, margin entire, rare irregularly serrate, apex acute to rounded; lip trilobed; lateral lobes 0.5–1.2 × 0.5–0.9 cm, yellow, deltoid, margin orange, noticeably fimbriate, apex cleft; central lobe 0.4–0.9 × 0.5–0.6 cm, yellow, suboblong, margin orange, fimbriate, rare entire, apex emarginate, calli ca. 0.15–0.25 × 0.08–0.1 cm, 2, yellow, basal, oblong, longitudinal lamella ca. 0.5–0.7 × 0.05 cm, yellow; column 1.6–2.1 × 0.2–0.3 cm, orange at 2/3-basal, yellow at 1/3-apical; anther cap ca. 0.16 × 0.16–0.19 cm, green, subglobous; pollinia 0.09–0.13 × 0.05–0.07 cm, 4, obovoid, rare oblong, laterally flattened. Capsules 2–4.2 × (0.8–)2–2.5 cm, green, subobconic to suboblongoid, up to three per infrutescence.

Examined material: 14.V.1961, *A.L. Costa 864* (ALCB); 10.I.1970, *Z. Rocha & Carlinda* (ALCB 9225); 20.X.1974, *A.L. Costa & W. Sant'Anna* (ALCB 483); 12.V.1979, *L.R. Noblick 1350* (ALCB); IX.1979, *L.R. Noblick 1583* (ALCB); 24.V.1981, *M.L. Guedes 224* (ALCB); 2.I.1982, *G.P. Lewis et al. 1001* (CEPEC); 12.IX.1982, *M.L. Guedes 547* (ALCB); 16.II.1982, *R. Ribeiro et al. 342* (HRB); 27.I.1983, *T. Plowman 12764* (F); 27.II.1983, *L.P. Queiroz 499* (ALCB); 20.XI.1983, *L.P. Queiroz 774* (ALCB); 29.X.1984, *L.P. Queiroz 888* (ALCB); 2.XII.1984, *M.L. Guedes 931* (ALCB); 4.I.1987, *L.P. Queiroz 1402* (HUEFS); 2.XI.1987, *M.L. Guedes* (ALCB 20772); 2.III.1990, *M. Campos et al.* (ALCB 21877); 26.IV.1993, *L. Nunes et al. 8* (HRB); 13.II.1997, *M.L. Guedes et al. 5135* (ALCB); 23.III.1997, *C.B. Nascimento & J. Costa 18* (HRB); 7.XI.1998, *C. Romão & J.M. Costa 2* (HUEFS); 5.III.1996, *B.F. Viana et al. 132* (HUEFS); 14.I.2000, *I.M. Azevedo-Brito & M.B. Tedesco 14* (HUEFS); 20.X.2000, fl., *M.M. Silva et al. 502* (HUEFS); 13.XI.2003, *L. Patrício & R. Machado* (ALCB 66840); 12.XI.2005, *E.P. Queiroz & F.A. Queiroz 1244* (HRB); 17.IV.2010, *C.C. Santana & C.M. Pigozzo 4* (HRB); 30.XI.2012, *M.L. Guedes & Alunos da disciplina BIO 043/2012 20261* (ALCB); X.2013, *D. Oliveira & M.L. Guedes* (ALCB 109795); 25.X.2014, *F.F.V.A. Barberena et al. 330* (ALCB, MBM, RB); 9.XII.2015, *F.F.V.A. Barberena & T.S. Sousa 339* (ALCB, RBspirit); 14.I.2016, *F.F.V.A. Barberena & T.S. Sousa 348* (ALCB); 5.III.2016, *F.F.V.A. Barberena & T.S. Sousa 355* (ALCB).

Epidendrum cinnabarinum is restricted to the Northeast Region of Brazil (occurring from the state of Rio Grande do Norte to the state of Bahia) and is found in the Atlantic Forest, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020). In APA Abaeté, the species could be confused when sterile with *Epidendrum orchidiflorum*, but *E. cinnabarinum* differs by having a caulome with usually fewer leaves (3–11-foliated *vs.* 5–64-foliated) and mainly by having non-resupinate flowers and orange to red-orange sepals and petals (*vs.* resupinate flowers and green sepals and petals). The species has been observed with flowers from October to May, and with fruits from January to April.

In APA Abaeté, *E. cinnabarinum* occurs predominantly in shrub formations, and is uncommon in restinga forest formations (Barberena *et al.* 2019a). The species is not threatened in the area since it has a population of about 150 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as Mata Fechada, Mata da Baronesa, near the airport, Condomínio Petromar, Lagoa da Alameda, Lagoa do Urubu, Lagoa 2&2 and Lagoa do Abaeté.

9. *Epidendrum orchidiflorum* (Salzm.) Lindl., Gen. Sp. Orchid. Pl. 103. 1831. Fig. 3i

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes 7–175 cm long, not thickened in pseudobulbs, cylindrical. Leaves 5–64, sessile, distributed along the caulome; blades 1.9–8.5 × 0.4–2.2 cm, green to vinaceous, coriaceous, ovate to lanceolate, obscurely parallel-veined, margin entire to revolute, apex acute to acuminate. Inflorescence 28.1–69.5 cm, raceme, terminal, laxa, 1–4-flowers opened simultaneously. Flowers bisexual, resupinate, ecalcarate, perianth without epicalyx; pedicel+ovary 1.4–2.5 cm long; sepals green, margin entire; dorsal sepal 0.9–1 × 0.4–0.5 cm, oblanceolate, apex acute; lateral sepals 1–1.1 × 0.4–0.5 cm, oblanceolate, subfalcate, apex acuminate; petals 0.8–0.9 × 0.1–0.15 cm, green, sometimes with vinaceous macules, oblanceolate-linear, inflex, margin entire, apex obtuse to obtuse-rounded; lip ca. 0.9 × 1.5–1.6 cm, green, rare with vinaceous macules, entire, suborbicular, retroflex, margin entire, apex truncated-emarginated, calli ca. 0.14–0.16 × 0.07–0.08 cm, 2, basal, oblong, divergent; column 0.4–0.5 × ca. 0.25 cm, green, with vinaceous macules at the base; anther cap ca. 0.12 × 0.16 cm, white, subquadratic; pollinia 0.07–0.08 × ca. 0.06 cm, 4, obovoid, laterally flattened. Capsules 1.8–2.8 × 1.3–2.5 cm, green, subgloboid to ellipsoid.

