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# ORCHIDACEAE NO PARQUE NACIONAL DO VIRUÁ, RR, BRASIL: ASPECTOS TAXONÔMICOS E BIOGEOGRÁFICOS

EDLLEY MAX PESSOA

**Orientador:** Prof. Marccus Alves
**Co-orientador:** Prof. Fábio de Barros

Dissertação apresentada ao Programa de Pós-Graduação em Biologia Vegetal da Universidade Federal de Pernambuco, como parte dos requisitos para obtenção do título de Mestre em Biologia Vegetal.

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Dissertação Apresentada à Banca Examinadora:

Orientador: Prof. Dr. Marccus Alves
Departamento de Botânica – UFPE

1º Examinador: Prof. William Wayt Thomas
New York Botanical Garden

2º Examinador: Prof. Rafael Batista Louzada
Departamento de Botânica – UFPE

1º Suplente: Prof. Maria Regina Barbosa
Departamento de Botânica - UFPB

2º Suplente: Prof. Maria Jesus Nogueira Rodal
Departamento de Botânica - UFRPE

*“esta obra há de servir também a alguém,*
*senão pra aprender ao menos pra corrigir”.*

**F.C. Hoehne**

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# ÍNDICE

**LEGENDA DAS FIGURAS**

## Fundamentação teórica

**Figura 1:** Amazônia e ecossistemas circundantes (Fonte: Global Environments Monitoring Unit).

**Figura 2:** Centros de endemismo da Amazônia (Fonte: Silva et al. 2005).

**Figura 3:** Escudo Guianense (Fonte: Funk et al. 2007).

**Figura 4:** Estado de Roraima e suas Unidades de conservação e terras indígenas (Fonte: Lisboa & Lisboa, 2009).

**Figura 5:** PARNA Viruá e suas localidades (Fonte: Lisboa & Lisboa, 2009).

**Figura 6:** Capa do volume 2 do livro *Orchidaceae Brasilienses.*

**Figura 7: 1.** Pseudobulbo; **2.** Sépala dorsal; **3.** Sépalas laterais fusionadas; **4.** Pétalas; **5.** Labelo; **6.** Coluna [*Gomesa barbata* (Lindl.) Chase & Williams, Adaptado de Pessoa & Alves, 2011].

**Figura 8:** Filogenia de Orchidaceae resumida. (Chase et al. 2003).

**Figura 9:** Distribuição de Orchidaceae (Fonte: Angiosperm Phylogeny Website).

## **Capítulo 1:** *Lockhartia viruensis* (Orchidaceae - Oncidiinae): a new species from Roraima State, Brazilian Amazonia Region

**Figura 1:** *Lockhartia viruensis.* **A.** Hábito **B.** Flor em vista frontal. **C.** Perianto dissecado. **D.** Flor em perfil com as pétalas removidas. **E.** Coluna, visão ventral. **F.** Polinário. **G.** Antera (Ilustrado do Holótipo Regina Carvalho).

## **Capítulo 2:** Novelties in Orchidaceae from Brazil.

**Figura 1: A.** *Duckeella pauciflora,* hábito e detalhe da flor. **B.** *Notylia angustifolia,* hábito e detalhe da flor. **C.** *Specklinia aristata,* hábito e detalhe da flor. **D.** *Trichocentrum recurvum,* hábito e detalhe da flor.

**Figura 2:** Distribuição geográfica das espécies estudadas no Brasil. ● - *Duckeella pauciflora*, ■ - *Notylia angustifólia*, ○ - *Specklinia aristata*, □ - *Trichocentrum recurvum*.

## **Capítulo 3:** Orchidaceae from Viruá National Park, Roraima, Brazilian Amazon.

**Figura 1:** Mapa da área de estudo. **A.** O estado de Roraima destacado no Brasil; **B.** O PARNA Viruá destacado em Roraima; **C.** Mapa do PARNA Viruá.

**Figura 2:** Diagramas florais. **A.** *Acianthera fockei* (Lindl.) Pridgeon & M.W. Chase; **B.** *Acianthera miqueliana* (H. Focke) Pridgeon & M.W. Chase; **C.** *Aganisia cyanea* (Lindl.) Rchb. f.; **D.** *Aspasia variegata* Lindl.; **E.** *Aspidogyne foliosa* (Poepp. & Endl.) Garay; **F.** *Brassavola martiana* Lindl.; **G.** *Brassia caudata* (L.) Lindl.; **H.** *Camaridium ochroleucum* Lindl.; **I.** *Campylocentrum huebneri* Mansf.; **J.** *Campylocentrum micranthum* (Lindl.) Rolfe; **K.** *Campylocentrum poeppigii* (Rchb.f.) Rolfe; **L.** *Catasetum discolor* (Lindl.) Lindl.; **M.** *Catasetum longifolium* Lindl.; **N.** *Catasetum macrocarpum* Rich. *ex* Kunth; **O.** *Catasetum x roseoalbum* (Hook.) Lindl.; **P.** *Catasetum saccatum* Lindl.; **Q.** *Cattleya violacea* (Kunth) Rolfe; **R.** *Caularthron bicornutum* (Hook.) Raf.; **S.** *Christensonella uncata* (Lindl.) Szlach., Mytnik, Górniak & Śmiszek; **T.** *Cleistes rosea* Lindl.

**Figura 3:** Diagramas florais. **A.** *Cleistes tenuis* (Rchb. f. *ex* Griseb.) Schltr.; **B.** *Cohniella cebolleta* (Jacq.) Christenson; **C.** *Dichaea picta* Rchb.f.; **D.** *Dimerandra emarginata* (G. Mey.) Hoehne; **E.** *Duckeella pauciflora* Garay; **F.** *Epidendrum anceps* Jacq.; **G.** *Epidendrum carpophorum* Barb. Rodr.; **H.** *Epidendrum coronatum* Ruiz & Pav.; **I.** *Epidendrum nocturnum* Jacq.; **J.** *Epidendrum orchidiflorum* Salzm. *ex* Lindl.;

**K.** *Epidendrum purpurascens* Focke; **L.** *Epidendrum rigidum* Jacq.; **M.** *Epidendrum strobiliferum* Rchb.f.; **N.** *Epidendrum viviparum* Lindl.; **O.** *Epistephium parviflorum* Lindl.; **P.** *Galeandra devoniana* R.H. Schomb. *ex* Lindl.; **Q.** *Habenaria schwackei* Barb. Rodr.; **R.** *Heterotaxis superflua* (Rchb.f.) F. Barros; **S.** *Laelia gloriosa* (Rchb.f.) L.O. Williams; **T.** *Ligeophila juruenensis* (Hoehne) Garay.

**Figura 4:** Diagramas florais e hábito. **A.** *Liparis nervosa* (Thunb.) Lindl.; **B.** *Lockhartia viruensis* Pessoa & Alves; **C.** *Lophiaris nana* (Lindl.) Braem; **D.** *Macradenia lutescens* R. Br. (1822: 612); **E-F.** *Maxillariella alba* (Hook.) M.A. Blanco & Carnevali; **G.** *Nohawilliamsia pirarensis* (Rchb.f.) M.W.Chase & Whitten; **H.** *Notylia angustifolia* Cogn.; **I.** *Ornithocephalus ciliatus* Lindl.; **J.** *Otostylis brachystalix* (Rchb.f.) Schltr.; **K.** *Pabstiella yauaperyensis* (Barb. Rodr.) F. Barros; **L.** *Pleurothallis pruinosa* Lindl.; **M.** *Polystachya concreta* (Jacq.) Garay & H.R.Sweet; **N.** *Polystachya foliosa* (Hook.) Rchb.f.

**Figura 5:** Diagramas florais e hábito. **A.** *Polystachya stenophylla* Schltr.; **B.** *Prosthechea fragrans* (Sw.) W.E. Higgins; **C.** *Prosthechea vespa* (Vell.) W.E. Higgins; **D.** *Quekettia microscopica* Lindl.; **E.** *Sarcoglottis amazonica* Pabst; **F.** *Scaphyglottis sickii* Pabst; **G.** *Solenidium lunatum* (Lindl.) Schltr.; **H.** *Trichocentrum recurvum* Lindl.; **I.** *Trichosalpinx egleri* (Pabst) Luer; **J.** *Trigonidium acuminatum* Bateman *ex* Lindl.; **K.** *Vanilla appendiculata* Rolfe; **L-M.** *Vanilla bicolor* Lindl.

## **Capítulo 4:** Aspects of Orchidaceae distribution on Northwestern South America: endemism centers × environmental conditions

**Figure 1**: Mapa de distribuição das áreas analisadas no estudo. **A.** Países com áreas analisadas. **B.** Centros de endemismo da Amazônia e áreas analisadas.: 1. Chocó (Colômbia); 2. Saul (Guiana Francesa); 3. Acre (Brasil); 4. Sucre (Venezuela); 5. FLONA Caxiuanã (Brasil); 6. Ilha do Combu (Brasil); 7. PARNA Barra Honda (Costa Rica); 8. PARNA Quéops (Costa Rica); 9. PARNA Viruá (Brasil); 10. Reserva Ducke (Brasil); 11. Serra das Andorinhas (Brasil); 12. Serrania Cuchila (Venezuela); 13. Serra de Carajás (Brasil).

**Figure 2:** Efeitos da altitude média na riqueza de espécies no Noroeste da América do sul e Costa Rica.

**Figure 3:** Análise de similaridade (UPGMA) da composição de espécies de Orchidaceae no Noroeste da América do Sul e Costa Rica. O dendrograma corresponde a valores de índice de Jaccard obtidos a partir de presença e ausência de espécies.

**Figure 4:** Mapa com a síntese do padrão biogeográfico da distribuição das espécies de Orchidaceae no Noroeste da América do Sul e Costa Rica.

**Figure 5:** Diagrama de ordenação representando os dois primeiros eixos significantes (Autovalores: Eixo 1= 0.73 e Eixo 2= 0.67; Correlação canônica: Eixo 1= 0.99 e Eixo 2= 0.98) gerado a partir de uma Análise de Correspondência Canônica para as áreas de estudo (Triângulos) e condições ambientais (flechas).

**Tabela 1:** Áreas analisadas, com país, coordenadas geográficas, número de espécies e referencia.

**RESUMO –** O Noroeste da América do Sul é caracterizado por uma alta diversidade de ecossistemas, a Floresta Amazônica é a maior formação vegetacional nessa região. Atualmente sabe-se que a Amazônia é um mosaico de oito centros de endemismo. podendo se destacar o Centro de Endemismo Guiana. O Parque Nacional do Viruá está localizado no Escudo das Guianas, região conhecida por altos níveis de endemismos. A flora da porção brasileira do escudo guianese é muito pouco conhecida, isso demostra que estudos florísticos são necessários para melhor conhecimento da distribuição local das espécies. Orchidaceae é uma das maiores famílias de plantas e a Colômbia, o Peru e o Brasil são os países com maior número de espécies. O objetivo desse estudo foi apresentar um tratamento taxonômico das espécies da família Orchidaceae ocorrentes no Parque Nacional Viruá, em Roraima, e, através da lista de espécies produzida, analisar comparativamente as relações de similaridade com outras áreas do Noroeste da América do Sul. Orchidaceae é representada na área de estudo por 69 espécies em 45 gêneros. *Epidendrum* L. (9 spp.) e *Catasetum* Rich. ex Kunth (5 spp.) são os gêneros mais representativos. Esse estudo representa cerca de 25% das espécies e 50% dos gêneros do estado de Roraima, no norte do Brasil, e acrescenta 19 novos registros para o estado. Através desse estudo foi descrita uma nova espécie, *Lockhartia viruensis* Pessoa & Alves, além de três novos registros para o Brasil. No Parque Nacional Viruá as florestas densas ("terra-firme" e inundável) são mais diversas (56 spp.) que a vegetação de Campinarana (13 spp.), e apenas uma espécie é compartilhada, (*Galeandra devoniana* R.H. Schomb. ex Lindl.). As analises de biogeografia ecológica foram conduzidas incluindo 13 áreas, duas da Costa Rica, uma na Colômbia e duas na Venezuela, além de oito no Brasil. O dendrograma obtido resultou num padrão de segregação das composições florísticas entre áreas amazônicas e não amazônicas. As condições ambientais analisadas parecem ser fatores importantes para explicar a composição florística de áreas não amazônicas. Altitude média, precipitação, vegetação e temperatura média, segregam as áreas da Costa Rica e o Chocó (Colômbia), enquanto que a presença de afloramentos rochosos distingue as áreas venezuelanas. O grupo amazônico é ambientalmente uniforme, e nenhuma das características físicas analisadas foi capaz de explicar sua segregação interna em dois sub-grupos. Fatores históricos podem explicar o padrão observado. O Parque Nacional Viruá formou um grupo junto com uma área do Centro de Endemismo Guiana e três do Centro de Endemismo Xingú, alguns desses na fronteira com o Centro de Endemismo Belém. Alguns estudos biogeográficos têm mostrado relações históricas entres esses três centros de endemismo.

Palavras Chave: Flora, Amazônia, Biogeografia, Monocotiledôneas, Roraima, Taxonomia.

**ABSTRACT –** Northwestern South America is characterized by a high diversity of ecosystems and the Amazon Forest is the biggest plant formation in this area. it is a mosaic of eight centers of endemism, including the Guianan center of endemism. The Viruá National Park is located on the Guiana Shield, distinguished by its high levels of biodiversity and endemism. Furthermore, the Brazilian portion of the Guiana Shield is very poorly known, it represents that floristic studies are needed to known the local distribution of the species. Orchidaceae is one of the largest families of plants, and Colombia, Peru and Brazil are the countries with the highest number of species. The aim of this study is to provide a survey of the Orchidaceae species from the Viruá National Park, Roraima State of Brazil, and throught the list of species, to analyse the floristic relationships with other areas on Northwestern South America. Orchidaceae is represented In the studied area by 69 species and 45 genera. *Epidendrum* L. (9 spp.) and *Catasetum* Rich. ex Kunth (5 spp.) are the more representative. This study represents about 25% of the species and about 50% of the genera cited to the State of Roraima, northern Brazil, and increased 19 new records of species. Throught this study has also been discribed a new species, *Lockhartia viruensis* Pessoa & Alves, besides the discovery of three new species records from Brazil.. On the PARNA Viruá the dense forest ("terra-firme" and floodable) is more diverse (56 spp.) than the "campinarana" vegetation (13 spp.), and share only one species (*Galeandra devoniana* R.H. Schomb. ex Lindl.). The biogeographic analysis were conducted with 13 areas, two from Costa Rica, one from Colombia, two from Venezuela, and eight from Brazil. The cluster analysis results in a split pattern between the Amazonian and non-Amazonian floristic composition. The environmental conditions analysed appear to be important factors to explain the Orchid composition of areas outside of the Amazon basin. Mid elevation, precipitation, vegetation and average temperature distinguish the Costa Rican areas, and the Chocó, whereas the presence of rock outcrops distinguishes the Venezuelan areas. The Amazonian group is very environmentally uniform, and no physical features are determinant to the internal segregation in two subgroups. Historical factors may explain observed the pattern. The PARNA Viruá form a group with one area of the Guyana Endemism Center and three of the Xingú endemism Center, some of then on the border of the Belém Endemism Center. Several biogeographical studies have shown the historical relationships among these three Endemism Centers.

Key Words: Flora, Amazon, Biogeography, Monocots, Roraima, Taxonomy.

# FUNDAMENTAÇÃO TEÓRICA

## 1. AMAZÔNIA

A Amazônia é o maior conjunto contínuo de florestas tropicais no planeta e sua área é de aproximadamente 6,7 milhões de km² (Mittermeier et al. 2003). Representa 5% da superfície do globo e 50% do continente sulamericano (Meirelles 2004) (Fig. 1).

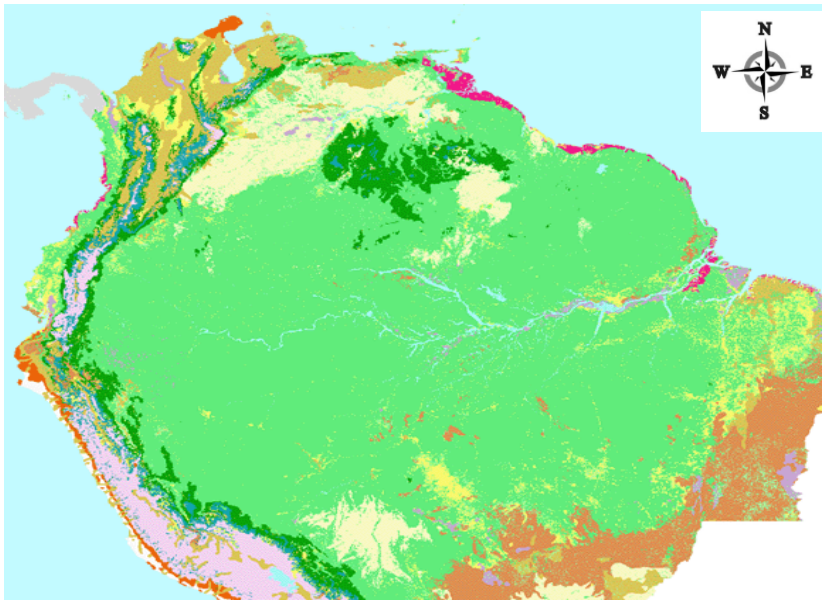


Figura 1: Amazônia e ecossistemas circundantes (Fonte Global Environments Monitoring Unit)

É considerada uma "Wilderness", ou seja, uma grande área pouco ou não modificada pela ação humana e que mantém suas características naturais. Tais áreas são de enorme importância no sentido de formação de estratégias de conservação, já que detém uma grande biodiversidade (Mittermeier et al. 2003).