Examined material: 30.XI.1969, *A.L. Costa* (ALCB 19624); 12.V.1979, *L.R. Noblick 1349* (ALCB); 22.V.1982, *L.P. Queiroz & M.L. Guedes 227* (ALCB); 20.IV.1983, *L.P. Queiroz 535* (ALCB); 12.XII.1985, *L.R. Noblick & I.C. Britto 4494* (HUEFS); 5.III.1996, *B.F. Viana et al. 132*b (HUEFS); 23.III.1997, *J. Costa & C.B. Nascimento 45* (HRB); 25.I.2006, *E.P. Queiroz 1381* (HUEFS); 12.I.2016, *F.F.V.A. Barberena & T.S. Sousa 346* (ALCB, RB, RBspirit); 26.I.2016, *F.F.V.A. Barberena & T.S. Sousa 349* (ALCB); 30.IV.2016, *F.F.V.A. Barberena et al. 363* (ALCB).

Epidendrum orchidiflorum occurs in Colombia, Venezuela, Guyana, Suriname, French Guiana, Peru, Bolivia and Brazil, where it is found in the Atlantic Forest, Amazon, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020; Govaerts *et al.* 2020; Tropicos 2020). In APA Abaeté, it could be confused with *E. cinnabarinum* when sterile, but is easily differentiated by the color of the flowers and resupination (see comments for the previous species). The species has been observed with flowers from November to May, and with fruits from March to May.

In APA Abaeté, *Epidendrum orchidiflorum* occurs exclusively in shrub formations. The

species is not threatened in the area since it has a population of more than 100 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as along the Interpretative Trail, in Mata Fechada and near Condomínio Petromar, Lagoa da Alameda, Lagoa do Urubu and Lagoa da Vitória.

10. *Epistephium williamsii* Hook.f., Bot. Mag. 90: t. 5485. 1865. Fig. 4a

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes 50–500 cm long, not thickened in pseudobulbs, subcylindrical. Leaves 9–11, sessile, distributed along the caulome; blades 2.8–13 × 1.5–5 cm, green, subcoriaceous to coriaceous, ovate to elliptical, reticulate-veined, margin entire, apex acute. Inflorescence 70–200 cm, raceme, terminal, 1–3-flowered; bracts ca. 1.4 cm long; floral bracts 0.6–0.7 cm long. Flowers bisexual, resupinate, ecalcarate, perianth with epicalyx; pedicel+ovary 2.2–3.4 cm long; epicalyx 0.2–0.3 cm long, sepals and petals pink to pinkish-white, margin entire; dorsal sepal 3–4.8 × 0.7–1.1 cm, oblanceolate, apex obtuse to acute; lateral sepals 3.2–4.9 × 0.8–1.1 cm, oblanceolate to oblong, apex acute to obtuse; petals 3.5–5 × 0.9–1.2 cm, obovate to narrow-elliptical, apex rounded to acute; lip slightly trilobed to trilobed; lateral lobes 1.6–2.3 × 0.5–1 cm, white, with veins pinkish, semicircular, margin pinkish, undulate, apex rounded; central lobe 0.6–0.7 × 1.7–2 cm, white, with veins pinkish, trapeziform, margin pinkish, undulate, apex emarginate, callus ca. 2.5 cm long, 1, lamellar, pilose; column 2.2–3.1 cm long, white; anther cap ca. 0.41 × 0.44 cm, orbicular; pollen grains loosely aggregated, not forming a distinct pollinia. Capsules 3.1–3.8 × 0.7–0.9 cm, green, with vinaceous macules, oblongoid to fusiform, epicalyx persistent.

Examined material: 12.XIII.1979, *L.R. Noblick 1473* (ALCB); 30.V.1984, *L.P. Queiroz 822* (HUEFS); 2.IX.1998, *C.B. Costa 318* (ALCB); 15.X.1991, *L.P. Queiroz 2542* (HUEFS); 13.III.2016, *F.F.V.A. Barberena & T.S. Sousa 357* (ALCB, RBspirit), *358* (ALCB).

Epistephium williamsii is restricted to Brazil, where it is found in the Atlantic Forest, Amazon, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020). *Epistephium lucidum* Cogn. is synonymous with *E. williamsii* (Carvalho *et al.* 2016), and so it is probably the most well-known species of the genus in Brazil. It is easily recognized at APA Abaeté by its reticulate-veined leaf blades and the epicalyx present at the base of the perianth and persistent in the capsules. The species has been observed with flowers and fruits from March to October.

In APA Abaeté, the species occurs only in restinga forest formations (Barberena *et al.* 2019a). *Epistephium williamsii* is strongly threatened in the area since it has a population of only 22 individuals situated near Lagoa 2&2, on the border of a swamp, which suffers from the urban growth of the surroundings (Barberena *et al.* 2019a).

Conservation actions have been discussed with the managers of APA Abaeté and Parque das Dunas with the aim of implementing them immediately. One of the proposals is manual seed dispersal along the borders of lagoons with similar vegetation types (preferably in restinga forest formations), such as Lagoa do Urubu, Lagoa da Vitória or marshes associated with Mata da Baronesa. The posibility of carefully removing two or three individuals for replanting on the banks of Lagoa da Vitória has been considered as an alternative, given the greater surveillance of this locality due to the proximity of the headquarters of Parque das Dunas.