Encontra-se distribuída por nove países: Bolívia, Brasil, Colômbia, Equador, Guiana, Guiana Francesa, Peru, Suriname e Venezuela. No Brasil, o termo "Amazônia Legal" compreende os sete estados da região Norte mais um trecho dos estados do Mato Grosso e Maranhão (Ribeiro 1999), sendo detentor de aproximadamente três quartos da área total amazônica (Ab'Sáber 2006).

É a maior e mais diversa floresta tropical do mundo e em apenas 5% da superfície terrestre acredita-se que estejam presentes mais de 25% de todas as espécies vivas (Meirelles 2004). Compilações recentes indicam que a Amazônia abriga pelo menos 40.000 espécies de plantas, 427 de mamíferos, 1.294 de aves, 378 de répteis, 427 de anfíbios e cerca de 3.000 de peixes (Rylands et al. 2002).

Seu clima não é uniforme com áreas nas quais se encontra uma estação seca bem definida (PARNA Viruá - pluviosidade inferior a 60 mm/mês) e outras nas quais praticamente não existe estação seca (Cabeça do Cachorro - pluviosidade de até 300 mm/mês). As chuvas também não são uniformes e na Amazônia brasileira, os maiores índices pluviométricos são encontrados no noroeste do Amazonas, na região conhecida como Cabeça do Cachorro. Nesta região chovem 3.600 mm/ano, e na costa do Amapá cerca de 3.000 mm/ano. As temperaturas médias variam de 26 ºC na estação chuvosa e 27,5 $^{o}$C na seca (Meirelles 2004).

A região é tipicamente considerada como de terras baixas e com praticamente metade da Amazônia Legal a menos de 100 m de altitude e o restante situado entre 100 e 500 m. As áreas acima de 500 m (podendo superar 2.500 m) compreendem menos de 2% da região, como alguns cumes na fronteira entre Brasil e Venezuela, na região dos "Tepuis" (Meirelles 2004).

A baixa fertilidade dos solos da Amazônia deve-se a sua avançada idade geológica sendo considerados pobres quimicamente devido a milhões de anos de exposição a água das chuvas, tornando-os solos "lixiviados" (Meirelles 2004).

A bacia Amazônia concentra cerca de 15% da água doce superficial em forma liquida do globo. Seus rios possuem diferentes tipos de água, que variam de composição química de acordo com a origem geológica e a cobertura vegetal por onde passam. Os rios que nascem de formações geológicas mais recentes, como os Andes, são de coloração "branca" (barrentas), e são ricos em nutrientes. Os que vêm de formações mais antigas podem ser "escuros" (pretos), "claros" ou "verde-azulados", sendo pobres em matéria orgânica e nutrientes (Meirelles 2004).

A exuberância das florestas amazônicas favoreceu uma idéia falsa de homogeneidade biótica da vegetação. Existem inúmeros tipos de formações vegetais na Amazônia. Cerca de 90% da área é composta por formações florestais sempre-verdes (Ab'Sáber 2006), o restante é classificado como áreas abertas, como Campinaranas e savanas (Amorim 2001).

As florestas de terra-firme nunca sofrem inundação, são em sua maioria perenifólias, porém algumas delas podem ser semi-caducifólias. Nas áreas inundáveis, que são sempre perenifólias, as árvores possuem adaptações a condição semi-submersa resultando na presença de um número restrito de espécies arbóreas, quando comparadas com as áreas de terra firme (Meirelles 2004).

As áreas abertas são tratadas por diversos nomes com difícil interpretação devido à diversidade de fitofionomias e carência de estudos abordando todos os aspectos inerentes a essas vegetações (Lisboa 1975). Entre os nomes usados estão Caatingas Amazônicas, Cerrado, Lavrados, Campinas e Campinaranas.

A região Amazônica é um mosaico de distintas áreas de endemismo (Figura 2) separadas pelos principais rios, cada um com suas próprias biotas e relações evolutivas. Deste modo, acredita-se que a maioria das espécies não está distribuída uniformemente na região e suas ocorrências estariam restritas a essas áreas de endemismos (Silva et al. 2005).


Figura 2: Centros de endemismo da Amazônia (Fonte: Silva et al. 2005)

Estudos de distribuição geográfica e de genética molecular com vertebrados (Haffer & Prance 2001), borboletas (Hall & Harvey 2002) e plantas vasculares (Prance 1982), indicam a existência de oito áreas de endemismos na Amazônia (Guiana, Imeri, Napo, Inabari, Rondônia, Tapajós, Xingu e Belém) (Fig. 2). Estes indicam que algumas dessas áreas estariam mais relacionadas historicamente com outras áreas da América do Sul do que com as demais áreas amazônicas (Amorim 2001). Por exemplo, a região noroeste da Amazônia estaria mais relacionada com áreas na América central e áreas dos Andes, enquanto que a região a sudeste estaria mais relacionada com a Floresta Atlântica (Amorim 2001).

É importante ressaltar que 20% da Amazônia brasileira, (aproximadamente 650 mil km²) já foi modificada pelo homem (Meirelles 2004). As maiores ameaças a essas áreas são a perda de habitat, degradação e fragmentação causada pelo desmatamento e extração seletiva de madeira (Gascon et al. 2001).

O desmatamento não é homogeneamente distribuído entre as áreas de endemismo da Amazônia. As áreas de endemismo Guiana, Imeri e Napo perderam, em suas partes brasileiras, menos de 5% da cobertura original, enquanto Belém tem mais de 60% de sua extensão comprometida (Silva et al. 2005).

As áreas de proteção ambiental também não estão bem distribuídas. Guiana, Imeri e Napo têm mais de 40% de suas áreas protegidas, enquanto que Belém tem menos de 20% (Silva et al. 2005).

Vista a complexidade da região amazônica, elevada diversidade biológica e a pressão antrópica, é necessária a criação de novas unidades de conservação. Estas devem garantir a proteção de áreas ricas em espécies cuja biodiversidade não sobreponha áreas protegidas pré-existentes (Pressey et al. 1993). Para isso é, necessário um grande esforço no registro da biodiversidade, para que esta sirva de base na definição de quais áreas apresentam maior potencial para conservação.

## 1.1 FISIONOMIAS

### 1.1.1 A Floresta Ombrófila Densa Aluvial: Florestas inundáveis

Poucas áreas no planeta permanecem inundadas de sete até quinze metros acima da cota do nível do mar e durante cerca de seis meses por ano. Esse fenômeno acontece somente no sudoeste da Ásia, no oeste do continente africano e ao longo dos rios da Amazônia (Ayres et al. 1998).

A área total da planície inundável da Amazônia é de 1.350.000 km² (20% da área total Amazônica) (Junk 1993). Sua denominação é confusa, e segundo Veloso et al. (1991), pode ser classificada como Floresta Ombrófila Densa Aluvial (não citando subtipos). Porém, são usualmente conhecidos dois sub-tipos, as Florestas de Igapó e as Florestas de Várzea (Prance 1980).

As Florestas de Igapó são áreas inundáveis por águas claras, escuras ou verde-azuladas cujas origens são de áreas geologicamente antigas e são particularmente ácidas e com solos arenosos, pobres em nutrientes (Prance 1980).

As Florestas de Várzea correspondem a segunda maior formação vegetal da bacia amazônica (Araújo et al. 1984). São áreas inundáveis por águas ditas brancas (barrentas), com grande quantidade de sedimentos em suspensão e originadas na região

andina, sob frequente erosão. Têm pH próximo ao neutro e seus solos são considerados naturalmente férteis (Prance 1980).

Alguns autores têm evidenciado, com base em inventários florísticos, que as Florestas de Várzea são mais ricas em espécies vegetais do que as Florestas de Igapó (Kubitzki 1989; Worbes 1997), e que há apenas 20% de similaridade florística entre as duas tipologias (Wittman et al. 2006).

### 1.1.2 Terra firme

As florestas de terra-firme são aquelas que não sofrem inundação em nenhuma época do ano e representam ca. de 96% da Amazônia (Meirelles 2004). Estas são consideradas mais ricas em espécies lenhosas que as florestas inundáveis (Gama et al. 2005), principalmente porque as espécies não necessitam de adaptações especiais para submersão.

Segundo Veloso et al. (1991), podem ser classificadas com Floresta Ombrófila densa ou aberta, onde dominam as Terras Baixas, porém também apresentando áreas Sub-Montanas, Montanas e, mais raramente, Alto-Montanas.

Quanto a composição florística, sabe-se que poucas espécies arbóreas são comuns a toda a área de terra firme amazônica, sendo a maior parte das espécies restrita a determinada localidade (Meirelles 2004).

A maior diversidade encontrada nas florestas de terra-firme, também está relacionada a presença de um sub-bosque, o qual está praticamente ausente nas florestas inundáveis (Meirelles 2004).

### 1.1.3 Campinaranas

"Campinarana" é um termo adotado aqui para designar formações abertas distribuídas pela Amazônia seguindo o proposto por Veloso et al. (1991). A nomenclatura utilizada para essas formações abertas é bastante controversa e muitas vezes confusa (Lisboa 1975). Alguns nomes utilizados são Campinas (para formações gramíneo-lenhosas), Caatingas Amazônicas (Lisboa 1975) (primeiro termo empregado) e Lavrados (Barbosa et al. 2007) (formações do extremo norte do Brasil, relacionadas com a Gran Sabanna Venezuelana).

De uma forma geral, são caracterizadas por serem enclaves de savana com solo diferenciado (arenoso), e flora característica. Tal formação é mais comum na bacia do Rio Negro, podendo ser encontrada na bacia do Rio Branco, e em regiões do Amapá e Pará (Veloso et al. 1991).

Muito se discute sobre a origem desse tipo de vegetação, porém sem consenso. Prance & Schubart (1978), acreditam que tais formações podem ter sua origem ligada a ação antrópica, enquanto Ducke & Black (1954), sugerem que seriam supostamente mais antigas que a floresta pluvial.

Ducke & Black (1954) utilizavam dois nomes para essa vegetação, as "Caatingas", localizadas no alto e médio Rio Negro e Rio Solimões, caracterizadas pela abundância de Orchidaceae epífitas e Chrysobalanaceae, e as "Campinas" distribuídas pela Amazônia com essas duas famílias não muito abundantes ou ausentes, além de diferenças de solo. Estudos são necessários para melhor compreensão da identidade e origem dessa(s) formação(ões) vegetacional(is).

## 1.2 CENTRO DE ENDEMISMO GUIANA

O Escudo das Guianas é uma das regiões geologicamente mais antigas do mundo, e apresenta elevadas taxas de endemismo. Esta formação abrange parte da Colômbia, Venezuela, Guiana, Suriname, Guiana Francesa e Brasil (Funk & Hollowell 2007) (Fig. 3). Alguns dos ecossistemas mais ricos em espécies são encontrados nessa área, como os Tepuis (Berry 1995), as Campinaranas (Veloso et al. 1991) e a "Gran Sabanna" da Venezuela (Sarmiento 1983).

Um checklist recente para a porção extra-brasileira cita Fabaceae (1.082 spp.), Orchidaceae (1.020 spp.), Rubiaceae (742), Melastomataceae (534 spp.), Poaceae (526 spp.) e Cyperaceae (413 spp.) como as famílias mais representativas em números de espécies (Funk & Hollowell 2007). O grande número de espécies de monocotiledôneas evidencia a alta diversidade das áreas abertas e das áreas montanhosas não florestadas (Tepuis) (Funk & Hollowell 2007).

Apesar da existência de alguns estudos, ainda se sabe muito pouco sobre a flora do Escudo das Guianas, especialmente em relação a história evolutiva das espécies endêmicas da área. Pouco se sabe, também, sobre a filogenia desses grupos.


Figura 3: Escudo Guianense (Fonte: Funk et al. 2007)

### 1.2.1. O Estado de Roraima

O estado de Roraima está localizado no norte do Brasil, limitado a leste pela Guiana e estado do Pará, ao Norte e noroeste pela Venezuela e ao sul e sudoeste pelo estado do Amazonas. Com superfície de 224.298,980 km² (IBGE 2002), está inserido, em sua totalidade, no Centro de Endemismo Guyana e, em parte, no Escudo Guianense (Funk & Hollowell 2007).

De acordo com Barbosa (1993), a ocupação do estado de Roraima vem ocorrendo desde o Brasil colônia, no século XVIII, quando os primeiros agrupamentos populacionais consistiam basicamente de nativos e poucos colonos na região do alto Rio Branco. Nesse século iniciou-se a introdução da pecuária, devido a existência de áreas abertas naturais propícias para a atividade.

Ainda segundo Barbosa (1993), no início do século XX houve um acréscimo populacional devido a atividade de mineração de ouro que se iniciava, com os imigrantes vindos principalmente da região Nordeste. Porém, é na segunda metade do século XX, através de políticas de criação de assentamentos, que houve um grande crescimento populacional e formação dos principais núcleos hoje existentes.

Estudos indicam a existência de quatro domínios geológicos principais no estado: Urariquera, Guiana Central, Parima e Anauá–Jatapu. Esses domínios caracterizam-se por associações geológicas, idades e feições estruturais específicas (Reis & Fraga 1998) e as variações pedológicas encontradas refletem na vegetação.

Desde modo uma grande variedade de tipologias de vegetação é encontrada no Estado de Roraima (Schaefer & Vale 1997).

Sua cobertura vegetacional original é distribuída em diferentes formações florestais e não-florestais, incluindo algumas particulares como as campinaranas concentradas ao sul e os Tepuis ao norte (Barbosa et al. 2003).

As Florestas Ombrófilas predominam no Estado, com variantes altitudinais que são desde as florestas montanas, sub-montanas, de terras baixas e aluviais (Gribel et al. 2009). Dentre os ecossistemas não florestados, as savanas encontradas em Roraima, também conhecidas como lavrados (Vanzolini & Carvalho 1991), formam as maiores áreas de savanas da Amazônia brasileira e compõem o complexo paisagístico "Rio Branco-Rupununi", que se estende para a Guiana e Venezuela (Barbosa et al. 2007). Segundo Ratter et al. (2006) e Barbosa et al. (2007), baseados em inventários fitofisionômicos, sua flora angiospérmica tem baixa riqueza específica.

Outro tipo de formação não-florestal encontrada no estado são as Campinaranas. Ocorrem na porção Centro-Sul, sendo unidades fitofisionomicamente complexas e com muitos problemas nomenclaturais (Lisboa 1975).

A baixa densidade populacional de Roraima resulta num bom estado de conservação de suas áreas originais, porém o aumento gradativo dessa população já indica necessidade de melhor acompanhamento do uso dessas áreas. Em 1978, apenas 132 km² (0,06%) da área do Estado tinham sofrido algum distúrbio por desmatamento, já em 1989 este valor se elevou a 3.621 km² (1,61%) (Fearnside et al. 1990).

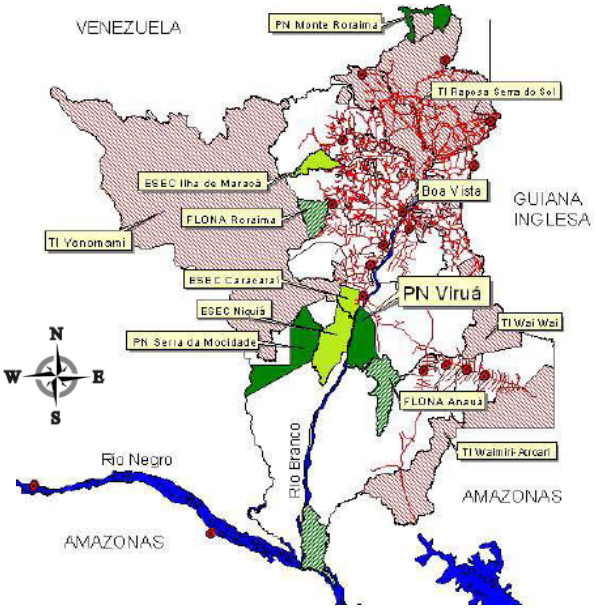


Figura 4: Estado de Roraima e suas Unidades de conservação e terras indígenas (Fonte: Lisboa & Lisboa, 2009)

Atualmente, as Unidades de Conservação somam 13,2% da área total do Estado de Roraima e, se somadas as Áreas Indígenas, esse número chega a 68% do território (Fig. 4). Demonstrando que grande parte da área do estado está, de alguma forma, protegida. Dentre essas Unidades de Conservação, destaca-se o Parque Nacional do Viruá, que vem se tornando um pólo de pesquisas na Amazônia brasileira.

### 1.2.2. Parque Nacional do Viruá

O Parque Nacional do Viruá está localizado no centro-sul de Roraima, ocupando uma área de 227.011 ha. Foi criado pelo decreto s/nº de 29/24/1998 com o objetivo principal de proteger a preservar amostras do ecossistema Campinarana (Schaefer et al. 2009).

O Parque é emoldurado por três rios (Fig. 5). A oeste fica o Rio Branco, que possui águas barrentas (brancas), ricas em sedimentos, que torna os solos ricos quimicamente. A leste fica o Rio Barauana, que possui leito rochoso, com solos rasos e ricos. No limite sul, o Rio Anauá, que corta transversalmente o Parque e carrega grande quantidade de sedimentos, vindos principalmente do Rio Branco (Schaefer et al. 2009). O rio Iruá, que dá nome ao parque, corta toda sua extensão. É de águas escuras, pobres em sedimentos e seu leito possui trechos no interior de Igapós densos descaracterizando o traçado original do rio. Ao longo de seu percurso ocorrem também áreas semelhantes a restingas arenosas. Tais características levam a caracterização do Parque como um "Pantanal Setentrional" (Schaefer et al. 2009).

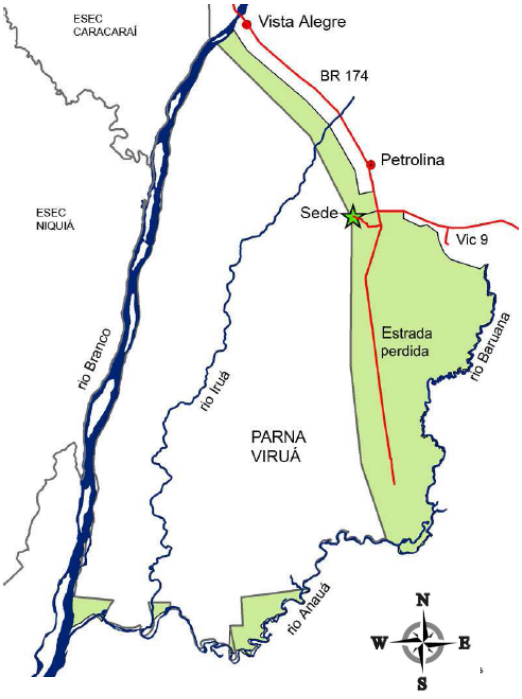


Figura 5: PARNA Viruá e suas localidades (em verde áreas a ser enxada)
(Fonte: Lisboa & Lisboa, 2009)

O Parque possui um grande mosaico de formações florestadas e abertas, com predomínio de ambientes submetidos a inundações periódicas, abrangendo um amplo sistema palustre ou pantanoso com domínio de sedimentos arenosos, tratado localmente como um "pantanal arenoso" (Schaefer et al. 2009).

Podem ser encontradas, segundo a classificação de Veloso et al. (1991), áreas de Florestas Ombrófilas Densas e Abertas de Terras Baixas, Florestas Ombrófilas Densas Aluviais ao longo dos rios e pequenas áreas de Florestas Ombrófilas Densas Submontanas, além das Campinaranas que são as formações com maior área de ocupação do Parque (Schaefer et al. 2009).

As Florestas Ombrófilas Densas Aluviais (ou Florestas inundáveis), são encontradas nos terraços aluviais dos rios, sobre solos aluviais e em áreas sazonalmente inundáveis. Nas margens dos Rios Branco, Barauana e Anauá, predominam Florestas de Várzea, enquanto nas margens do rio Iruá predominam as Florestas de Igapó (Gribel et al. 2009).

As Florestas Ombrófilas Densas e Abertas de terra-firme são encontradas na Serra do Preto, Serra da Perdida e proximidades, além de áreas não inundáveis da bacia dos Rios Branco, Anauá e Barauana (Gribel et al. 2009).

As Campinaranas podem ser encontradas por todas as áreas, com as principais manchas na região central, margeando o Igapó do Rio Iruá. Uma das maiores áreas contínuas de Campinaranas do mundo está localizada na área conhecida localmente como "Estrada Perdida" (Gribel et al. 2009).

O PARNA do Viruá vem se consolidando desde 2005 como um dos principais pólos de pesquisas na Amazônia, tendo sido, no ano de 2008, a Unidade de Conservação que recebeu maior número de solicitações de pesquisa na Amazônia e a quarta do Brasil (Lisboa & Lisboa 2009).

# 2. ORCHIDACEAE

## 2.1 BREVE HISTÓRICO

Os estudos de Orchidaceae no Brasil tiveram início com Velloso, com a "*Flora Fluminensis*" (Vellozo 1831-1881) e Lindley, com "*The Genera and Species of Orchidaceous Plants*" (Lindley 1830-1840), que nessas obras descreveram inúmeras espécies brasileiras. Entretanto, os primeiros trabalhos de maior abrangência para família e exclusivos do País foram os publicados por Barbosa Rodrigues no "*Genera et species orchidearum novarum*" (Barbosa-Rodrigues 1877), e Cogniaux, com três volumes da "*Flora Brasiliensis*" (Cogniaux 1893-1896, 1898-1902, 1904-1906).

No início do século XX, surgiram as primeiras publicações de um dos maiores orquidólogos brasileiros, Frederico Carlos Hoehne. Sob sua autoria inúmeras obras foram publicadas sobre as Orchidaceae brasileiras, das quais se destacam a "*Iconografia das Orchidáceas do Brasil"* (Hoehne 1949) e quatro volumes da "*Flora brasilica*" (Hoehne 1940, 1942, 1945, 1953), esta não concluída por ocasião da morte do mesmo.

Mais recentemente, Pabst & Dungs elaboraram a mais abrangente revisão da família para o Brasil - "*Orchidaceae Brasilienses*" (Fig. 6) (Pabst & Dungs 1975, 1977). Nesta obra foram apresentadas novas combinações e sinonimizações, reduzindo o número de táxons citados para o país.


Figura 6: Capa do volume 2 do livro *Orchidaceae Brasilienses*

A compilação de nomes mais recente das espécies de Orchidaceae do Brasil foi produzida por Barros et al. (2012), e nela estão apresentadas várias mudanças com relação a revisão de Pabst & Dungs (1975, 1977).

## 2.2. MORFOLOGIA

Representantes de Orchidaceae são plantas herbáceas, perenes, de porte extremamente variável (Rasmussen 1985). Podem ser terrícolas, epífitas, rupícolas, aquáticas ou saprófitas (mico-heterotróficas), sendo estas últimas mais representadas em regiões temperadas (Dunsterville & Garay 1976). Possuem uma grande diversidade morfológica, tanto vegetativa quanto floral, devido principalmente ao grande número de espécies vivendo em diferentes habitats, em todos os continentes, interagindo com diversos grupos de polinizadores.

As adaptações das orquídeas aos diferentes habitats estão presentes principalmente nos órgãos vegetativos - raiz, caule e folhas. As raízes são fasciculadas e podem ser carnosas como as de *Sarcoglottis*, possuírem tuberóides como em *Habenaria* ou ainda, como em algumas espécies áfilas de *Campylocentrum*, elas podem ser clorofiladas e responsáveis pela realização de fotossíntese. Em muitas espécies, principalmente nas epífitas, as raízes possuem externamente, uma ou mais camadas de células mortas, constituindo o velame (Rasmussen 1985). Este tecido tem como função absorver água e nutrientes e também evitar a perda de água pelas raízes. A raiz também

possui associação simbiótica com fungos. As micorrizas são consideradas muito importantes durante os primeiros estágios de desenvolvimento da plântula (Clements 1988).

Orchidaceae apresenta dois tipos de crescimento: monopodial e simpodial (Rasmussen 1985). Nas espécies de crescimento simpodial, o caule possui crescimento limitado, e novos brotos geralmente surgem de gemas axilares do rizoma. Nas orquídeas monopodiais, o caule apresenta potencial para um crescimento apical indefinido, com novas folhas partindo sempre do mesmo meristema vegetativo (Dressler 2003; Sing-Chi et al. 2009).

O caule pode ser dividido em uma porção mais basal denominada rizoma e outra, geralmente ereta, denominada de cauloma que também recebe o nome de pseudobulbo quando intumescido. O rizoma geralmente é formado por vários nós e entrenós, cresce paralelamente ao substrato, podendo ser aéreo ou subterrâneo e variar em comprimento e espessura. Os pseudobulbos podem ser classificados de acordo com o número de entrenós. São chamados homoblásticos quando formados por mais de um entrenó, sendo estes mais ou menos semelhantes (p. ex., *Cyrtopodium*) ou heteroblásticos, quando formados por um único entrenó espessado, estando os outros reduzidos (p. ex., *Oncidium*). O caule secundário ainda pode ser delgado, sem nenhum tipo de intumescimento, sendo então denominado cormo ou cauloma (Rasmussen 1985; Toscano-de-Brito & Cribb 2005).

As folhas são normalmente alternas e dísticas, às vezes equitantes ou rosuladas e apresentam grande variação morfológica, podendo inclusive estar ausentes em algumas espécies ou reduzidas a escamas. Algumas apresentam bainha, mas também podem possuir pseudo-pecíolo ou serem sésseis. Geralmente a lâmina foliar é achatada dorsi-ventralmente, porém algumas podem ser cilíndricas como em *Brassavola* ou achatadas lateralmente, como em *Ornithocephalus*. Possuem formas e texturas variadas (Rasmussen 1985; Toscano-de-Brito & Cribb 2005).

As inflorescências são geralmente indeterminadas, principalmente dos tipos racemo, panícula, espiga e corimbo. Podem ser unifloras, paucifloras ou multifloras, mas também ocorrem flores solitárias, em glomérulos e, mais raramente, em cimeiras. São consideradas laterais, quando partem da base do caule, como em *Rodriguezia* ou das axilas foliares, como em *Vanilla*, e terminais, quando partem do ápice do caule, como em *Epidendrum* (Rasmussen 1985).

A flor é o órgão que possui maior variação, entretanto é bastante conservadora quanto ao número e disposição dos verticilos (Toscano-de-Brito & Cribb 2005). São diclamídeas, mais comumente zigomorfas (apenas em alguns gêneros basais são actinomorfas, ex. *Apostasia*), trímeras e monoclinas, com poucos gêneros de flores diclinas, como *Catasetum*. Possuem três sépalas, sendo a oposta ao labelo com posição dorsal e as outras duas posicionadas lateralmente. As pétalas também são em número de três, sendo uma diferenciada em labelo, que no botão floral ocupa a porção superior na flor, mas durante o desenvolvimento floral pode se reposicionar através uma torção ou encurvamento do pedicelo-ovário, passando a ocupar posição inferior. Esse fenômeno é conhecido como ressupinação e está associado ao acesso do polinizador (Carnevali & Ramírez-Morillo 2003). Os verticilos florais são muito variáveis em relação a coloração, forma, textura e ornamentação, que segundo Van Der Pijl & Dodson (1966), selecionam polinizadores e facilitam a polinização cruzada (Fig. 7).

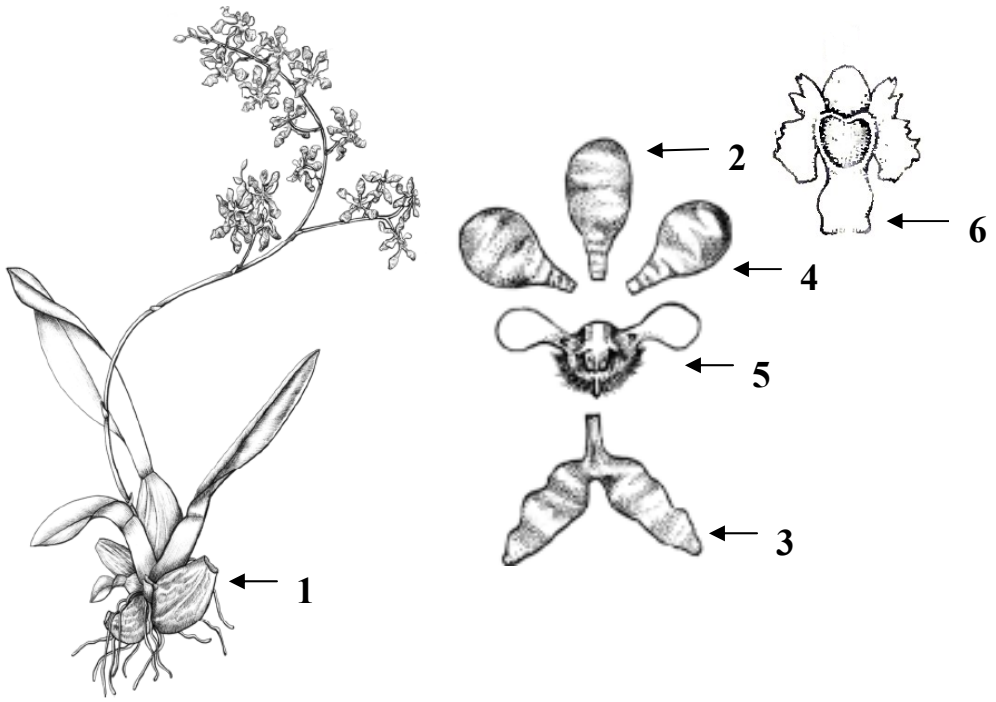


Figura 7: 1. Pseudobulbo; 2. Sépala dorsal; 3. Sépalas laterais fusionadas; 4. Pétalas; 5. Labelo; 6. Coluna [*Gomesa barbata* (Lindl.) Chase & Williams, Adaptado de Pessoa & Alves, 2011].

O androceu e o gineceu são extremamente modificados, sendo esta uma das principais características da família. Os filetes e o estilete são adnados, formando uma estrutura chamada coluna ou ginostêmio (Rasmussen 1985). O androceu apresenta um, dois ou três estames férteis, sendo a primeira a condição mais frequente (Christenson 2004). Os grãos de pólen podem se apresentar unidos em tétrades, políades ou em

polínias (Rasmussen 1985). O conjunto das polínias e seus apêndices é denominado polinário. Os apêndices das polínias podem ser caudículas (estruturas acelulares formadas por viscina), estipe (estrutura formada a partir de tecido do rostelo, que se diferencia, destaca-se e unindo-se as polínias) e/ou viscídio (glândula viscosa que tem como função aderir o polinário ao corpo do polinizador) (Toscano-de-Brito & Cribb 2005).

O estigma é uma cavidade assimétrica, geralmente voltada para face ventral da coluna e separado da antera fértil por uma estrutura chamada rostelo (Toscano-de-Brito & Cribb 2005). A principal função do rostelo é separar as polínias do estigma, impedindo a autopolinização (Christenson 2004).

O ovário é ínfero, geralmente sem diferenciação aparente do pedicelo. É tricarpelar e, geralmente, unilocular com placentação parietal, porém raramente pode ser trilocular com placentação axial (Rasmussen 1985). Na maioria das vezes não é possível distinguir o ovário do pedicelo, o que obriga a tratá-los em conjunto nas descrições morfológicas. O fruto é mais comumente do tipo cápsula (Christenson 2004). As sementes são numerosas, minúsculas, possuem um embrião rudimentar e não apresentam endosperma. A forma das sementes é bastante variada e juntamente com o tamanho reduzido facilitam a dispersão pelo vento (Rasmussen 1985).

Segundo Van der Pijl & Dodson (1966) a grande variabilidade morfológica encontrada nas flores das Orchidaceae está intimamente relacionada com polinizadores preferenciais, assim sendo, uma gama desses agentes dependem dessas plantas para sua sobrevivência, uma vez que os recursos ofertados por elas são de grande importância pra sua dieta (néctar) e/ou reprodução (cera ou odores).

## 2.3 TAXONOMIA

Orchidaceae está inserida entre as monocotiledôneas, na ordem Asparagales, tendo como família irmã Hypoxidaceae (APG III 2009). Compreende cerca de 24.500 espécies (Dressler 2005), distribuídas em 800 gêneros (Dressler 1993). Dressler (1993) e Szlachetko (1995) propuseram sistemas de classificação para a família com base em caracteres morfológicos. Mais recentemente, com o advento da biologia molecular, outros trabalhos sugeriram novas classificações como os de Cameron et al. (1999),

Chase et al. (2003) e Pridgeon et al. (1999, 2001, 2003, 2005), sendo que este último utiliza análises combinadas de caracteres morfológicos e moleculares.

O Sistema de Classificação proposto por Chase et al. (2003) consiste na divisão de Orchidaceae em cinco subfamílias: Cypripedioideae, Apostasioideae, Vanilloideae, Orchidoideae e Epidendroideae. Estas se individualizam, do ponto de vista morfológico, principalmente por sinapomorfias relacionadas às polínias e as anteras.

Segundo esse Sistema de Classificação, Apostasioideae é a subfamília que primeiro divergiu na evolução das orquídeas e seus representantes possuem três ou dois estames férteis, com pólen em mônades. Está representada por dois gêneros e 15 espécies no mundo, contudo é a única subfamília sem representantes no Brasil. Cypripedioideae apresenta dois estames férteis, um estaminódio e pólen aglutinado, porém sem formar polínias, e está representada por cinco gêneros e cerca de 150 spp. no mundo (Pridgeon et al. 1999). Vanilloideae possui apenas um estame fértil e o pólen se apresenta em massas farinosas, mas não polínias verdadeiras, e seus representantes estão distribuídos em 15 gêneros e ca. 250 spp. no mundo (Pridgeon et al. 2003). As demais subfamílias, Orchidoideae e Epidendroideae apresentam pólen aglutinado em polínias e são as mais ricas em táxons, com 208 gêneros e ca. 3.630 spp. (Pridgeon et al. 2001) e 650 gêneros e caa. 18.000 spp. no mundo (Pridgeon et al. 2005), respectivamente (Fig. 8).

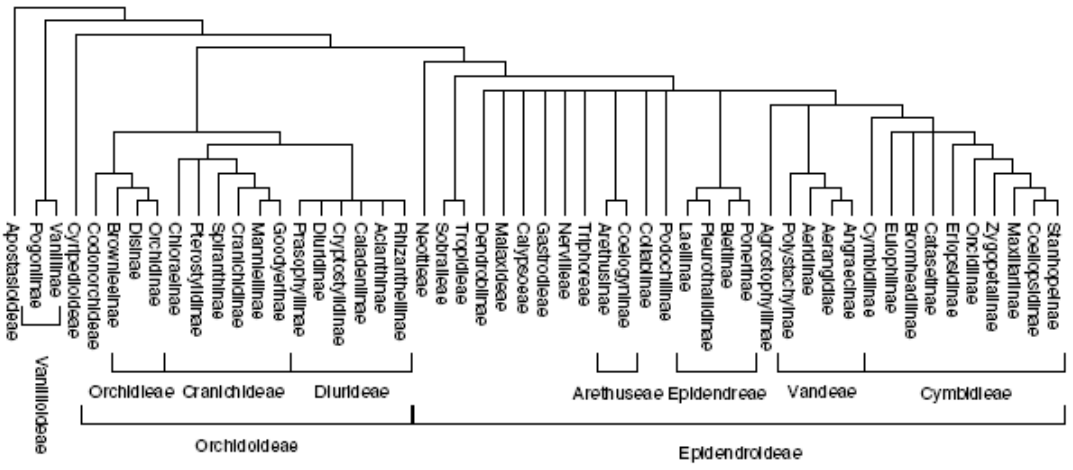


Figura 8: Filogenia de Orchidaceae resumida. (Chase et al. 2003)

Nas últimas décadas, com o advento das técnicas moleculares, houve diversas mudanças nas propostas de delimitação e circunscrição de Tribos, Subtribos, e Gêneros

de Orchidaceae. Em relação a grupos importantes na flora brasileira, os parágrafos abaixo dão um resumo dessas modificações:

Para a Subtribo Pleurothallidinae, o trabalho de Pridgeon & Chase (2001) transferiu algumas das espécies brasileiras anteriormente submetidas ao então grande gênero *Pleurothallis*, principalmente para *Acianthera*, *Anathallis*, *Pabstiella* e *Specklinia.* Tais análises tiveram recentes ajustes apontados por Chiron et al. (2012).