11. *Galeandra montana* Barb.Rodr., Gen. Sp. Orchid. 2: 175. 1881. Fig. 4b

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes 2.1–3.7 cm long, thickened in pseudobulbs, homoblastic, ovoid. Leaves 3–4, sessile, apical; blades 8–55 × 0.3–1.5 cm, green, chartaceous, linear, margin entire, apex acute to acuminate. Inflorescence 30.8–60.5 cm long, raceme, terminal, 2–5-flowered; bracts 2.2–14.9 cm long; floral bracts 0.4–1.6 cm long. Flowers bisexual, resupinate, calcarate; pedicel+ovary ca. 1.5–4 cm long; sepals and petals greenish-brown, with vinaceous veins, margin entire, apex acuminate; dorsal sepal 1.8–2.7 × 0.5–0.8, narrow-elliptical; lateral sepals 2.3–2.7 × 0.4–0.7 cm, oblong; petals 1.8–2.2 × 0.5–0.9 cm, elliptical; lip trilobed, straight; lateral lobes 1,9–2,5 × 1,1–1,3 cm, white, semicircular, margin crenulate, apex rounded; central lobe ca. 0.8 × 1.8 cm, white, vinaceous at the apex, transversal elliptical, margin entire, apex emarginate, calli ca. 3 cm long, 4, lamellar; calcar 0.6–0.8 × ca. 0.4 cm, green to brownish, saciform; column 0.9–1.5 cm long, white; anther cap ca. 0.32 × 0.35 cm, white, suborbicular, rostrum ca. 0.15 cm long; pollinia ca. 0.16–0.17 × 0.14–0.15 cm, 2, ovoid. Capsules 2.9–4.2 × (1–)1.4–2 cm, green, oblongoid to ellipsoid.

Examined material: 30.V.1984, *L.P. Queiroz 821* (HUEFS); 30.IX.1984, *L.P. Queiroz 877* (HUEFS);

17.VI.1985, *M.L. Guedes et al.* (ALCB15821); 9.VI.2003, *M.L. Guedes & A.L. Cotias 10199* (ALCB); 15.VII.2007, *D. Cardoso & A.L. Cortês 2106* (HUEFS); 2.IX.2012, *U.C.S. Silva 166* (HUEFS); 14.V.2016, *F.F.V.A. Barberena & T.S. Sousa 365* (ALCB, RBspirit); 21.V.2016, *F.F.V.A. Barberena et al. 368* (ALCB); 8.VII.2016, *T.S. Sousa & T.A. Nascimento 4* (ALCB).

Galeandra montana is restricted to Brazil, where it is found in the Atlantic Forest, Amazon and Cerrado phytogeographic domains (Flora do Brasil 2020). It can be recognized at APA Abaeté by having greenish-brown sepals and petals, a white central lobe of the lip with vinaceous veins and apex and a saciform calcar. The species has been observed with flowers from May to September, and with fruits from May to November.

In APA Abaeté, the species occurs in an open area (bare sand) and shrub formations (Barberena *et al.* 2019a). It is not threatened in the area since it has a population of around 50 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as near Lagoa SOS, Lagoa do Urubu, Lagoa 2&2, Lagoa do Abaeté and Mata Fechada.

12. *Habenaria schenckii* Cogn., *Fl. bras.* 3(4): 61. 1893. Fig. 4c

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes inconspicuous, not thickened in pseudobulbs. Leaves 2, sessile, basal; blades 2.2–2.7 × 2.2–2.7 cm, green, membranaceous, very widely ovate, margin entire, apex acuminate to apiculate. Inflorescence 14–20.5 cm long, glabrous, raceme, terminal, 2–4-flowered; bracts 1.4–1.6 cm long; floral bracts 1.1–1.4 cm long. Flowers bisexual, resupinate, calcarate; pedicel+ovary ca. 1.2 cm long; sepals green, subfalcate, margin entire, apex acute; dorsal sepal ca. 0.55 × 0.35 cm, oval; lateral sepals 0.6–0.65 × ca. 0.3 cm, oval-lanceolate; petals pale green, bifid, upper portion ca. 0.55 × 0.15 cm, triangular-linear, margin entire, apex acute, lower portion ca. 0.8 × 0.04 cm, linear, margin entire, apex acute; lip trilobed; lateral lobes ca. 1 × 0.1 cm, pale green, linear, margin entire, apex acute; central lobe ca. 0.65 × 0.08 cm, pale green, linear, margin entire, apex rounded, calli ca. 0.2 × 0.07 cm, 2, oblong; calcar ca. 1.7 cm long, pale green, cylindrical; column 0.2–0.3 cm; anther cap ca. 0.12 × 0.07 cm, oblong; pollinia not seen. Fruits not seen.
Examined material: 16.VI.2017, *T.S. Sousa & T.A. Nascimento 73*, *74* (ALCB).

Habenaria schenckii is restricted to Brazil, where it is found in the Atlantic Forest, Amazon, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020). It is easily recognized at APA Abaeté by its wide-ovate leaf blades and bifid petals. The species has been observed with flowers in June.

In APA Abaeté, *Habenaria schenckii* occurs exclusively in shrub formations (Barberena *et al.* 2019a). The species is threatened in the area, since, although it has a population of almost 100 individuals, the spatial distribution is extremely aggregated (individuals are restricted to an area of 1 m^2). The only conservation action adopted thus far is periodic surveillance of the population, which is situated at the Interpretative Trail near the headquarters of Parque Municipal das Dunas.

13. *Koellensteinia florida* (Rchb.f.) Garay, Orquideología 8(1): 23. 1973.