Entre as Oncidiinae, a maioria das espécies brasileiras anteriormente pertencentes à *Oncidium* Sw. estão submetidas ao gênero *Gomesa* R. Br., segundo Chase et al. (2009), enquanto entre as Maxillariinae, o gênero *Maxillaria* Ruiz & Pav. foi subdividido em diversos pequenos gêneros por Blanco et al. (2007).

Em *Scaphyglottis* Poepp. & Endl. está incluída a maioria das espécies com pseudobulbos sobrepostos, como aquelas posicionadas nos antigos gêneros *Hesixea* Lindl., *Hexadesmia* Brongn., *Tetragamestus* Rchb.f. e *Reichenbachanthus* Barb. Rodr. (Dressler et al. 2004).

*Trichocentrum* Poepp. & Endl., após sequenciais mudanças de circunscrição é tratado como originalmente proposto (Pupulin 1999), excluindo parte das espécies, hoje pertencentes aos gêneros *Lophiaris* (Braem 1993) e *Cohniella* (Christenson 1999).

A subtribo Laeliinae, especialmente as espécies brasileiras do grupo *Laelia-Cattleya-Sophronitis*, este que teve seguidas propostas de classificação publicadas nos últimos anos, na mais recente delas (Van den Berg et al. 2009) as espécies desse grupo foram transferidas para o gênero *Cattleya* Lindl.

A Subtribo Zygopetalinae também sofreu importantes modificações com os estudos de Whitten et al. (2005) e Pupulin (2009), que demonstraram o polifiletismo de alguns gêneros como *Zygosepalum* Rchb.f. Este que teve algumas espécies, principalmente aquelas do escudo das Guianas, transferidas por Romero-González & Fernández-Concha (2010) para o gênero *Weidmannia* G. A. Romero & Carnevali.

## 2.4 DISTRIBUIÇÃO

Orchidaceae possui distribuição cosmopolita (Christenson 2004) (Fig. 9), porém é nas regiões tropicais e subtropicais que se encontra a maioria das espécies, com o

Figura 9: Distribuição de Orchidaceae
(Fonte: Angiosperm Phylogeny Website)

predomínio de epífitas (Dressler 1993). Nas regiões temperadas, as formas terrícolas ou mico-heterotróficas são as mais abundantes.

A região Neotropical e a região Indo-Maláia são considerados como os centros de diversidade da família (Dressler 1993). Alguns gêneros são pantropicais como *Bulbophyllum*, *Habenaria*, *Malaxis* e *Vanilla* (Christenson 2004). Por outro lado algumas espécies da família são micro-endêmicas (restritas a pequenas áreas) (Pabst & Dubgs 1975).

O Neotrópico destaca-se pela diversidade de espécies de orquídeas. Neste contexto, a Colômbia, o Peru e o Brasil respectivamente, são os países com a flora orquidológica mais exuberante do mundo (Pabst & Dubgs 1975), graças às grandes extensões de florestas úmidas e dos gradientes altitudinais presentes.

No Brasil ocorrem ca. de 240 gêneros e 2.500 espécies (Barros et al. 2013), presentes em todas as formações vegetais. No entanto, as florestas úmidas abrigam a maior diversidade taxonômica, com especial destaque para a Floresta Atlântica (ca. 1400 spp.) e a Floresta Amazônica (ca. 770 spp.).

### 2.4.1. Orchidaceae na Floresta amazônica

Até há pouco tempo não existiam inventários taxonômicos focados nas espécies de Orchidaceae da Amazônia brasileira, estando seu estudo restrito a obras clássicas como Flora Brasiliensis (Cogniaux 1893-1896, 1898-1902, 1904-1096), Flora Brasílica (Hoehne 1940, 1942, 1945, 1953) e Orchidaceae Brasiliensis (Pabst & Dungs 1975, 1977).

Dos estudos que já foram realizados, a maioria se restringe a listas de espécies como os de Silva et al. (1995), Cardoso et al. (1996), Atzingen et al. (1996), Ilkiu-Borges & Cardoso (1996), e Silveira et al. (1995). Dos poucas publicações de cunho taxonômico existentes destacam-se os dos gêneros *Habenaria* (Batista et al. 2008) e *Galeanda* (Monteiro et al. 2009).

Recentemente Barros et al. (2012) citaram os estados do Amazonas (576 spp.), Pará (475 spp.) e Roraima (336 spp.) como os mais ricos em numero de espécies para a Amazônia brasileira.

Na Amazônia, a diversidade orquidológica é muito acentuada, porém ainda muito pouco conhecida (Silva & Silva 2000). Destacam-se como regiões pouco

conhecidas para a família as áreas de fronteira do Brasil com as Guianas e Venezuela, os altos cursos dos rios formadores da bacia amazônica e áreas as centrais inacessíveis (Silva & Silva 2000).

Em um recente trabalho sobre a Flora do Escudo das Guianas (extra-brasileira), Orchidaceae, com mais de 1.000 espécies citadas, foi citada como a segunda família mais representativa, perdendo apenas para Fabaceae (Funk & Hollowell 2007), o que demonstra a grande diversidade a ser explorada na porção brasileira, que permanece carente de estudos.

## 3. OBJETIVOS

Considerando a porção brasileira do Escudo Guianense, uma região carente de informações taxonômicas, o presente estudo objetivou apresentar um inventário taxonômico das espécies da família Orchidaceae ocorrentes no Parque Nacional Viruá, em Roraima, e, através da lista de espécies produzida, analisar comparativamente as relações de similaridade com outras áreas no Noroeste da América do Sul.

Como produtos são apresentados o tratamento taxonômico das espécies da área, além das análises biogeográficas e um guia de identificação.

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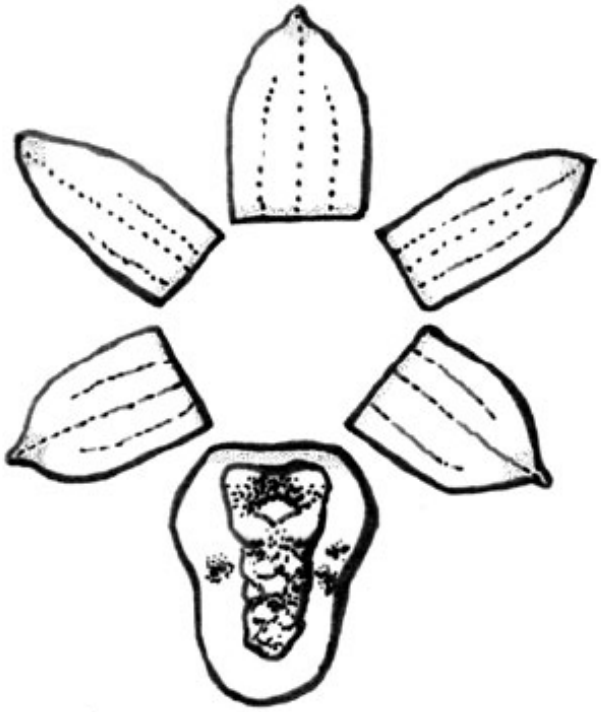

## CAPÍTULO 1: *LOCKHARTIA VIRUENSIS* (ORCHIDACEAE - ONCIDIINAE): A NEW SPECIES FROM RORAIMA STATE, BRAZILIAN AMAZONIA REGION

Artigo Publicado no periódico Brittonia 64(2): 162-164 (2012)

# *Lockhartia viruensis* (Orchidaceae-Oncidiinae), a new species from Roraima state, Brazilian Amazonia region

EDLLEY PESSOA[1] AND MARCCUS ALVES[2]

[1]Programa de Pós-Graduação em Biologia Vegetal, Departamento de Botânica, Universidade Federal de Pernambuco, CEP: 50670-901, Recife, Pernambuco, Brazil; e-mail: edlley_max@hotmail.com

[2]Departamento de Botânica, Universidade Federal de Pernambuco, CEP: 50670-901, Recife, Pernambuco, Brazil; e-mail: alves.marccus@gmail.com

**Abstract.** A new species, *Lockhartia viruensis*, is described and illustrated from the state of Roraima, in the Brazilian Amazon, and its affinities are discussed. The new species is similar to *L. imbricata*, but differs by having an entire lip with an obtuse to rounded apex, a callus on the disk of the lip with a longitudinal row of papillae with a rounded apex, and the margin of the column wings entire.

**Key words:** Amazon, Brazil, Oncidiinae, Orchidaceae, Roraima, diversity.

**Resumo.** Uma nova espécie, *Lockhartia viruensis*, é descrita e ilustrada para a Amazônia brasileira, estado de Roraima, e suas afinidades são discutidas. A nova espécie é semelhante a *L. imbricata* (Lam.) Hoehne, difere por possuir labelo inteiro, com ápice obtuso a redondo, um calo no disco com uma a fileira longitudinal papilosa de ápice redondo e margem das asas da coluna inteiras.

*Lockhartia* Hook. is a small genus of Orchids with 27 species in subtribe Oncidiinae (Chase et al., 2003). Species of *Lockhartia* are small to medium-sized epiphytic orchids, with imbricate and laterally compressed leaves; the habit is similar to that of *Erycina* Lindl., because of the equitant leaves, but the stem is longer in *Lockhartia*. The flowers of *Lockhartia* and *Oncidium* Sw. are superficially similar in the color yellowish with brown spots, and in the form of the sepals, petals and lip, but *Lockhartia* lacks a tabula infrastigmatica, a structure present only in the column base of the *Oncidium* species (Mora-de-Retana, 1999). The lip of the majority *Lockhartia*

species is usually complex, can be lobed in several forms, and has a callus with a large variation of forms, characters that are very important to the taxonomy in the genus. Vegetatively, *Lockhartia* species are easily separated from those of other genera, because it is the only orchid genus with equitant leaves and stem much longer than wider (Ames & Correl, 1953).

The genus is distributed from Mexico and Central America to Brazil, Bolivia and Peru (Schweinfurth, 1961). According to Barros et al. (2010), there are six recorded species in Brazil: *Lockhartia goyazensis* Rchb.f., *L. imbricata* (Lam.) Hoehne, *L. ivainae* M. F. F.Silva & A. T.Oliveira, *L. ludibunda* Rchb. f., *L. lunifera* (Lindl.) Rchb. f. and *L. parthenocomos* (Rchb. f.) Rchb. f. A seventh species has been discovered in the Brazilian Amazon, in the state of Roraima, and is described and illustrated below.

**Lockhartia viruensis** E. Pessoa & M. Alves, **sp. nov.** Type: Brazil. Roraima: Município Cararaí, Parque Nacional do Viruá, 01º25′13.5″ N, 60º59′ 9.8″ W, 68 m, 12 Sep 2010 (st, fl: nov 2010), *E. Pessoa, A. R. Lourenço, S. O. Santos, M. Chagas, J. D. Garcia, G. A. Gomes-Costa & M. Alves 372* (holotype: UFP; isotypes: INPA, NY). (Fig. 1)

Species haec *L. imbricata* (Lam.) Hoehne similis sed labello integro, apicem obtuso vel rotundato, callus papillosus, apicem rotundato, ad columnae alis margine integris differt.

Caespitose, epiphytic, sympodial herbs. Roots filiform. Stems 10–13.5 cm long, pendent, wholly concealed by imbricate leaf bases. Leaves 10–16 mm long, 4–5 mm wide, distichous, stiff, imbricate, bilaterally compressed, triangular in lateral view, apex obtuse to rounded. Inflorescence lateral-subterminal, originating from the leaf axils; flower solitary, subtended by 1 ovate-lanceolate floral bract; peduncles 3–4 mm long; bract 2–3 mm long, 1.5 mm wide, apex acute. Flowers yellow, with red-brown spots on the lip and column, resupinate; sepals subsimilar, 3.5–4.0 mm long, 2.2–2.3 mm wide, ovate-lanceolate, apex acute to acuminate, concave, reflexed; petals 4 mm long, 1.5–2.0 mm wide, oblong-elliptic, apex acute; lip 4–5 mm long, 3.0–3.5 mm wide, ovate-pandurate, apex obtuse to rounded, convex, margin entire, the disk with a trapeziform callus, callus 1.2–1.5 mm long, 1.6–2.0 mm wide, distally bilobed, provided apically with a longitudinal row of papillae, row 1.9–2.2 mm long, 1.1–1.3 mm wide, extending

to the middle third of the lip, apex rounded; column 1.9–2.2 mm long, 1.5 mm wide, apex with a triangular-dolabriform wing on both sides of the stigma, margin entire; anther cap 0.9 mm long, 0.7 mm wide, cucullate, pollinia 2, clavate, 0.9 mm long; ovary pedicellate, about 8–9 mm long. Fruits not observed.

*Distribution and ecology*.—*Lockartia viruensis* is known only from the state of Roraima, Brazil, where a few individuals were seen. They were found in humid *terra-firme* forest, near areas of *igapó* forest and Amazonian *campinas* and *campinaranas*. The individuals were growing epiphytically on the trunks of large trees. The natural flowering period is unknown; the collected specimen flowered under cultivation in November, at the Federal University of Pernambuco, Brazil.

*Etymology*.—The name of the new species pays homage to the Viruá National Park, located in the State of Roraima, Brazil, where it was collected.

Literature and herbarium research suggests that the specimen represents a new species. It appears to be morphologically similar to *Lockhartia imbricata* (Lam.) Hoehne, which has widely variable floral morphology. The small flowers of *L. imbricata* have a very simple lip, and can be confused with *Lochkartia viruensis,* but the former species may be distinguished by having an entire lip with an obtuse to rounded apex, a callus on the disk of the lip with a longitudinal row of papillae with rounded apex, and the margin of the column wings entire.

**Acknowledgments**

The authors thank Antônio Lisboa, Beatriz Lisboa, CAPES, Iran das Chagas Almeida, and Mike Hopkins, who made the field-work possible. Additionally, the authors thank Regina Carvalho for the line drawing of the new species.

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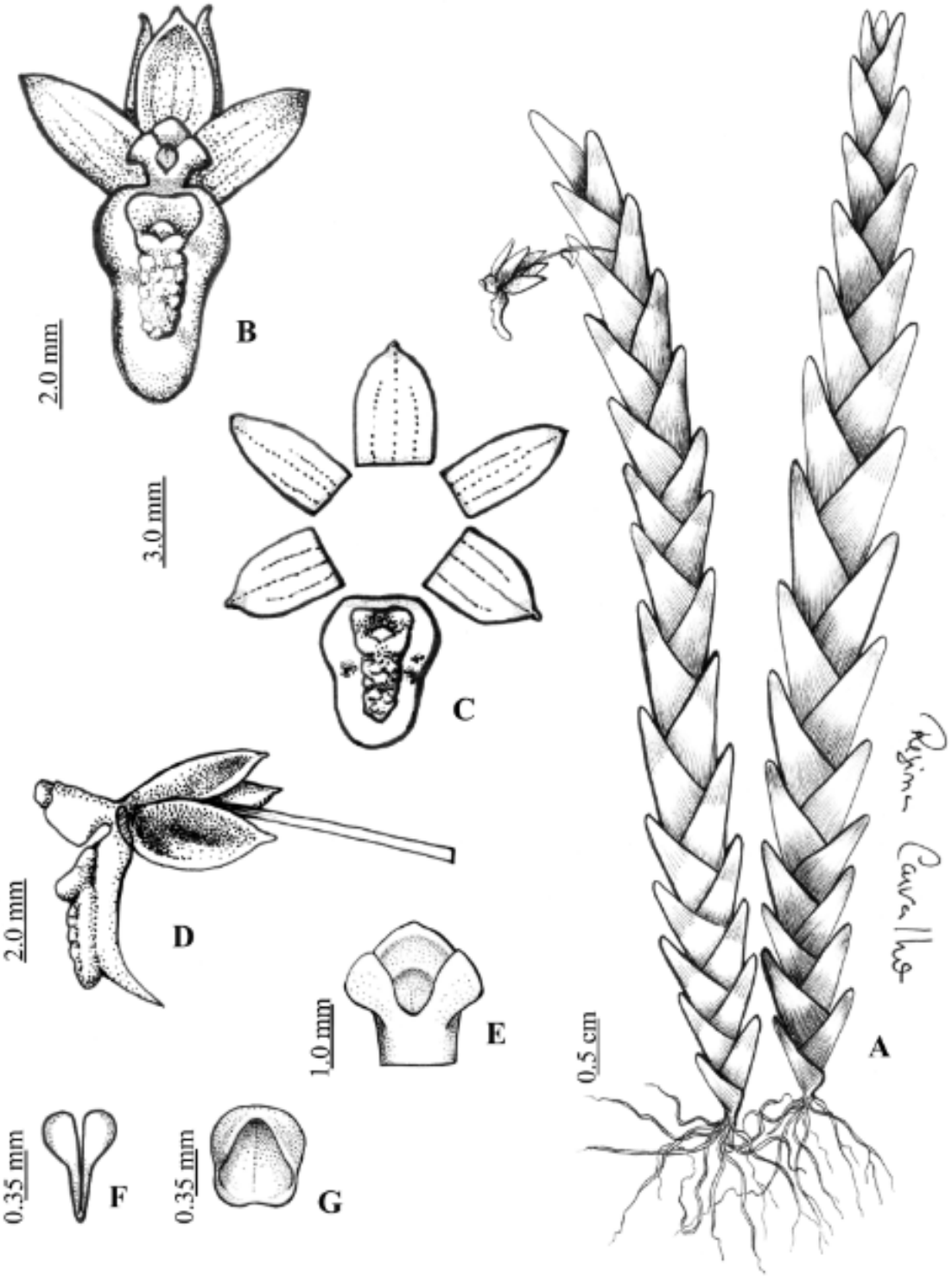


FIG. 1. Lockhartia viruensis. A. Habit. B. Flower, frontal view. C. Dissected perianth. D. Flower in profile with the petals removed. E. Column, ventral view. F. Pollinarium. G. Anther cap. (Drawn from the holotype.).

**CAPÍTULO 2:** NOVELTIES IN ORCHIDACEAE FROM BRAZIL.

Manuscrito submetido ao periódico Checklist

Category of Paper: Notes on Geographic Distribution

Short title: Novelties in Orchidaceae from Brazil.

# Novelties in Orchidaceae from the Brazilian Amazon.

Edlley Pessoa[1], Fabio de Barros[2] and Marccus Alves[1]

[1.]Laboratório de Morfo-Taxonomia Vegetal, Dept. Botânica, Universidade Federal de Pernambuco. CEP: 50670-901, Recife, Pernambuco, Brazil.

[2] Instituto de Botânica, Núcleo de Pesquisa Orquidário do Estado, CEP 04301-902, São Paulo, São Paulo, Brazil

*Corresponding author. E-mail: *edlley_max@hotmail.com*

Abstract: Three new records of Orchidaceae in the Brazilian Amazon are presented: *Duckeella pauciflora* Garay, *Notylia angustifolia* Cogn. and *Specklinia aristata* (Hook.) Pridgeon & Chase, and the occurrence of *Trichocentrum recurvum* Lindl. is confirmed.

The Amazon Basin is the largest forest area in the world and most remains under-collected (Hopkins 2007). Orchidaceae are represented by 764 species within the Brazilian portion of the Amazon region (Barros *et al.* 2012). However, Silva and Silva (2000) pointed out that additional collection efforts along the border with the Guyanas and Venezuela (Guayana Shield), the upper courses of rivers, and the central inaccessible areas could result in an increase to the already rich orchid flora.

The aim of this study is to present some new occurrences of Orchidaceae for the Brazilian Amazon. The plants studied here have been previously reported from the Venezuelan portion of the Guayana Shield, close to the border with Brazil. The species are described, illustrated, and their taxonomic affinities are discussed.

1. ***Duckeella pauciflora*** Garay, Bot. Mus. Leafl. 18: 186. 1958. Figures 1A-2

Terrestrial herbs; rhizome reduced. Leaves 2-4, linear-lanceolate, apex acute. Inflorescences in a raceme, ca. 30 cm long, terminal, 2-4-flowered, erect. Flowers yellowish; sepals sub-similar oblong-oblanceolate, apex acute; petals ovate-rhombic, apex obtuse; lip trilobate, lateral lobes basal, shortly oblong, apex rounded, central lobe oblong-oblanceolate, apex acute, callus 1 at the base, minutely fimbriate, orange.

*Duckeella* Porto & Brade is a small genus with three species (Chase *et al.* 2003), from which *D. adolphii* Porto & Brade and *D. alticola* C. Schweinf. are cited for Brazil by Barros *et al.* (2012). *Duckeella pauciflora* were previously found in Venezuela and Colombia (Govaerts 2003), and here the first record for Brazil is provided. It is morphologically similar to *D. adolphii*, but differs in having broader petals and a lip with an acute apex. This terrestrial orchid is not frequent in the area, and can be found in open areas, on sandy soils of Amazonian "*campinas*" vegetation.

**Material examined:** BRAZIL. Roraima: Caracaraí, Parque Nacional do Viruá, 27.III.2011, fl., T. D. Monge 1424 (INPA).

2. ***Notylia angustifolia*** Cogn., Symb. Antill. 6: 618. 1910. Figures 1B-2

Epiphytic herbs; pseudobulb heteroblastic, ellipsoid. Leaves 3, one on the apex and two basal, oblong to elliptic, apex tridenticulate. Inflorescence in a raceme, 5-6.5 cm long, lateral, pendulous, 18-22-flowered. Flowers greenish-white; dorsal sepals elliptic, apex acute; lateral sepals narrow elliptic, fused at the base to the middle, apex

acute; petals elliptic, sub-falcate, whitish with 2-3 orange spots, apex acute; lip unguiculate, deltoid, apex acute.

The Neotropical genus *Notylia* Lindl. includes ca. 60 species (Chase *et al.* 2003) with 24 species found in Brazil according Barros *et al.* (2012). *Notylia angustifolia* occurs in Trinidad and Tobago, French Guyana and Venezuela (Govaerts 2003). This is the first record for Brazil. Due to its small plant size, *N. angustifolia* can be confused with *N. logispicata* Hoehne & Schltr. but it differs by having a shorter inflorescence and greenish-white flowers, whereas the flowers are yellowish in *N. longispicata*. It is common in the sub-canopy of the Viruá National Park, especially in flooded forest.

**Material examined:** BRAZIL. Roraima: Caracaraí, Parque Nacional do Viruá, 19.IX.2011, fl., E. Pessoa et al. 672 (UFP); 19.X. 2011, fl., E. Pessoa et al. 773 (INPA); 30. XI.2011, fl., E. Pessoa et al. 864 (INPA).

3. ***Specklinia aristata*** (Hook.) Pridgeon & Chase, Lindleyana 16: 256. 2001. Figures 1C-2

≡*Pleurothallis aristata* Hook., Ann. Nat. Hist. 2: 329. 1839.

Epiphytic herbs, cauloma cylindric. Leaves 1, apical, spatulate to oblanceolate, apex minutely tridenticulate. Inflorescences in a fractiflex raceme, 3.7-6.5 cm long, terminal, 2-11-flowered, erect. Flowers yellowish-purple, dorsal sepal lanceolate, long-caudate; lateral sepals lanceolate, connate at the base, long caudate; petals elliptic-lanceolate, margin fimbriate, apex acuminate; lip trilobate, purplish, papillose, basal appendages 2.

*Specklinia* Lindl. includes ca. 200 species (Pridgeon et al. 2005), seven of which are cited by Barros *et al.* (2012) for the Brazilian Amazon. *Specklinia aristata* is morphologically related to species placed by Luer (2006) in the genus *Muscarella*. It

can be easily differentiated from *S. samacensis* (Ames) Pridgeon & Chase and *S. semperflorens* (Lindl.) Pridgeon & Chase by the long-caudate sepals. It is found from Central America to northwestern South America (Govaerts 2003), and the material cited here is a new record for Brazil, growing in montane ombrophilous forest (1200 m elev.), close to the border with Venezuela.

**Material examined:** BRAZIL. Amazonas: Santa Isabel do Rio Negro, Parque Nacional do Pico da Neblina, 28.XII.2004, fl., F. A. Carvalho et al. 258 (INPA).

4. ***Trichocentrum recurvum*** Lindl., Edwards's Bot. Reg. 29 (Misc.): 9. 1843. Figures 1D-2

Epiphytic herbs; pseudobulb heteroblastic, reduced, globose to cylindrical. Leaves 1, apical, elliptic to oblong-elliptic, apex acute. Inflorescence in a raceme, 1.8-2 cm long, lateral, pendulous, 1-2-flowered. Flowers whitish, dorsal sepal elliptic to oblanceolate-elliptic, apex acuminate; lateral sepals elliptic-falcate, apex acute; petals elliptic to oblong-elliptic, apex obtuse; lip obovate-pandurate, apex retuse, the callus consisting of two keels at the base, purplish, the spur curved.

*Trichocentrum* Poepp. & Endl. is a Neotropical genus with controversial circumscription (Pupulin 1995). Four species of *Trichocentrum s.s.* (excluding *Cohniella* Pfitzer, *Lophiaris* Raf. and *Lophiarella* Szlach., Mytnik & Romowicz) are cited for Brazil - *T. albococcineum* Linden, *T. fuscum* Lindl., *T. tenuiflorum* Lindl. and *T. wagneri* Pupulin (Barros *et al.* 2012). Despite *T. recurvum* having been cited as probably occurring in Brazil by Cogniaux (1904-1906), its presence had was confirmed by Pabst nor by Dungs (1977) and Barros *et al.* (2012), among other authors. However, few specimens were recently found in the northern region of the Brazilian Amazon in "*Terra-Firme*" forest.

**Material examined:** Brazil. Pará: São Félix do Xingu, 06.VIII,1994, fl. J.B.F. Silva 354 (MG); Roraima: Caracaraí, Parque Nacional do Viruá, 18.IX.2011, fl., E. Pessoa et al. 655 (UFP, INPA).

Acknowledgements. We are indebted to the organizations which funded our field research, including CNPq and CAPES. F. Barros thanks CNPQ for the Research Productivity Grant received.

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Figure captions:

Figure 1. A. *Duckeella pauciflora,* habit and flower in detail. B. *Notylia angustifolia,* habit and flower in detail. C. *Specklinia aristata,* habit and flower in detail. D. *Trichocentrum recurvum* habit and flower in detail.

Figure 2. Geographic distribution of the studied species in Brazil. ● - *Duckeella pauciflora*, ■ - *Notylia angustifolia*, ○ - *Specklinia aristata*, □ - *Trichocentrum recurvum*.

Figure 1

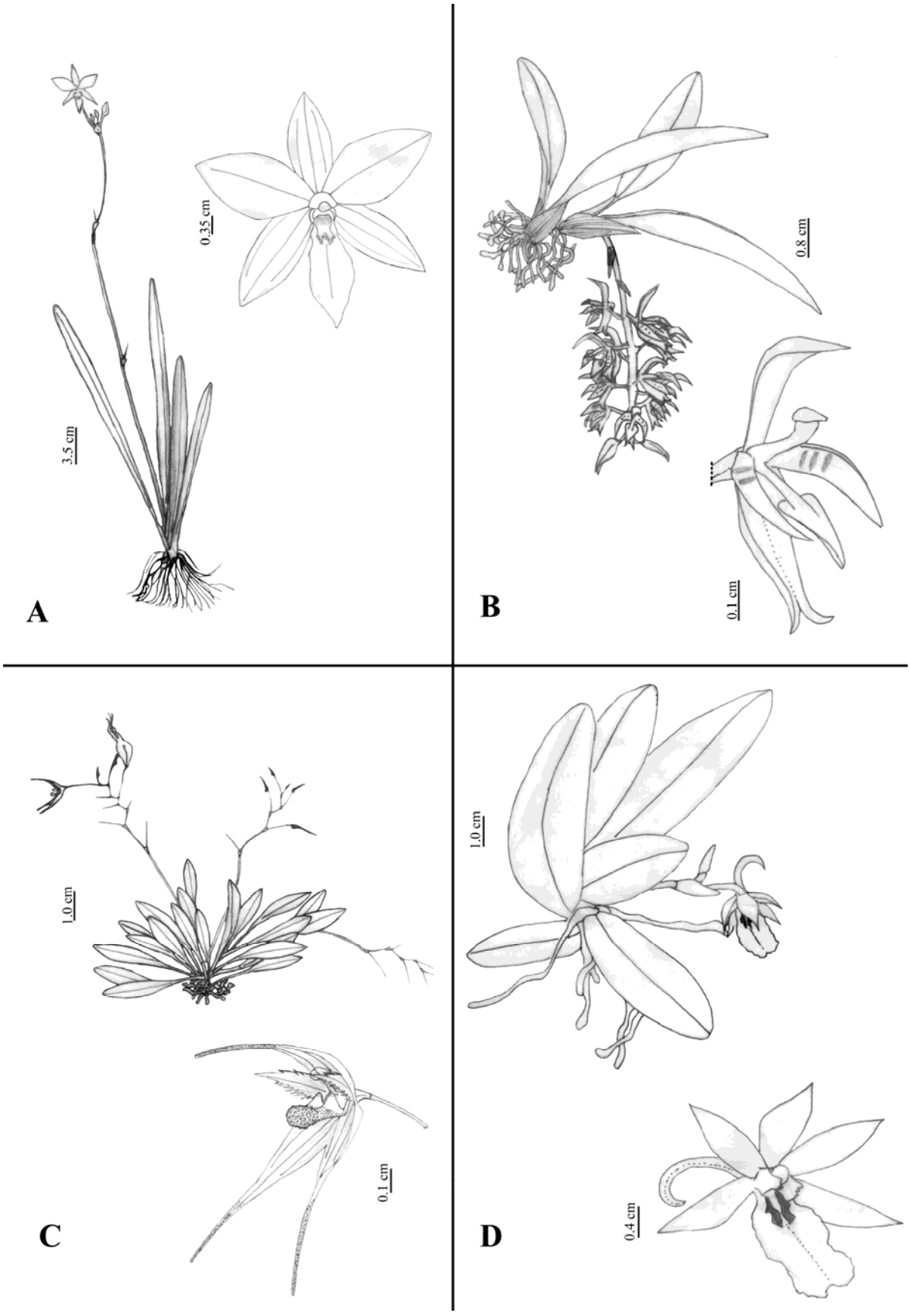
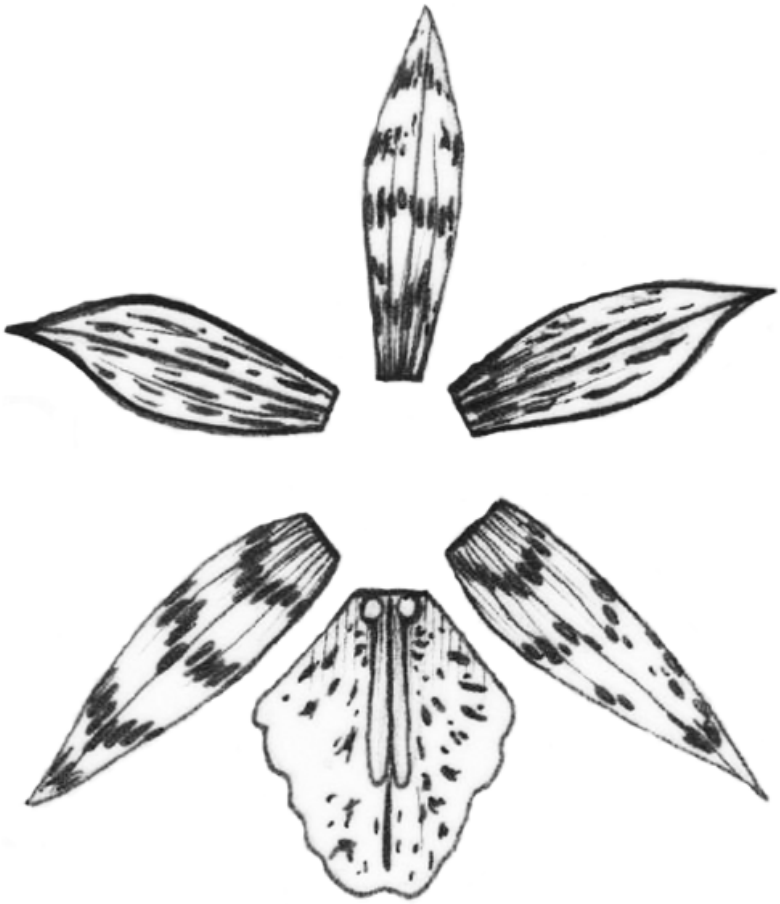


Figure 2



**CAPÍTULO 3:** ORCHIDACEAE FROM VIRUÁ NATIONAL PARK, RORAIMA, BRAZILIAN AMAZON.

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A ser submetido ao periódico Phytotaxa

## Orchidaceae from Viruá National Park, Roraima, Brazilian Amazon.

EDLLEY PESSOA[1]; FÁBIO DE BARROS[2] & MARCCUS ALVES[3]

[1]*Programa de Pós-Graduação em Biologia Vegetal, Departamento de Botânica, Universidade Federal de Pernambuco, CEP: 50670-901, Recife, Pernambuco, Brazil; e-mail: edlley_max@hotmail.com*

[2]*Instituto de Botânica, Núcleo de Pesquisa Orquidário do Estado de São Paulo, CEP 04301-902, São Paulo, São Paulo, Brazil; e-mail:*

[3]*Departamento de Botânica, Universidade Federal de Pernambuco, CEP: 50670-901, Recife, Pernambuco, Brazil; e-mail: alves.marccus@gmail.com*

### Abstract

The Viruá National Park is located on the Guyana Shield, an area known for its high levels of biodiversity and endemisms. Furthermore, the Brazilian portion of the Guyana Shield is very poorly known, so that floristic studies are needed to known the local distribution of the species. The aim of this study is to survey the species of Orchidaceae from the Viruá National Park, Roraima State, Brazil. Orchidaceae are represented In the studied area by 69 species and 45 genera. *Epidendrum* L. (9 spp.) and *Catasetum* Rich. ex Kunth (5 spp.) are the most diverse genera. These species comprise about 25% of the species and about 50% of the genera cited for the state of Roraima, northern Brazil, and include 19 new species records for the state. The dense forest ("*terra-firme*" and flooded forests) is more diverse (56 spp.) than the "*campinarana*" vegetation (13 spp.), and both share only a single species. Descriptions, illustrations, ecological comments, geographical distribution and an identification key are provided.