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes ca. 1.1 × 0.7 cm long, thickened in pseudobulbs, heteroblastic, ovoid. Leaves 2, peciolate, terminal; pecioles 5.8–7 cm long; blades 14–18.2 × 2.1–2.2 cm, green, immaculate, chartaceous, narrow-elliptical, plicate, margin entire, apex acuminate. Inflorescence 27.3–28.7 cm long, raceme, lateral, congest, 2–3-flowers opened simultaneously; bracts 0.4–0.6 cm long; floral bracts. Flowers bisexual, resupinate, ecalcarate; pedicel+ovary 1.1–1.4 cm long; sepals white, margin entire, apex obtuse; dorsal sepal ca. 1.2 × 0.5 cm, obovate; lateral sepals ca. 1.1 × 0.5 cm, elliptical; petals ca. 0.9 × 0.5 cm, white, obovate, margin entire, apex obtuse; lip trilobed; lateral lobes ca. 0.3 × 0.2 cm, white, oblong, margin entire, apex rounded; central lobe ca. 0.6 × 1 cm, white, reniform, margin entire, apex emarginate, callus not seen; column ca. 0.4 cm long; anther cap not seen; pollinia not seen. Fruits not seen.
Examined material: 6.V.1979, *L.R. Noblick 1298* (ALCB).

Koellensteinia florida is restricted to Brazil (only occurring in the states of Rio de Janeiro and Bahia) and is endemic to the Atlantic Forest phytogeographic domain (Flora do Brasil 2020). It is easily recognized at APA Abaeté by its narrow-elliptical and plicate leaf blades and white flowers. The species has been collected with flowers in May.

In APA Abaeté, the species possibly occurs in shrub formations (Queiroz 1987). However, it may have been suppressed locally since the species, considered rare in the APA in the 1980s (*Noblick & Britto 4479*), has only been recorded at one location

(near Lagoa do Abaeté) and has not been collected for more than 40 years, despite recent intense expeditions in the area (Barberena *et al.* 2019a).

14. *Liparis nervosa* (Thumb.) Lindl., Gen. Sp. Orchid. Pl. 26. 1830. Fig. 4d

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes 1.6–3 cm long, thickened in pseudobulbs, homoblastic, ovoid. Leaves 3–6, sessile, distributed along the caulome; blades 4.5–20.5 × 2.1–7.2 cm, green, membranaceous, ovate to elliptical, base attenuate (resemble a peciole), amplexicaule, margin entire, apex acute. Inflorescence 17.5–48 cm long, raceme, terminal, laxa, 7–12-flowered; bracts 0.7–1.2 cm long; floral bracts 0.4–0.8 cm long. Flowers bisexual, resupinate, ecalcarate; pedicel+ovary 0.8–2.2 cm long; sepals greenish-yellow to vinous-green, oblong, margin entire, revolute; dorsal sepal 0.7–0.9 × 0.15–0.25 cm, apex acute to rounded; lateral sepals 0.6–0.7 × ca. 0.3 cm, subfalcate, apex obtuse; petals 0.7–0.9 × 0.05–0.1 cm, greenish-yellow to vinous green, oblanceolate-linear to linear, subfalcate, margin entire, revolute, apex rounded; lip 0.5–0.7 × 0.4–0.5 cm, greenish-yellow to vinous green, entire, obcordate, genuflex, margin entire, apex emarginate, calli ca. 0.08 × 0.04 cm, 2, basal; column 0.5–0.6 cm long; pollinia ca. 0.065 × 0.03 cm, 4, deltoid. Capsules 1.7–2.1 × (0.4–)0.6–0.8 cm, green, obovoid.

Examined material: 19.VI.1985, *R. Rebouças & Alunos do 1º semestre de 1985* (ALCB15001); 10.VI.1993, *L.P. Queiroz 3222* (HUEFS); 1.IV.1996, *B.F. Viana et al. 133* (HUEFS); 10.VI.2015, fl., *F.F.V.A. Barberena & A.M. Anjos 337* (ALCB); 6.VI.2016, *F.F.V.A. Barberena et al. 369* (ALCB; HUEFS, RBspirit); 6.VI.2016, *F.F.V.A. Barberena et al. 371* (ALCB, RB).

Liparis nervosa has a wide worldwide distribution, occurring in several African and Asian countries and from the United States to South Brazil; in Brazil it is found in Atlantic Forest, Amazon, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020; Govaerts *et al.* 2020; Tropicos 2020). The species is recognized in APA Abaeté by its membranaceous and plicate leaf blades, and, mainly, the oblique and genuflex lip. The species has been collected with flowers from April to July, and with fruits in July and August.

In APA Abaeté, *Liparis nervosa* occurs exclusively in restinga forest formations (Barberena *et al.* 2019a). The species is not threatened in the area since it has a population of around 100 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as in Mata Fechada, along the Interpretative Trail and near Mata da Baronesa and Lagoa do Urubu.

15. *Oeceoclades maculata* (Lindl.) Lindl., Gen. Sp. Orchid. Pl. 237-238. 1833. Fig. 4e

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes 1.4–3.1 cm long, thickened in pseudobulbs, heteroblastic, ovoid. Leaf 1, sessile, apical; blade 12.4–28 × 3.2–3.7 cm, green, with dark green macules, coriaceous, oblong, rare narrow-elliptical, conduplicate, apex acute, margin entire. Inflorescence 25.7–50.3 cm long, raceme, lateral, laxa, 1–4-flowered; bracts 1.9–3.9 cm long; floral bracts 0.3–1.9 cm long. Flowers bisexual, resupinate, calcarate; pedicel+ovary 0.7–1 cm long; sepals and petals brownish, margin entire; dorsal sepal 1–1.3 × 0.25–0.3, oblong to elliptical, apex acute; lateral sepals ca. 1 × 0.2–0.3 cm, oblong to elliptical, apex acute; petals 0.9–1.1 × 0.2–0.3 cm, oblong to elliptical, apex acute; lip white, panduriform, trilobed; lateral lobes 0.3–0.4 × 0.25–0.4 cm, vinaceous, deltoid, margin entire, apex rounded; central lobe 0.3–0.4 × 0.7–0.8 cm, white, transverse elliptical, margin undulate, apex emarginate, calli ca. 0.2 × 0.2 cm, 2, basal, obtriangular; calcar ca. 0.5 cm long, brownish, claviform; column ca. 0.5 cm long; anther cap ca. 0.18 × 0.15 cm, subtrapeziform; pollinia not seen. Capsules 2.3–3.1 × 0.9–1.7 cm, green, fusiform to ellipsoid.

Examined material: 14.XI.1994, *L.P. Queiroz 4244* (HUEFS); 26.III.2016, *T.S. Sousa 3* (ALCB); 16.II.2016, *F.F.V.A. Barberena & T.S. Sousa 350* (ALCB, RBspirit); 9.IV.2016, F.F.V.A. *Barberena et al. 361* (ALCB); 21.V.2016, *F.F.V.A. Barberena 367* (ALCB).

Oeceoclades maculata is Pantropical, occurring in several countries in Africa and America, including Brazil, where it is found in the Atlantic Forest, Amazon, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020; Govaerts *et al.* 2020; Tropicos 2020). It is easily distinguished from other species of Orchidaceae at APA Abaeté by its maculate leaf blades; lateral inflorescence and calcarate flowers are diagnostic features complementary to identification. The species has been observed with flowers from February to August, and with fruits from May to October.

In APA Abaeté, the species occurs exclusively in restinga forest formations (Barberena *et al.* 2019a). The species is not threatened in the area

since it has a population of around 100 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as Mata Fechada, Mata da Baronesa and near the airport, Lagoa da Vitória, Lagoa do Urubu and Lagoa 2&2.

16. *Pelexia* viridis (Cogn.) Schltr., Beih. Bot. Centralbl., Abt. 2 37(3): 407. 1920. Fig. 4f

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes inconspicuous, not thickened in pseudobulbs. Leaves 1–4, peciolate, distributed along the caulome; pecioles 4–14 cm long; blades 8.5–15 × 1.2–3.7 cm, green, papyraceous, oblong to linear-lanceolate, margin entire, apex acute to acuminate. Inflorescence 36.5–47.5 cm long, laxa, congest to the apex, raceme, terminal, pilose, 12–15-flowered; bracts ca. 3.5 cm long; floral bracts 1.1–1.7 cm long. Flowers bisexual, resupinate, calcarate, pilose; pedicel+ovary 0.7–1 cm long; sepals margin entire, apex acute to acuminate; dorsal sepal 1.1–1.4 × 0.3–0.5 cm, green, oblanceolate; lateral sepals 1.2–1.3 × 0.2–0.3 cm, white-greenish, oval-lanceolate, falcate; petals 1–1.4 × 0.15–0.2 cm, greenish-white, with a longitudinal green stripe, entire, linear-oblanceolate, apex rounded; lip 1–1.2 × 0.5–0.6 cm, white, with a green longitudinal stripe, recurve, entire, panduriform, margin entire, apex retuse-crenate; calcar 0.35–0.5 × ca. 0.35 cm, green to yellowish, subclaviform; column 0.7 cm long; anther cap ca. 0.37 × 0.25 cm, subtriangular; pollinia ca. 0.39 × 0.12 cm, 2, deltoid. Capsules ca. 0.9 × 0.5 cm, green, ovoid.

Examined material: 3.X.2013, *D.N. Carvalho 368* (HUEFS); 6.VI.2016, *F.F.V.A. Barberena et al.* 370 (ALCB, RBspirit); 8.VIII.2016, *F.F.V.A. Barberena et al. 373* (ALCB).

Pelexia viridis is restricted to Brazil, where it is found in the Atlantic Forest and Cerrado phytogeographic domains (Flora do Brasil 2020). It is easily distinguished from other species of Orchidaceae at APA Abaeté by having pilose inflorescences and flowers. The species was observed with flowers from June to August and in October, and with fruits in August and September.

In APA Abaeté, *P. viridis* occurs exclusively in restinga forest formations (Barberena *et al.* 2019a). The species is not threatened in the area yet since, although it has a population of less than 50 individuals (Barberena *et al.* 2019a), it occurs in several localities, such as Mata da Baronesa, Mata Fechada and near Lagoa do Urubu.

17. *Prescottia leptostachya* Lindl., Edwards's Bot. Reg. 22: sub t. 1915 [err. typ. t. 1916). 1836. Fig. 4g

Terricolous, erect (non-climber) herb with sympodial growth. Caulomes inconspicuous, not thickened in pseudobulbs. Leaves 1–3, peciolate, basal; pecioles 1–2.2 cm long; blades 5.1–12.1 × 1.6–5.6 cm, silvery-green, membranaceous, elliptical to oblong, margin entire, apex acute to acuminate, rare obtuse. Inflorescence 25.8–48.4 cm long, raceme, terminal, 23–40-flowered; bracts 0.6–1.9 cm long; floral bracts 0.2–0.3 cm long. Flowers bisexual, non-resupinate, ecalcarate; pedicel+ovary 0.3–0.5 cm long; sepals and petals green, oblong, revolute, margin entire, apex obtuse; dorsal sepal ca. 0.15 × 0.05 cm; lateral sepals ca. 0.25 × 0.1 cm; petals 0.15–0.2 × ca. 0.05 cm; lip ca. 0.25 × 0.15 cm, green, entire, cucullate, margin entire, apex obtuse; column ca. 0.08 cm long; anther cap ca. 0.035 × 0.04 cm, suborbicular; pollinia not seen. Capsules 0.4–0.8 × 0.1–0.2 cm, green, obovoid to oblongoid.