**Keywords:** Amazon, Diversity, Flora, Monocots, Orchidaceae, Taxonomy.

## Introduction

The most conspicuous plant formation in northern South America is the Amazon Forest, which is the biggest continuous forest in the world (Mittermeier *et al.* 2003). According to Silva *et al.* (2005), it is a mosaic of vegetation types, and eight centers of endemism can be recognized, delimited by the main rivers.

The "Guiana Endemism Center" is one of them and is dintinguished by its high biodiversity and endemism level (Funk & Hollowell 2007). Some of the world's richest ecosystems are found there, like the Table top-mountains (Tepui) vegetation (Berry 1995), the Amazonian "*Campinaranas*" and the Venezuelan "*Gran Sabannah*" (Sarmiento 1983).

In a recent published checklist of the Guiana Shield (Brazilian side excluded), Orchidaceae are cited as the second most diverse family in number of species (Funk & Hollowell 2007). The Brazilian side of the Guiana Shield is poorly known and not well collected (Hopkins 2007).

Orchidaceae are one of the largest families of plants with about 24,500 species (Dressler 2005). Colombia, Peru and Brazil are the countries with the highest number of species (Pabst & Dungs 1975). Barros *et al.* (2012) cited around 2,500 species and 240 genera for Brazil, where the Atlantic Forest (ca. 1,400 species) and the Amazon Forest (765 species) are the richest ecosystems.

The aim of this study is to provide a survey of the Orchidaceae species of the Viruá National Park, located on the Brazilian side of the Guiana Shield, including descriptions, illustrations, identification key, and comments on ecology and geographical distribution of the species.

## Methods

The studied area comprises the Viruá National Park, located on the south-middle of Roraima State in Brazil (municipality of Caracaraí), between the Rio Branco and Rio Barauana (Figure 1), with about 230,000 ha (61º10'13,39"W–01º42'14,46"N, 61º09'08,23"W–00º56'16,26"N), where the lowlands (maximum elevation, 360 m) dominate. The weather is Tropical Rainy Monsoon (Am, *sensu* Köppen), with an annual precipitation of 2,000 mm (Schaefer *et al.* 2009). According to Veloso (1992), the

vegetation comprises Ombrophilous Forest ("*Terra-Firme*" and Floodable) and "*Campinarana*".

The fieldwork was carried out from July 2010 to September 2012. The samples were submitted to the usual taxonomic procedures (Mori *et al.* 1985) and deposited at INPA herbarium, with duplicates sent to NY, RB, SP, and UFP herbaria.

Few previously collected herbarium specimens from the study area and surroundings are deposited at the herbaria collections visited (HUAM, IAN, INPA, MIRR, MG, SP and UFRR; Thiers 2012, continuously updated) were found and analyzed.

Dunsterville and Garay (1959, 1961, 1965, 1966, 1972, 1976), Pabst and Dungs (1975, 1977) and Carnevali *et al.* (2003) are among the most important references used for taxonomic identification, which also included the analysis of herbarium collections. The morphology follow Harris and Harris (2001) and Gonçalves and Lorenzi (2007).

The ecosystems found in the area, "terra-firme forest", "várzea forest", "igapó forest" and "campinarana" were named following the definitions proposed by Veloso (1992) and Prance (1980). The species are locally classified as rare when in small population and restricted to one ecosystem, or common, when they are found in more than one ecosystem. For each species, the basionym is provided after the accepted name.

## Results

Orchidaceae are represented in the study area by 69 species (4 of them identified on genus level) and 45 genera. *Epidendrum* Linnaeus (1763: 1347) (9 spp.) and *Catasetum* Richard *ex* Kunth (1822: 330) (5 spp.) are the most representative ones. The richness of species is higher than in some areas of Venezuela (Leopardi 2010) and Brazil (Cardoso *et al.* 1996).

Some species, such as *Liparis nervosa* (Thunberg 1784: 814) Lindley (1830: 26) and *Polystachya concreta* (Jacquin 1760: 30) Garay & Sweet (1974: 206), are pantropical and widely distributed (Govaerts *et al.* 2012). About 40% of the species (28) are endemic of the Amazon forest (Govaerts *et al.* 2012, Barros *et al.* 2012). Others are endemic to the Guiana Shield, such as *Catasetum longifolium* Lindley (1839: 94), *Duckeella pauciflora* Garay (1958: 186), *Lockhartia viruensis* Pessoa & Alves (2012: 162), *Nohawilliamsia pirarensis* (Reichenbach f. 1850: 846) Chase & Whitten (2009:

555), *Quekettia microscopica* Lindley (1939: 3), *Trichocentrum recurvum* Lindley (1843: 9), and *Vanilla appendiculata* Rolfe (1895: 178) (Govaerts *et al.* 2012, Barros *et al.* 2012), which amounts to about 10% of endemism. One species was recently described as new to science (*L. viruensis*), and considered endemic to the area (Pessoa & Alves 2012).

This study pointed out 19 new records to the state of Roraima. The results here presented comprise about 25% of the species and 50% of the genera cited by Barros *et al.* (2012) to the state.

The forested areas ("*terra-firme forest*", "*várzea* forest" and "*igapó* forest") are more diverse (56 spp.) than the non-forested habitats ("*Campinaranas*") (13 spp.). These habitats share only one species, *Galeandra devoniana* R.H. Schomburgk. *ex* Lindley (1840: 37). The low number of species presented here for the non-forested habitats ("*campinaranas*") is different from the data of Braga (1977) who cited a higher number of orchids in the "c*ampinaranas*" from central Amazon. Our data point out a divergence of the floristic composition among open areas on the Amazon, and suggests more studies on the diversity of these areas.

The flooded forests ("*várzea* forest" and "*igapó* forest") are more diverse (52 spp.) than the non-flooded one ("*terra-firme* forest") (17 spp.). These habitats share 13 species. Although, studies with woody plants showed the highest species richness on "*terra-firme* forest" (Gama *et al.* 2005), the long-term water availability and the humidity on the flooded forests could explain our results. Furthermore, the "*várzea* forest" is much more diverse (47 spp.) than the "*igapó* forest" (21 spp.), and both share 16 species. It agrees with the data of Kubitzki (1989) and Worbes (1997), which have shown that the "*várzea* forest" is richer in species than the "*igapó* forest". The "*várzea* forest" is the ecosystem with more restricted species (31 spp.), followed by the "*campinaranas*" with 12 species.

The richest localities on the Viruá National Park are the Anauá River (39 spp.) and the Barauana River (37 ssp.). Both areas have "*várzea* forest" and 27 species shared. The localities along the Iruá River are of "*igapó* forest" type and emerge as the poorest ones, with only six species, none of them restricted.

The taxonomic treatment does not include four species which were identified to generic level: *Campylocentrum* sp., *Notylia* sp., *Vanilla* sp., and *Lophiaris* sp. Their taxonomic identities remain unclear because of the lack of flowers and fruits in the

collected material. The analysis of the vegetative portions shows that they do not belong to any of the species previously registered to the area.

**Key to the species**

1. Hemi-epiphyte herbs (lianescent growth)
   2. Leaves with obtuse to rounded base; lip without callus, with pubescent lines on distal half……..……...….*Vanilla bicolor*
   2. Laves with attenuate base; lip with one multiridged callus on disc, and 1 tuft of fleshy hairs on the apex……...……..*Vanilla appendiculata*
1. Epiphyte and/or terrestrial herbs
   3. Inflorescence terminal
      4. Terrestrial herbs
         5. Flowers with spur
            6. Petals bifid, lip trifid……...……..*Habenaria schwackei*
            6. Petals and lip not divided
               7. Leaves elliptic; epichile of lip sub-orbicular…….*Aspidogyne foliosa*
               7. Leaves lanceolate; epichile of lip anchoriform……...*Ligeophila juruenensis*
         5. Flowers without spur
            8. Stem (including pseudobulb) inconspicuous, up to 3.0 cm long
               9. Leaves linear; lip trilobed…….…..……....*Duckeella pauciflora*
               9. Leaves oblanceolate, ovate or elliptic; lip entire
                  10. Sepals and petals ≤ 0.8 cm long; lip with emarginate apex……...*Liparis nervosa*
                  10. Sepals and petals ≥ 1.7 cm long; lip with obtuse apex……..…….*Sarcoglottis amazonica*
            8. Stem > 10.0 cm long
               11. Inflorescence 1-2 flowered
                  12. Leaves ≤ 2.2 cm long; sepals and petals ≤ 1.7 cm long…...*Cleistes tenuis*
                  12. Leaves > 2.5 cm long; sepals and petals > 3.4 cm long……*Cleistes rosea*
               11. Inflorescence more than 7 flowered
                  13. Peduncle 6-20 times longer than the rachis; flowers greenish; lip without a tuft of hairs on the apex……....……..……..*Epidendrum orchidiflorum*

13. Peduncle shorter or little longer than the rachis; flowers purplish, lip with a tuft of hairs on the apex……..…..……*Epistephium parviflorum*

4. Epiphytic herbs

14. Leaves only at the apex of the stem

15. Leaves cylindrical; lip with short fimbriate margin…....*Brassavola martiana*

15. Leaves flattened; lip with entire, slightly erose or ciliate margin

16. Stems (pseudobulbs) superposed; leaves narrowly-oblong…...…….....*Scaphyglottis sickii*

16. Stems (including cauloma and pseudobulb) not superposed; leaves elliptic, wide-elliptic, oblong, oblong-elliptic, lanceolate, obovate or oblanceolate

17. Stem ≤ 0.2 cm wide; leaf apex minutely tridenticulate; lateral sepals connate

18. Peduncle ≤ 0.1 cm long; dorsal sepal almost two times longer than the lateral sepals……..…….*Acianthera miqueliana*

18. Peduncle > 1.0 cm long; dorsal sepal smaller, the same size or a little longer than the lateral sepals

19. Lip with truncate apex; leaves obovate to oblanceolate; ……...……...*Pabstiella yauaperiensis*

19. Lip with rounded, obtuse or acute apex; leaves lanceolate, elliptic or wide-elliptic

20. Leaves lanceolate; lateral sepals entirely connate; lip with entire margin……...……...…….*Pleurothallis pruinosa*

20. Leaves elliptic or wide-elliptic; lateral sepals connate up to the second third; lip with ciliate or slightly erose margin

21. Lip obovate with acute to obtuse apex and slightly erose margin…….……..*Acianthera fockei*

21. Lip oblong with rounded apex and ciliate margin……*Trichosalpinx egleri*

17. Stem > 0.4 cm wide; leaf apex not minutely tridenticulate; lateral sepals free

22. Lip entire

23. Lip ≤ 0.8 cm long, apex acute to obtuse…..…….....*Prosthechea vespa*

23. Lip ≥ 1.2 cm long, apex acuminate.....*Prosthechea fragrans*

22. Lip three-lobed

24. Peduncle eight times longer than the rachis

25. Pseudobulb cylindric to slightly wider on the apex; flowers whitish; column adnate to the lip up to its apex……...*Epidendrum viviparum*

25. Pseudobulb fusiform; flowers brownish; column adnate to the lip only at its base …..……...…….*Laelia gloriosa*

24. Peduncle smaller to three times longer than the rachis

26. Apical leaves 2; flowers purplish; lip with emarginate apex……*Cattleya violacea*

26. Apical leaf 1; flowers whitish, lip with acute apex…….....*Epidendrum purpurascens*

14. Leaves distichous along the stem

27. Leaves with acute apex; flowers with spur……...…….*Galeandra devoniana*

27. Leaves with minutely emarginate, emarginate or obtuse apex; flowers lacking spur

28. Stem (pseudobulb) ≤ 1.0 cm long, ovoid

29. Perianth > 0.25 cm long; lip with cuspidate apex….*Polystachya concreta*

29. Perianth ≤ 0.25 cm long; lip with emarginate apex

30. Lateral lobes of the lip shorter than the central lobe……..*Polystachya foliosa*

30. Lateral lobes of lip the longer than the central lobe……..*Polystachya stenophylla*

28. Stem (including pseudobulb) ≥ 4.5 cm long, cylindrical to narrow ellipsoid or fusiform

31. Column free or adnate at the base of the lip

32. Peduncle + rachis ≤ 1.4 cm long; lip entire..…*Dimerandra emarginata*

32. Peduncle + rachis > 24.0 cm long; lip three-lobed……*Caularthron bicornutum*

31. Column entirely adnate to the claw of lip

33. Lip entire

34. Stem branched; lip cordiform with acute apex……...*Epidendrum strobilliferum*

34. Stem not branched; lip sub-orbicular, with cuspidate apex……....*Epidendrum rigidum*

33. Lip trilobed

35. Peduncle + rachis > 15.0 cm long; central lobe of the lip bilobulate

36. Peduncle longer than the rachis; flowers pinkish-orange.....*Epidendrum anceps*

36. Peduncle shorter than the rachis; flowers creamish.....*Epidendrum coronatum*

35. Peduncle + rachis ≤ 4.2 cm long; central lobe of the lip linear

37. Sepals and petals ≤ 3.6 cm long; ovary + pedicel ≤ 4.8 cm long……..…*Epidendrum nocturnum*

37. Sepals and petals ≥ 4.3 cm long; ovary + pedicel > 5.5 cm long…….…….*Epidendrum carpophorum*

3. Inflorescence lateral

38. Pseudobulbs absent

39. Leaves laterally flattened, imbricate

40. Stem > 6.0 cm long; inflorescence one-flowered…..……*Lockhartia viruensis*

40. Stem ≤ 2.0 cm long; inflorescence multi-flowered…*Ornithocephalus ciliatus*

39. Leaves dorsoventrally flattened

41. Inflorescence one-flowered; flowers lacking spur ….....*Dichaea picta*

41. Inflorescence multi-flowered; flowers with spur

42. Leaves aciculate, sub-conical…..…..……...*Campylocentrum poeppgii*

42. Leaves flattened, oblong-elliptic

43. Spur ≥ 1.0 cm long, straight.....*Campylocentrum huebneri*

43. Spur < 0.4 cm long, curved……*Campylocentrum micranthum*

38. Pseudobulbs present

44. Leaves cylindrical

45. Inflorescence one-flowered; flowers whitish to creamish, with a mentum……..….*Christensonella uncata*

45. Inflorescence multi-flowered; flowers yellowish, without a mentum

46. Leaves ≥ 13.0 cm long; perianth > 0.5 cm long…...…*Cohniella cebolleta*

46. Leaves ≤ 11.0 cm long; perianth ≤ 0.5 cm long…*Quekettia microscopica*

44. Leaves flattened

47. Pseudobulbs homoblastic

48. Lip cuneate, clawed, not helmet-shaped……..*Otostylis brachystalix*

48. Lip helmet-shaped, not clawed

49. Petals ≥ 1.6 cm wide; lip with entire margin...*Catasetum macrocarpum*

49. Petals ≤ 1.2 cm wide; lip with short to long fimbriate margin

50. Flowers yellow-brownish; sepals ≥ 4.5 cm long..*Catasetum saccatum*

50. Flowers yellowish, yellow-purplish or orangish; sepals ≤ 1.9 cm long

51. Lip ≤ 1.5 cm long, margin laterally long fimbriate...……...……....*Catasetum* ð *roseoalbum*

51. Lip > 1.5 cm long, margin laterally short fimbriate to serrate

52. Leaves ≤ 39.0 cm long, ellipctic to oblanceolate……....*Catasetum discolor*

52. Leaves > 41.0 cm long, linear-elliptic……*Catasetum longifolium*

47. Pseudobulbs heteroblastic

53. Inflorescence strictly one-flowered

54. Apical leaf 1; peduncle ≥ 6.5 cm long; lip ≤ 0.6 cm long.……...*Trigonidium acuminatum*

54. Apical leaves 1-2; peduncle ≤ 4.5 cm long; lip > 1.0 cm long

55. Leaves 2, apical; lip three-lobed, lateral lobes well developed……..….*Camaridium ochroleucum*

55. Leaf 1, apical; lip obscurely three-lobed, lateral lobes vestigial

56. Flowers yellowish with a dark purplish lip; petals linear-oblanceolate……...*Heterotaxis superflua*

56. Flowers whitish; petals lanceolate……...…..*Maxillariella alba*

53. Inflorescence multi-flowered (sometimes with only one developed flower, but clearly not one-flowered)

57. Leaves only 1 apical

58. Pseudobulbs ≤ 0.5 cm long.

59. Leaves oblanceolate; flowers yellowish with brownish spots; spur absent…….……..….*Lophiaris nana*

59. Leaves elliptic; flowers whitish with a purplish spot; spur present ……...……...*Trichocentrum recurvum*

58. Pseudobulbs > 0.5 cm long.

60. Pseudobulbs cylindrical; peduncle ≤ 5.5 cm long; flowers yellowish-brown; lip not clawed, three-lobed…...*Macradenia lutescens*

60. Pseudobulbs ellipsoid; peduncle ≥ 12.0 cm long; flowers bluish; lip clawed, entire…….....*Aganisia cyanea*

57. Leaves 1-2 apical and 1-2 basal

61. Lip adnate to the base of the column, margin erose …….....*Aspasia variegata*

61. Lip free from the column, margin entire

62. Peduncle four times or more longer than the rachis; lip three-lobed…….…...…*Nohawilliamsia pirarensis*

62. Peduncle shorter or slightly longer than the rachis; lip entire

63. Sepals with caudate apex; lip not clawed…….....*Brassia caudata*

63. Sepals with acute or obtuse apex; lip clawed

64. Flowers whitish-green; sepals narrow-elliptic; lateral sepals, connate at the base to the middle; lip deltoid, apex acute …….……...……*Notylia angustifolia*

64. Flowers yellowish-brown; sepals oblanceolate; lateral sepals free from each other; lip suborbicular, apex rounded to obtuse ……*Solenidium lunatum*

**1. *Acianthera fockei*** (Lindley) Pridgeon & M.W. Chase (2001: 243). ≡ *Pleurothallis fockei* Lindley (1859: 23). [Fig. 2A]

Epiphyte. Cauloma 0.6-6.2 ð 0.1 cm, cylindrical. Leaves 1, apical, 3.0-6.0 ð 0.7-1.7 cm, elliptic, the apex minutely tridenticulate. Inflorescence terminal, in a raceme, 1-3-flowered; peduncle 1.3-2.0 cm long; rachis 0.3-0.6 cm long; floral bracts ca. 0.1 cm long, clasping, the apex acute. Flowers orangish-red; dorsal sepal 0.5-0.65 ð 0.15-0.2 cm, oblong-lanceolate, the apex acute; lateral sepals 0.5-0.65 ð 0.18-0.19 cm, oblong-lanceolate, the apex acute to obtuse, connate up to the second thrid, articulate to the column foot forming a small mentum; petals 0.32-0.35 ð 0.08-0.1 cm, elliptic-oblanceolate, the apex acute; lip 0.38-0.4 ð 0.25-0.26 cm, obovate, redish, margin slightly erose, the apex acute to obtuse , base with 2 basal appendages; column 0.25-0.3 cm long; pollinia 2; ovary + pedicel 0.3-0.38 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima**: Caracaraí, Parque Nacional do Viruá, Estrada Perdida, 11.IX.2010, st., *E. Pessoa et al. 364* (INPA); Grade PPBio, 18.X.2011, fl., *E. Pessoa et al. 752* (UFP).

Comments: Distributed in northern South America, from Guyana, Suriname, and Venezuela to Northern Brazil (states of Amazonas, Mato Grosso, Pará and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and occurs only in "*igapó* forest". It can be confused with *Acianthera miqueliana* (H. Focke) Pridgeon & M.W. Chase, but differs mainly by the longer peduncle.

**2. *Acianthera miqueliana*** (H. Focke) Pridgeon & M.W. Chase (2001: 244).
≡ *Specklinia miqueliana* H. Focke (1849: 199). [Fig. 2B]

Epiphyte. Cauloma 3.0-6.0 ð 0.1 cm, cylindrical. Leaves 1, apical, 4.5-5.3 ð 1.0-1.3 cm, lanceolate, the apex minutely tridenticulate. Inflorescence terminal, in a raceme, 1-3-flowered; peduncle ≤ 0.1 cm long; rachis 0.25-0.65 cm long; floral bracts 0.1-0.18 cm long, clasping, the apex obtuse. Flowers purplish with yellowish apex; dorsal sepal 0.8-1.0 ð 0.1-0.12 cm, linear, the apex acute; lateral sepals 0.43-0.5 ð 0.18-0.2 cm, lanceolate, the apex acute, connate up to the apex, articulate to the column foot forming a small mentum; petals 0.2-0.25 ð 0.03-0.08 cm, elliptic, the apex acute; lip 0.25-0.28 ð 0.13-0.15 cm, elliptic, purplish, margin slightly erose, the base with 2 basal appendages, the apex rounded; column 0.18-0.21 cm long; pollinia 2; ovary + pedicel 0.1-0.12 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima**: Caracaraí, Parque Nacional do Viruá, Rio Anauá, 29.XI.2011, fl., *E. Pessoa et al. 859* (INPA).

Comments: Distributed in northern South America, from Guyana, Suriname, Venezuela, Ecuador, and Peru to Northern Brazil (states of Amapá, Amazonas, Pará and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is commonly found in "*várzea*" forest and "*igapó*" forest. It can be confused with *Acianthera fockei*, but differs mainly by the shorter peduncle.

**3. *Aganisia cyanea*** (Lindley) Reichenbach f. (1876: 13). ≡ *Acacallis cyanea* Lindley (1853: 30). [Fig. 2C]

Epiphyte. Pseudobulb 2.0-3.8 ð 0.5-1.0 cm, heteroblastic, ellipsoid. Leaves 1, apical, 11-24 ð 2.5-7.6 cm, elliptic to oblanceolate, the apex acute. Inflorescence lateral, in a raceme, 2-7-flowered; peduncle 12-16 cm long; rachis 1.5-7.0 cm long; floral bracts 0.9-1.0 cm long, lanceolate, the apex acute. Flowers bluish; dorsal sepal 2.2-2.5 ð 1.5 cm, obovate, the apex acute; lateral sepals 2.4-2.6 ð 1.6-1.7 cm, obovate, the apex acute; petals 2.2-2.3 ð 1.5-2.0 cm, obovate to sub-orbiculate, the apex cuspidate; lip 2.3-2.5 ð 2.2 cm, clawed, flabellate, pinkish, margin minutely denticulate, the apex acute, callus 1 on disc, triangular; column 1.0-1.2 cm long; pollinia 2; ovary + pedicel 1.0-1.6 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima**: Caracaraí, Parque Nacional do Viruá, Grade PPBio, 12.IX.2010, fl., *E. Pessoa et al. 369* (INPA, UFP); ibid., 23.IX.2011, fl., *E. Pessoa et al. 717*(INPA, UFP); Estrada Perdida, 16.IX.2011, fl., *E. Pessoa et al. 631* (INPA, UFP).

Comments: Distributed in northern South America, from Colombia and Venezuela, to Peru and Northern Brazil (states of Acre, Amapá, Amazonas, Pará, and Rondônia) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and only found on "*igapó* forest", usually growing in the lower part of the trunks. It is easily recognized by the bluish flowers with a pinkish lip with minutely denticulate margin.

**4. *Aspasia variegata*** Lindley (1836: 1907). [Fig. 2D]

Epiphyte. Pseudobulb 4.0-6.5 ð 1.5-1.6 cm, heteroblastic, ovoid to ellipsoid. Leaves, 2 apical and 2 basal, 10.0-24.5 ð 2.2-10.0 cm, narrow elliptic, the apex acute. Inflorescence lateral, in a raceme, 1-5-flowered; peduncle 4.0-7.0 cm long; rachis 1.5-4.0 cm long; floral bracts 0.9-1.2 cm long, deltoid, the apex acute. Flowers yellowish with discontinuous purple lines; dorsal sepal 2.0-2.2 ð 0.5 cm, oblong-elliptic, the apex acute; lateal sepals 2.4-2.6 ð 0.4-0.6 cm, elliptic, the apex acute; petals 1.8-2.2 ð 0.6-0.7 cm, elliptic, the apex acute; lip 1.8-2.0 ð 1.5 cm, ovate, obscurely trilobed, whitish with purple spots, margin erose, the apex cuspidate, the base adnate to the column, callus 2 on base, trapeziform, and 2 on disc, oblong; column 1.5-1.8 cm long; pollinia 2; ovary + pedicel 3.0-4.0 cm long. Fruits 5.0-7.5 ð 0.5-0.7 cm, fusiform.

Examined material: BRAZIL. **Roraima**: Caracaraí, Parque Nacional do Viruá, Rio Barauana, 21.IX.2011, fl., *E. Pessoa et al. 698* (INPA); Grade PPBio, 23.VII.2010, fr., *E. Pessoa et al. 345* (INPA, UFP); ibid., 02.XII.2006, fr., *Carvalho, F. A. et al. 1084* (INPA); Estrada Perdida, 24.XI.2006, fr., *Carvalho, F. A. et al.* 811 (INPA).

Comments: Distributed in northern South America, from Trinidad & Tobago, French Guyana, Guyana, Suriname, Venezuela, Colombia to Brazil (states of Amapá, Amazonas, Distrito Federal, Goiás, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó* forest", "*várzea* forest" and "*terra-firme* forest". It could be confused when sterile with *Solenidium lunatum* (Lindley) Schlechter., but differs mainly by the lip adnate at the base to the column.

**5. *Aspidogyne foliosa*** (Poeppig & Endlicher) Garay (1977: 201). ≡ *Pelexia foliosa* Poeppig & Endlicher (1838: 17). [Fig. 2E]

Terrestrial. Stem 6.5-25.0 ð 0.15-0.2 cm, cylindrical. Leaves 2-5 along the stem, 2.0-11.5 ð 1.3-3.5 cm, elliptic, the apex short-acuminate. Inflorescence terminal, in a raceme, 17-46-flowered; peduncle 2.5-4.5 cm long; rachis 3.5-12.0 cm long; floral bracts 0.8-1.2 cm long, lanceolate, the apex acuminate. Flowers white-greenish; dorsal sepal 0.4-0.42 ð 0.15-0.18 cm, elliptic, the apex acute; lateral sepals 0.4-0.48 ð 0.15-0.18 cm, elliptic, the apex acute; petals 0.4-0.41 ð 0.11-0.13 cm, oblanceolate, the apex acute; lip 0.45-0.5 ð 0.19-0.3 cm, hypochile obovate, epichile suborbicular, reflexed, whitish, margin entire, the apex obtuse, spur 0.6-0.7 cm long, cylindrical; column 0.28-0.3 cm long; pollinia 2; ovary + pedicel 0.7-1.0 cm long. Fruits 1.1-1.2 ð 0.2-0.3 cm, ellipsoid.

Examined material: BRAZIL. **Roraima**: Caracaraí, Parque Nacional do Viruá, Grade PPBio, 23.IX.2011, fl., *E. Pessoa et al. 718* (INPA); ibid., 17.X.2011, fr., *E. Pessoa et al. 749* (INPA); Rio Barauana, 21.IX.2011, fl./fr., *E. Pessoa et al. 697* (INPA, SP, UFP).

Comments: Distributed on South America, from French Guyana, Guyana, Suriname, Venezuela, Colombia, Ecuador, Peru, Bolivia to Brazil (widely distributed) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs only in

"*várzea* forest". It could be confused with *Ligeophila juruenensis* (Hoehne) Garay, but differs mainly by elliptic leaves and sub-orbicular epichile of the lip.

**6. *Brassavola martiana*** Lindley (1836: 1914). [Fig. 2F]

Epiphyte. Stem 3.0-12.0 ð 0.2-0.4 cm, cylindrical. Leaves 1, apical, 11.0-30.0 ð 0.2-0.7 cm, cylindrical, the apex acute. Inflorescence terminal, in a raceme, 2-12-flowered; peduncle 0.5-4.5 cm long; rachis 1.0-5.5 cm long; floral bracts 0.3-0.5 cm long, deltoid, the apex acute. Flowers whitish; dorsal sepal 3.0-3.3 ð 0.3-0.5 cm, elliptic, the apex acute; lateral sepals 2.5-2.7 ð 0.4-0.5 cm, elliptic-falcate, the apex acute; petals 2.6-2.7 ð 0.2-0.3 cm, narrow-elliptic, the apex acute; lip 2.0-2.2 ð 1.1-1.5 cm, ovate, whitish, the base adnate to the column, margin short fimbriate, the apex acute, longitudinal callus on base; column 0.9-1.1 cm long; pollinia 8; ovary + pedicel 4.0-8.0 cm long. Fruits 4.5-10.0 ð 1.0-1.5 cm, ellipsoid.

Examined material: BRAZIL. **Roraima**: Caracaraí, Parque Nacional do Viruá, Rio Barauana, 15.IX.2010, fr., *E. Pessoa et al. 381* (INPA); Rio Anauá, 22.VIII.2012, fr., *E. Pessoa & Melo, A. 972* (INPA, SP, UFP); ibid., 24.VIII.2012, fl., *E. Pessoa et al. 996* (INPA, SP, UFP); Grade PPBio, 12. IX.2010, st., *E. Pessoa et al. 368* (INPA).
Comments: Distributed in northern South America, from French Guyana, Guyana, Suriname, Venezuela, Colombia, and Peru to Northern Brazil (states of Amapá, Amazonas, Mato-Grosso, Pará, Rondônia, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is common In the studied area, and occurs in "*igapó* forest", "*várzea* forest" and "*terra-firme* forest". It could be confused with other species with cylindrical leaves, such as *Cohniella cebolleta* (Jacquin) Christenson, but differs mainly by the terminal inflorescence.

**7. *Brassia caudata*** (Linnaeus) Lindley (1824: 832). ≡ *Epidendrum caudatum* Linnaeus (1759: 1246). [Fig. 2G]

Epiphyte. Pseudobulbs 6.5-9.0 ð 1.8-2.3 cm, heteroblastic, obovate to ellipsoid. Leaves, 2 apical and 1 basal, 8.0-24.0 ð 3.5-5.0 cm, oblong-elliptic, the apex obtuse. Inflorescence lateral, in a raceme, 6-8-flowered; peduncle 12.0-17.0 cm long; rachis 9.5-11.0 cm long; floral bracts 0.6-0.7 cm long, deltoid, the apex acute. Flowers yellowish

with brownish spots; dorsal sepal 4.5-4.8 ð 0.5-0.6 cm, lanceolate, the apex caudate; lateral sepals 6.6-11.5 ð 0.5-0.6 cm, linear lanceolate, the apex long-caudate; petals 1.8-2.2 ð 0.4-0.5 cm, elliptic-lanceolate, the apex acuminate; lip 2.0-2.6 ð 1.0-1.2 cm, ovate, whitish-yellow with brownish spots, margin entire, the apex acuminate, callus 1 on the base, bicarenate; column 0.5-0.6 cm long; pollinia 2; ovary + pedicel 1.0-1.2 cm long. Fruits 4.5-5.5 ð 1.0-1.2 cm, ellipsoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 25.VII.2010, fl., *E. Pessoa et al. 350* (INPA); ibid. 19.IX.2011, fl/fr., *E. Pessoa et al. 671* (INPA); ibid. 03.XII.2006, fr., *Carvalho, F. A. et al. 1115* (INPA); Rio Anauá, 21.VIII.2012, fl., *Pessoa & Melo 967* (INPA).

Comments: Widely distributed on Neotropics, including Brazil (states of Acre, Amazonas, Maranhão, Mato Grosso, Pará and Rondônia) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is common and occurs in "*igapó* forest" and "*várzea* forest". It usually grows on big trees, and is easily recognized by the long-caudate apex of the lateral sepals.

**8. *Camaridium ochroleucum*** Lindley (1824: 844). [Fig. 2H]

Epiphyte. Pseudobulbs 2.8-8.0 ð 1.0-2.3 cm, heteroblastic, ovoid to ellipsoid. Leaves, 2 apical and 2-3 basal, 9.5-36.0 ð 0.5-1.5 cm, narrow-oblong, the apex emarginate. Inflorescence lateral, single flowered; peduncle 2.5-4.5 cm long; rachis inconspicuous; floral bracts 1.4-1.8 cm long, clasping, the apex acute. Flower whitish; dorsal sepal 2.4-2.5 ð 0.6-0.7 cm, oblanceolate, theapex obtuse; lateral sepals 2.4-2.5 ð 0.6-0.7 cm, elliptic, the apex obtuse; petals 2.3-2.4 ð 0.5-0.6 cm, oblanceolate, the apex obtuse; lip 1.2-1.3 ð 1.3 cm, obovate, trilobed, whitish with a yellowish disc, lateral lobes 0.35-0.4 ð 0.5-0.8 cm, ovate, the apex obtuse, central lobe 0.3-0.5 ð 0.5-0.6 cm, oblong, margin entire, the apex rounded; column 0.6-0.8 cm long, pollinia 2; ovary + pedicel 1.0-1.1 cm long. Fruits 2.2-3.5 ð 0.8-1.3, obovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 17.IX.2011, fr., *E. Pessoa et al. 637* (INPA, UFP); Rio Barauana, 21.IX.2011, fr., *Pessoa E. et al. 702* (INPA); Rio Anauá, 20.XI.2011, fr., *E. Pessoa & Vasconselos,*

*S. 847* (INPA); ibid., 23.VIII.2012, fl./fr., *E. Pessoa & Melo, A. 989* (INPA, NY, SP, UFP).

Comments: Widely distributed on Neotropics, including Brazil (states of Acre, Amapá, Amazonas, Distrito Federal, Goiás, Maranhão, Mato Grosso, Minas Gerais, Pará, Rondônia, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó* forest" and "*várzea* forest". It could be confused with *Maxillariella alba* (Hooker) Blanco & Carnevali, but differs mainly by two apical leaves, and lip with well developed lateral lobes.

**9. *Campylocentrum huebneri*** Mansfeld (1928: 382). [Fig. 2I]

Epiphyte. Stem 4.0-36.0 ð 0.3-0.5 cm, cylindrical. Leaves 9-30, distichous along the stem, 3.5-8.0 ð 0.5-1.2 cm, oblong-elliptic, the apex emarginate, asymmetric. Inflorescence lateral, in a raceme, 8-12-flowered; peduncle 0.2-0.6 cm long; rachis 0.7-1.5 com long; floral bracts ca. 0.05 cm long, deltoid, the apex acute. Flowers yellowish; dorsal sepal 0.3-0.35 ð 0.1-0.15 cm, laceolate, the apex obtuse to acute; lateral sepals 0.4-0.42 ð 0.1-0.17 cm, lanceolate-falcate, the apex acute; petals 0.25-0.3 ð 0.1-0.13 cm, oblong-elliptic, the apex acute; lip 0.25-0.32 ð 0.3-0.35 cm, trilobed, yellowish, lateral lobes 0.08-0.1 ð 0.05-0.07 cm, deltoid, the apex acute, central lobe 0.18-0.2 ð 0.08-0.1 cm, lanceolate, margin entire, the apex acute, spur 1.0-1.5 cm long, cylindrical, straight; column 0.1-0.13 cm long; pollinia 2; ovary + pedicel 0.15-0.25 cm long. Fruits 0.7-1.0 ð 0.2-0.3 cm, fusiform.