Examined material: 25.X.2014, *F.F.V.A. Barberena et al. 328* (ALCB); 9.XII.2015, *F.F.V.A. Barberena & T.S. Sousa 340* (ALCB, RBspirit); 19.X.2016, *F.F.V.A. Barberena & T.S. Sousa 387* (ALCB, RB).

Prescottia leptostachya is restricted to Brazil (occurs only in the state of Bahia), where it is found in the Atlantic Forest and Caatinga phytogeographic domains (Flora do Brasil 2020). It is easily recognized in APA Abaeté by having silvery green leaf blades, non-resupinate flowers and a cucullate lip. The species has been observed with flowers and fruits from October to January.

In APA Abaeté, *P. leptostachya* occurs exclusively in restinga forest formations (Barberena *et al.* 2019a). The species is not threatened in the area since it has a population of more than 100 individuals (Barberena *et al*. 2019a) and occurs in several localities, such as Mata Fechada and near the airport, Mata da Baronesa, Lagoa do Jacaré and Lagoa do Urubu.

18. *Vanilla bahiana* Hoehne, Arq. Bot. Estado São Paulo 2(5): 108, t. 43. 1950. Fig. 4h

Secondary hemiepiphytic, climber herb with monopodial growth. Caulomes 60–500 cm long, not thickened in pseudobulbs, cylindrical, internodes (4–)7–15 cm long. Leaves 9–50, sessile, distributed along the caulome; blades 4–10.5 × 1.1–2.6 cm, green, coriaceous, oblong, margin entire to revolute, apex acute to acuminate. Inflorescence 4–16.2 cm long, raceme, axillar,

1-flower opened simultaneously; floral bracts 0.5–1.5 cm long; Flowers bisexual, resupinate, ecalcarate; pedicel+ovary 2.1–4.1 cm long; sepals and petals green, oblanceolate, margin entire; dorsal sepal 6.5–6.9 × 0.9–1 cm, apex acute; lateral sepals 6–7.5 × 0.9–1.4 cm, apex acuminate; petals 6.1–6.8 × 0.8–1, apex rounded to acute; lip 4–6.3 × 3.1–4 cm, white, with longitudinal yellow veins, yellow-green to yellow at the apex, entire, obovate, margin undulate, apex emarginate, callus ca. 0.6 × 0.5–0.6, 1, orbicular, central; column 4.9–5.5 cm long; anther cap 0.5–0.56 × 0.38–0.42 cm, panduriform; pollen grains loosely aggregated, not forming a distinct pollinia. Capsules (6.5–)8.5–14.2 × 0.9–1.1 cm long, green, long-oblongoid.

Examined material: 15.XI.1963, *A.L. Costa* (ALCB 4691); 20.XII.1986, *L.P. Queiroz et al. 1390* (HRB, HUEFS); 4.I.1987, *L.P. Queiroz 1404* (HUEFS); 11.VII.1987, *M.L. Guedes* (ALCB 20939); 23.X.1992, *L.P. Queiroz & N.N.A. Santos 2870* (HUEFS); 9.XII.1996, *O. Vieira 1* (ALCB); 30.III.1998, *C.B. Nascimento & J. Costa 70* (HRB); 30.III.1998, *J. Costa & C.B. Nascimento 206* (HRB); 27.XII.2007, *E.P. Queiroz 2621* (HRB); 25.X.2014, *F.F.V.A. Barberena et al. 331* (ALCB); 15.XI.2014, *F.F.V.A. Barberena & L.V.S. Aguiar 334* (ALCB); 12.I.2016, *F.F.V.A. Barberena & T.S. Sousa 345* (ALCB); 9.IV.2016, *F.F.V.A. Barberena & T.S. Sousa 360* (ALCB).

Vanilla bahiana is restricted to Brazil, where it is found in the Atlantic Forest, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020). It could be confused with *V. palmarum* at APA Abaeté by having monopodial growth and climbing habit, but *V. bahiana* is easily distinghished as hemiepiphytic with internodes (4–)7–15 cm long, sessile leaves, oblong leaf blades and green sepals and petals (*vs*. holoepiphytic, internodes 1–3.5 cm long, peciolate leaves, ovate to oval-lanceolate leaf blades and yellow sepals and petals). The species has been observed with flowers from November to June, and with fruits throughout the year.

In APA Abaeté, *V. bahiana* occurs in shrub and restinga forest formations (Barberena *et al.* 2019a). The species is not threatened in the area, where it has a population of more than 150 individuals (Barberena *et al.* 2019a) and occurs in several localities, such as along the Interpretative Trail and near the headquarters of Parque Municipal das Dunas, the airport, Condomínio Petromar, Mata da Baronesa, Lagoa da Vitória, Lagoa da Alameda, Lagoa do Urubu, Lagoa 2&2 and Lagoa do Abaeté.

19. *Vanilla palmarum* (Salzm. ex Lindl.) Lindl., Gen. Sp. Orchid. Pl. 436. 1840. Fig. 4i

Characteristic holoepiphytic, climber herb with monopodial growth. Caulomes 60–200 cm long, not thickened in pseudobulbs, cylindrical, internodes 1–3.5 cm long. Leaves 40–130, peciolate, distributed along the caulome; pecioles 0.2–0.5 cm long; blades 3–9.7 × 1.5–3.6 cm, green to yellowish-green, coriaceous, ovate to oval-lanceolate, margin entire, apex acute to obtuse, sometimes rounded. Inflorescence 1.1–3.7 cm long, raceme, axillar, 1-flower opened simultaneously; floral bracts 0.5–0.8 cm long. Flowers bisexual, resupinate, ecalcarate; pedicel+ovary 1.6–4.6 cm long; sepals yellow, lanceolate, margin entire, apex obtuse; dorsal sepal ca. 5.2 × 0.9 cm; lateral sepals 4.8–4.9 × ca. 0.8 cm; petals 4.8–5 × 1–1.1 cm, yellow, oblong, margin entire, apex obtuse; lip 3–4 × ca. 2.2 cm, yellow, entire to subtrilobed, with dark yellow-pilose veins in the central region, obovate, margin undulate, apex emarginate; column 3.4–3.5 cm long; anther cap ca. 0.15 × 0.15 cm, subquadrangular; pollen grains loosely aggregated, not forming a distinct pollinia. Capsules 4.3–4.7 × 0.5–0.7 cm, green, oblongoid, triangular in cross section.

Examined material: 30.V.1984, *L.P. Queiroz 823* (HUEFS); 18.XII.1986, *M.L. Guedes et.al.* (ALCB 20987); 16.III.2016, *F.F.V.A. Barberena & T.S. Sousa 359* (ALCB).

Vanilla palmarum occurs in Ecuador, Colombia, Venezuela, Guyana, Suriname, French Guiana, Peru, Bolivia and Brazil, where it is found in the Atlantic Forest, Amazon, Caatinga and Cerrado phytogeographic domains (Flora do Brasil 2020; Govaerts *et al.* 2020; Tropicos 2020). The species could be confused with *V. bahiana* at APA Abaeté, but is easily distinghished by its ecological category, size of internodes, leaf insertion on the caulome, shape of leaf blades and color of floral segments (see comments for the previous species). The species has been observed with flowers and fruits from March to September.

In APA Abaeté, *V. palmarum* occurs exclusively in restinga forest formations (Barberena *et al.* 2019a). The species is strongly threatened in the area since it has a population of only four individuals growing on *Elaeis guineensis* Jacq. (Arecaceae) in a swampy area near Lagoa 2 & 2, which suffers from urban growth of the surroundings (Barberena *et al.* 2019a). In Atlantic Forest remnants, *V. palmarum* grows exclusively on *E. guineensis* and *S. schizophylla* (Barberena

et al. 2019b). Conservation actions have been discussed with the heads of APA Abaeté and Parque Municipal das Dunas with the aim of immediate implementation. The main proposal is manual dispersion of seeds on *E. guineensis* situated in other areas of APA Abaeté, preferably those near the headquarters of Parque Municipal das Dunas, which would facilitate monitoring.

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References

Aguiar AP, Chiarello AG, Mendes SL & Matos EN (2005) Os corredores Central e da Serra do Mar na Mata Atlântica brasileira. *In*: Galindo-Leal C & Câmara IG (eds.) Mata Atlântica: biodiversidade, ameaças e perspectivas. Fundação SOS Mata Atlântica Conservação Internacional, Belo Horizonte. Pp. 119-132.

Assis AM, Thomaz LD & Pereira OJ (2004) Florística de um trecho de floresta de restinga no município de Guarapari, Espírito Santo, Brasil. Acta Botânica Brasílica 18: 191-201.

Azevedo CO & van den Berg C (2007) A família Orchidaceae no Parque Municipal de Mucugê, Bahia, Brasil. Hoehnea 34: 1-47.

Azevedo CO, van den Berg C & Barros F (2014) A revision of *Prescottia* (Orchidaceae: Orchidoideae, Cranichideae). Phytotaxa 178: 233-286. DOI: 10.11646/phytotaxa.178.4.1

Barberena FFVA, Baumgratz JFA & Barros F (2018) Ecological data for an orchid diversity hotspot show that the subtribe Laeliinae may be endangered in the Brazilian Atlantic Forest. Nordic Journal of Botany 2018: e01728. DOI: 10.1111/njb.01728

Barberena FFVA, Sousa TS & Rocha Junior JAL (2019a) Mapping threats to the orchid populations in an environmental protection area in Bahia, Northeast Brazil. Oecologia australis 23: 346-356. DOI: 10.4257/oeco.2019.2302.12

Barberena FFVA, Sousa TS, Ambrosio-Moreira BS & Roque N (2019b) What are the species of phorophytes of *Vanilla palmarum* (Orchidaceae) in Brazil? An assessment of emblematic specificity with palm tree species. Rodriguésia 70: e02732017. DOI: 10.1590/2175-7860201970037

Bastos CA & van den Berg C (2012) Flora da Bahia: *Catasetum* (Orchidaceae). Sitientibus série Ciências Biológicas 12: 83-89.

Benzing DH (1990) Vascular epiphytes, general biology and related biota. Cambridge University Press, Cambridge. 354p.

Britto IC, Queiroz LP, Guedes MLS, Oliveira NC & Silva LB (1993) Flora Fanerogâmica das Dunas e Lagoas do Abaeté, Salvador, Bahia. Sitientibus Série Ciências Biológicas 11: 31-46.

Carvalho DN, Meneguzzo, TEC, Popovkin A & van den Berg C (2016) Orchidaceae of Bahia, Brazil: notes on taxonomy and nomenclature. Phytotaxa 272: 231-234. DOI: 10.11646/phytotaxa.272.3.10

CONAMA - Conselho Nacional do Meio Ambiente (2009) Resolução Conama nº 417, de 23 de novembro de 2009. Available at <http://www.mma.gov.br/port/conama/legiabre.cfm?codlegi=617>. Access on 7 April 2020.

Diário Oficial do Estado da Bahia (1987) Decreto nº 351, de 22 de setembro de 1987. Available at <http://www.icmbio.gov.br/cepsul/images/stories/legislacao/Decretos/1987/dec_ba_351_1987_uc_criaapa_lagoas_dunasabaete_salvador_ba_altrd_dec_2540_1993_res_cepram_3023_2002.pdf>. Access on 7 April 2020.

Diário Oficial do Estado da Bahia (1993) Decreto nº 2540, de 18 de outubro de 1993. Available at <http://www.ceama.mp.ba.gov.br/component/docman/cat_view/393-unidades-deconservacao-estado-da-bahia/394-estaduais/395-apas/459-lagoas-edunasdoabaete.html?limit=30&limitstart=0&order=hits&dir=DESC&Itemid=131>. Access on 7 April 2020.

Diário Oficial do Município de Salvador (2011) Decreto nº 22.507, de 22 de dezembro de 2011. Available at <https://leismunicipais.com.br/a/ba/s/salvador/decreto/2011/2250/22507/decreton-22507-2011-delimita-e-implanta-o-parquedas-dunas-amplia-o-parque-do-abaete-e-daoutras-providencias>. Access on 7 April 2020.

Fernandes MF & Queiroz LP (2015) Floristic surveys of restinga forests in southern Bahia, Brazil reveal the effects of geography on community composition. Rodriguésia 66: 51-73. DOI: 10.1590/2175-7860201566104

Filgueiras TS, Nogueira PE, Brochado AL & Guala II GF (1994) Caminhamento: um método expedito para levantamentos florísticos qualitativos. Cadernos de Geociências 12: 39-43.

Flora do Brasil (2020) (em construção). Orchidaceae. Available at <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB179>. Access on 7 April 2020.

Gomes FS & Guedes MLS (2014) Flora vascular e formas de vida das formações de restinga do litoral norte da Bahia, Brasil. Acta Biológica Catarinense 1: 22-43.

Govaerts R, Bernet P, Kratochvil K, Gerlach G, Carr G, Alrich P, Pridgeon AM, Pfahl J, Campacci MA, Baptista DH, Tigges H, Shaw J, Cribb P, George A, Kreuz K & Wood J (2020) World checklist of Orchidaceae. Facilitated by the Royal Botanic Gardens, Kew. Available at <http://wcsp.science.kew.org/>. Access on 7 April 2020.

Ministério do Meio Ambiente do Brasil (2020) Download de dados geográficos. Available at <http://mapas.mma.gov.br/i3geo/datadownload.htm>. Access on 7 April 2020.

Murray-Smith C, Brummitt NA, Oliveira-Filho AT, Bachman S, Moat J, Lughadha EMN & Lucas EJ (2009) Plant diversity hotspots in the Atlantical Coastal Forests of Brazil. Conservation Biology 23: 151-163.

Peixoto AL & Maia LC (2013) Manual de procedimentos para herbários. Editora Universitária UFPE, Recife. 106p.

Pridgeon AM, Cribb PJ, Chase MW & Rasmussen FN (1999) Genera Orchidacearum: general introduction, Apostasioideae, Cypripedioideae. Vol. 1. Oxford University Press, Oxford. 197p.

Queiroz EP (2007) Levantamento florístico e georreferenciamento das espécies com potencial econômico e ecológico em restinga de Mata de São João, Bahia, Brasil. Biotemas 20: 41-47.

Queiroz EP, Cardoso DBOS & Ferreira MHS (2012) Composição florística da vegetação de restinga da APA Rio Capivara, litoral norte da Bahia, Brasil. Sitientibus série Ciências Biológicas 12: 119-141.

Queiroz LP (1987) Nova espécie de *Koellensteinia* Rchb.f. (Orchidaceae) da Bahia. Revista Brasileira de Botânica 10: 21-24.

Ribeiro MC, Metzger JP, Martensen AC, Ponzoni FJ & Hirota MM (2009) The Brazilian Atlantic Forest: how much is left, and how is the remaining forest distributed? Implications for conservation. Biological Conservation 142: 1141-1153.

Ribeiro PL, Borba EL & Toscano-de-Brito ALV (2005) O gênero *Bulbophyllum* Thouars (Orchidaceae) na Chapada Diamantina, Bahia, Brasil. Revista Brasileira de Botânica 28: 423-439.

Schiavone DC (2014) Macroinvertebrados bentônicos como indicadores da integridade de ecossistemas de água doce costeiros. Estudo de caso: lagos do Parque das Dunas, Salvador, BA. M.S. thesis. Universidade de São Paulo, São Carlos. 92p.

Silva DG (2002) O gênero *Cleistes* Rich. *ex* Lindl. (Orchidaceae: Vanilloideae: Pogoniinae) na Chapada Diamantina, Bahia, Brasil. M.S. thesis. Universidade Estadual de Feira de Santana, Feira de Santana. 73p.

Silva FO (2012) Biodiversidade e interações positivas em moitas de restinga. Ph.D. thesis. Universidade Federal da Bahia, Salvador. 164p.

Silva JMC & Casteleti CHM (2003) Status of the biodiversity of the Atlantic Forest of Brazil. *In*: Galindo-Leal C & Câmara IG (eds.) The Atlantic Forest of South America: biodiversity status, threats and outlook. The Center for Applied Biodiversity Science and Island Press, Washington. Pp. 43-59.

Silva PRG (1993) Identidade, territorialidade e ecologismo: o caso da Lagoa do Abaeté. Caderno CRH 18: 117-137.

Smidt EC (2003) A subtribo Spiranthinae Lindl. (Orchidaceae: Orchidioideae) na Chapada Diamantina, Bahia, Brasil. M.S. thesis. Universidade Estadual de Feira de Santana, Feira de Santana. 113p.

Tambosi LR (2014) Estratégias espaciais baseadas em ecologia de paisagens para a otimização dos esforços de restauração. Ph.D. thesis. Universidade de São Paulo, São Paulo. 116p.

Thiers B [continuously updated] Index Herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available at <http://sweetgum.nybg.org/science/ih/>. Access on 6 April 2020.

Tropicos (2020) Orchidaceae. Facilitated by Missouri Botanical Garden. Available at <https://www.tropicos.org/home>. Access on 6 April 2020.

Vieira TL, Barros F & Roque N (2014) Orchidaceae no município de Jacobina, estado da Bahia, Brasil. Hoehnea 41: 469-482. DOI: 10.1590/S2236-89062014000300012

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