Examined material: Brazil. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 26.VII.2010, fl., *E. Pessoa et al. 355* (INPA); ibid., 21.IX.2011, fr., *E. Pessoa et al. 701* (INPA, UFP); Grade PPBio, 19.IX.2011, fl., *E. Pessoa et al. 670* (INPA, UFP).

Comments: Distributed in northern South America, from Venezuela, Ecuador to Northern Brazil (States of Acre and Amazonas) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is common and occurs in "*várzea* forest" and "*terra-firme* forest". It could be confused with *Campylocentrum micranthum* (Lindley) Rolfe, but differs mainly by longer and straight spur.

**10. *Campylocentrum micranthum*** (Lindley) Rolfe (1903: 245). ≡ *Agraecum micranthum* Lindl. (1835: 1772). [Fig. 2J]

Epiphyte. Stem 7.0-19.0 ð 0.3-0.4 cm, cylindrical. Leaves 5-17, distichous along the stem, 3.5-8.5 ð 1.0-2.2 cm, oblong-elliptic, apex emarginate, asymmetric. Inflorescence lateral, in a raceme, 14-30-flowered; peduncle 0.1-0.3 cm long; rachis 2.0-3.5 cm long; floral bracts ca. 0.1 cm long, deltoid, the apex acute. Flowers whitish; dorsal sepal 0.4-0.6 ð 0.05-0.1 cm, linear-lanceolate, the apex acute; lateral sepals 0.45-0.6 ð 0.05-0.1 cm, linear-lanceolate, sub-falcate, the apex acute; petals 0.35-0.45 ð 0.05-0.1 cm, linear-elliptic, the apex acute; lip 0.4-0.5 ð 0.12-0.15 cm, trilobed, whitish, lateral lobes 0.01-0.02 ð 0.01 cm, deltoid, the apex acute, central lobe 0.25-0.3 ð 0.06-0.08 cm, lanceolate, margin entire, the apex acute, spur 0.3-0.4 cm long, cylindrical, curved; column ca. 0.1 cm long; pollinia 2; ovary + pedicel 0.1-0.15 cm long. Fruits 0.9-1.2 ð 0.2-0.3 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 25.VIII.2012, fl., *E. Pessoa et al. 1001* (INPA, SP, UFP).
Comments: Widely distributed on Neotropics and in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and is found in "*várzea* forest". It preferentially grows in the shade habitats, and it could be confused with *Campylocentrum huebneri*, but differs mainly by its shorter, curved spur.

**11. *Campylocentrum poeppigii*** (Reichenbach f.) Rolfe (1903: 246). ≡ *Agraecum poeppigii* Reichenbach f. (1849: 858). [Fig. 2K]

Epiphyte. Stem 21.0-56.0 ð 0.2-0.3 cm, cylindrical. Leaves 18-30 distichous along the stem, 0.3-0.7 ð 0.1 cm, aciculate, sub-conical, the apex acute. Inflorescence lateral, in a raceme, 11-14-flowered; peduncle 0.1-0.3 cm long; rachis 0.6-1.1 com long; floral bracts ca. 0.05 cm long, deltoid, apex acute. Flowers whitish; dorsal sepal 0.19-0.21 ð 0.11-0.12 cm, oblong-ovate, the apex rounded; lateral sepals 0.2-0.21 ð 0.1-0.11 cm, oblong-ovate, subfacate, the apex rounded to acute; petals 0.15-0.18 ð 0.08-0.1 cm, oblong-elliptic, the apex acute; lip 0.11-0.12 ð 0.15-0.16 cm, trilobed, whitish, lateral lobes ca. 0.01 ð 0.01 cm, deltoid, the apex acute, central lobe 0.05 ð 0.03 cm, deltoid,

margin entire, the apex acute, spur ca. 0.2 cm long, obtrullate; column 0.08-0.1 cm long; pollinia 2; ovary + pedicel 0.2-0.25 cm long. Fruits 0.7-1.0 ð 0.15-0.25 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 15. IX. 2010, fr., *E. Pessoa et al. 380* (INPA, UFP); ibid., 21.IX.2011, fr., *E. Pessoa et al. 693* (INPA, SP, UFP); Rio Anauá, 30.XI.2011, fl., *E. Pessoa et al. 863* (INPA, UFP); ibid, 21.VIII.2012, fr., *E. Pessoa & Melo, A. 968* (INPA).

Comments: Widely distributed on Neotropics, including Brazil (states of Amazonas, Rondônia and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common, but occurs only in "*várzea* forest". It is easily recognized by the aciculate, sub-conical leaves.

**12. *Catasetum discolor*** (Lindley) Lindley (1844: 34). ≡ *Monachanthus discolor* Lindley (1834: 1735). [Fig. 2L]

Epiphyte or terrestrial. Pseudobulbs 8.5-26.0 ð 1.7-3.5 cm, homoblastic, fusiform. Leaves 5-7, distichousalong the pseudobulb, 13.5-39.0 ð 3.0-6.0 cm, elliptic to oblanceolate, the apex acute. Inflorescence lateral, in a raceme, 3-14-flowered; peduncle 14.0-53.0 cm long; rachis 2.0-15.0 cm long; floral bracts 0.7-1.0 cm long, deltoid, the apex acute. Flowers yellowish; dorsal sepal 1.5-1.7 ð 0.4 cm, oblong, the apex acute; lateral sepals 1.8-1.9 ð 0.7 cm, oblong-falcate, the apex acute; petals 1.9-2.1 ð 0.5-0.8 cm, wide-elliptic, the apex obtuse to rounded; lip 1.8-2.5 ð 1.8-2.0 cm, helmet-shaped, yellowish, margin laterally short fimbriate to serrate, the apex rostrate; column 0.6-0.9 cm long; pollinia 2; ovary + pedicel 3.2-3.5 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 23.VII.2010, fl., *E. Pessoa et al. 343* (INPA); ibid., 18.IX.2011, fl., *Pessoa, E et al. 651* (INPA); ibid., 17.X.2011, fl., *E. Pessoa et al. 751* (INPA); Estrada Perdida, 20.I.2011, fl., *Cabral, F.N. et al. 365* (INPA); ibid., 02.IX.2002, fl., *Ferreira, C.A. et al. 12430* (INPA).

Comments: Distributed in northern South America, from French Guyana, Guyana, Suriname, Venezuela, Colombia, and Peru to Brazil (states of Alagoas, Amazonas, Bahia, Ceará, Espírito Santo, Maranhão, Pará, Paraíba, Pernambuco, Rio de Janeiro, Roraima, and Sergipe) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it

is common on open areas and occurs only in "*Campinaranas*". It is found sometimes associated to ant's gardens. It could be confused with *C.* ð *roseoalbum* (Hooker) Lindley, a natural hybrid between *Catasetum discolor* and *C. longifolium* Lindley, but differs mainly by a laterally short lip with fimbriate to serrate margin.

**13. *Catasetum longifolium*** Lindley (1839: 94). [Fig. 2M]

Epiphyte. Pseudobulbs 8.0-32.0 ð x 2.0-5.0 cm, homoblastic, fusiform. Leaves 5-12, distichous along the pseudobulb, 41.0-135.0 ð 0.7-3.5 cm, linear-elliptic, the apex acute. Inflorescence lateral, in a raceme, 2-6-flowered; peduncle 8.5-17.0 cm long; rachis 1.0-11.0 cm long; floral bracts 0.5-1.0 cm long, deltoid, the apex acute. Flowers, orangish; dorsal sepal 0.8-1.6 ð 0.6 cm, oblong-lanceolate, the apex acute; lateral sepals 1.2-1.9 ð 0.5-0.7 cm, lanceolate-falcate, the apex acute; petals 1.4-1.6 ð 0.75-1.0 cm, elliptic, the apex acute; lip 1.6-2.8 ð 1.4-2.2 cm, helmet-shaped, orangish, margin laterally short fimbriate, the apex rostrate; column 0.5-0.7 cm long; pollinia 2; ovary + pedicel 1.5-4.0 cm long. Fruits 9.0-14.0 ð 2.0-4.5, ellipsoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Estrada Perdida, 27.X.2011, fr., *E. Pessoa et al. 797* (INPA, UFP); ibid., 27.X.2011, fl., *Pessoa, E et al. 798* (INPA).

Comments: Distributed in northern South America, from French Guyana, Guyana, Suriname, and Venezuela to Northern Brazil (states of Amazonas, Pará, Rondônia, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common, occuring only in "*campinaranas*". It grows preferentially on *Mauritia flexuosa* L.f. (Arecaceae), and could be confused with *Catasetum discolor*, but differs mainly by the longer and linear-elliptical leaves.

**14. *Catasetum macrocarpum*** Richard *ex* Kunth (1822: 331). [Fig. 2N]

Epiphyte. Pseudobulbs 4.5-13.0 ð 1.3-3.0 cm, homoblastic, fusiform. Leaves 5-9, distichous along the pseudobulb, 13.0-32.0 ð 3.5-5.5 cm, oblanceolate, the apex acute. Inflorescence lateral, in a raceme, 4-8-flowered; peduncle 13.5-33.0 cm long; rachis 4.2-12.0 cm long; floral bracts 0.5-0.7 cm long, lanceolate, the apex acute. Flowers yellow-greenish with purple spots; dorsal sepal 4.1-4.5 ð 1.2-1.4 cm, oblanceolate, the apex

acute; lateral sepals 4.5-4.8 ð 1.7-1.8 cm, oblanceolate to elliptic, the apex acute; petals 4.3-4.6 ð 1.6-2.2 cm, wide-elliptic, the apex acute; lip 1.5-2.4 ð 1.2-2.0 cm, helmet-shaped, yellow-greenish, margin entire, the apex rostrate; column 3.0-3.6 cm long; pollinia 2; ovary + pedicel 1.5-1.8 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 22.IX.2011, fl., *E. Pessoa et al. 711* (INPA).

Comments: Distributed on South America, from Trinidad & Tobago, French Guyana, Guyana, Suriname, Venezuela, and Colômbia, to Argentina and Brazil (states of Alagoas, Amazonas, Bahia, Espírito Santo, Maranhão, Pará, Pernambuco, Roraima, and Tocantins) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*várzea* forest". It is easily recognized by its helmet-shaped lip with entire margin.

**15. *Catasetum* ð *roseoalbum*** (Hooker) Lindley (1840: 61). ≡ *Monachanthus roseo-albus* Hooker (1840: 3796). [Fig. 2O]

Epiphyte. Pseudobulbs 6.0-16.5 ð 1.2-2.0 cm, homoblastic, fusiform. Leaves 4-7, distichous along the pseudobulb, 13.0-20.0 ð 3.0-4.0 cm, elliptc, the apex acute. Inflorescence lateral, in a raceme, 4-21-flowered; peduncle 6.0-27.0 cm long; rachis 3.0-25.5 cm long; floral bracts 0.5-0.8 cm long, lanceolate to deltoid, the apex acute. Flowers yellow-purplish; dorsal sepal 1.2-1.5 ð 0.4-0,5 cm, oblong, the apex acute; lateral sepals 1.3-1.7 ð 0.5-0,6 cm, elliptic-falcate, the apex acute; petals 1.4-1.8 ð 0.5 cm, oblong, the apex obtuse; lip 1.2-1.5 ð 1.5-1.7 cm, helmet-shaped, yellow-pinkish, margin laterally long fimbriate, the apex rostrate; column 0.4-0.8 cm long; pollinia 2; ovary + pedicel 1.5-3.0 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 18.IX.2011, fl., *E. Pessoa et al. 650* (INPA); ibid., 21.X.2011, fl., *E. Pessoa et al. 780* (INPA); Estrada Perdida, 27.X.2011, fl., *E. Pessoa et al. 799* (INPA).

Comments: Distributed in northern South America, from Guyana, Suriname, and Venezuela to Northern Brazil (states of Amazonas and Pará) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is common in *"campinaranas"*. *C.* ð *roseoalbum* is a natural hybrid between *Catasetum*

*discolor* and *C. longifolium*, and could be confused with these species, but differs mainly by the laterally long fimbriate margin of the lip.

**16. *Catasetum saccatum*** Lindley (1840:76). [Fig. 2P]

Epiphyte. Pseudobulbs 19.0-22.0 ð 3.5-4.0 cm, homoblastic, fusiform. Leaves 5-6, distichous along the pseudobulb, 15.5-41.0 ð 5.3-7.5 cm, elliptic to oblanceolate, the apex acute. Inflorescence lateral, in a raceme, 10-15-flowered; peduncle 23.0 cm long; rachis 11.5 cm long; floral bracts 0.5-0.7 cm long, deltoid, the apex acute. Flowers yellowish-brown; dorsal sepal 4.5-4.7 ð 1.0-1.2 cm, oblanceolate, the apex acute; lateral sepals 4.5-4.7 ð 1.2-1.4 cm, obllanceolate, sub-falcate, the apex acute; petals 4.1-4.3 ð 1.1-1.2 cm, elliptic to oblanceolate, the apex acute; lip 3.3-3.5 ð 2.5-2.8 cm, ovate, the disc with a helmet-shaped depression, yellowish-brown, margin laterally short fimbriate, the apex rostrate; column 3.5-3.7 cm long; pollinia 2; ovary + pedicel 3.0-3.5 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 24.VIII.2012, fl., *E. Pessoa & Melo, A. 997* (UFP).
Comments: Distributed in northern South America, from Guyana, Venezuela, Ecuador, Peru, and Bolivia to Brazil (states of Amazonas, Mato Grosso, Mato Grosso do Sul, Pará. Rondônia, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and occurs only in "*várzea* forest". It could be confused with any of the *Catasetum* species from the area, but differs mainly by its brownish flowers.

**17. *Cattleya violacea*** (Kunth) Rolfe (1889: 802). ≡ *Cymbidium violaceum* Kunth (1816: 341). [Fig. 2Q]

Epiphyte. Pseudobulb 13.0-28.0 ð 0.8-1.5 cm, heteroblastic, cylindrical to slightly wider on apex. Leaves 2, apical, 9.0-15.0 ð 3.5-7.0 cm, wide-elliptic, the apex obtuse. Inflorescence terminal, in a raceme, 2-8-flowered; peduncle 4.0-6.5 cm long; rachis 7.0-13.0 cm long; floral bracts 0.3-0.4 cm long, deltoid, the apex acute. Flowers purplish; dorsal sepal 6.0-7.0 ð 1.4-1.6 cm, elliptic to oblong-elliptic, the apex acute; lateral sepals 5.0-6.0 ð 1.4-2.0 cm, elliptic-falcate, the apex acute; petals 5.6-6.5 ð 2.5-3.5 cm, wide-elliptic to obovate, the apex obtuse; lip 4.6-4.8 ð 4.5-4.7 cm, trilobed,

purplish with yellowish whitish margin disc, lateral lobes 2.0-2.2 ð 2.4-2.5 cm, deltoid, the apex acute, central lobe 2.0-2.2 ð 3.4-3.5 cm, bilobed, margin minutely erose, the apex emarginate, longitudinal ridges on disc; column 2.5-3.0 cm long; pollinia 4; ovary + pedicel 4.5-6.5 cm long. Fruits 12.5 ð 3.5 cm, globose.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 21.IX.2011, fl., *E. Pessoa et al. 700* (INPA); Rio Anauá, 26.III.2011, fl., *Barbosa, T.D.M.. et al. 1405* (INPA); ibid., 24.VIII.2012, fr., *E. Pessoa & Melo, A. 995* (INPA).

Comments: Distributed in northern South America, from French Guyana, Guyana, Venezuela, Bolivia, Colombia, Ecuador, and Peru to Brazil (states of Amazonas, Mato-Grosso, Minas Gerais, Pará, Rondônia, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó* forest" and "*várzea* forest". It is easily recognized by the large and purplish flowers.

**18. *Caularthron bicornutum*** (Hooker) Rafinesque (1837: 41). ≡ *Epidendrum bicornutum* Hooker (1834:3332). [Fig. 2R]

Epiphyte. Pseudobulb 6.5-16.5 ð 1.5-2.5 cm, homoblastic, fusiform. Leaves 4-8, distichous along the pseudobulb, 3.0-9.0 ð 0.9-1.8 cm, oblong, the apex emarginate. Inflorescence terminal, in a raceme, 7-13-flowered; peduncle 19.0-34.5 cm long; rachis 5.8-10.5 cm long; floral bracts 0.3-0.4 cm long, ovate, the apex acute. Flowers, pinkish-white; dorsal sepal 2.3-2.5 ð 0.9-1.0 cm, elliptic, the apex acuminate; lateral sepals 2.3-2.4 ð 0.8-1.0 cm, lanceolate, the apex acute; petals 2.1-2.5 ð 1.2-1.4 cm, wide-elliptic, the apex acute; lip 2.1-2.2 ð 1.0-1.1 cm, trilobed, white with purple spots, lateral lobes 0.4-0.7 ð 0.25-0.3 cm, lanceolate, the apex obtuse to rounded, central lobe 1.3-1.5 ð 0.4-0.5 cm, oblong, margin entire, the apex acute, calli 2 on disc, horn-like; column 0.8-1.0 cm long, pollinia 4; ovary + pedicel 2.8-3.0 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 23.VIII.2012, fl., *E. Pessoa & Melo, A. 987* (INPA).

Comments: Distributed in northern South America, from Trinidad & Tobago, Guyana, Suriname, Venezuela, and Colombia to Brazil (states of Amazonas, Pará, Rondônia and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and

occurs in "*várzea* forest", usually associated with termites sometimes living inside of dead pseudobulbs. It is easily recognized by the trilobed lip with 2 horn-like callus on the disc.

**19. *Christensonella uncata*** (Lindley) Szlachetko, Mytnik-Ejsmont, Górniak & Śmiszek (2006: 59). ≡ *Maxillaria uncata* Lindley (1837: 1986). [Fig. 2S]

Epiphyte. Pseudobulb 0.7-1.0 ð 0.1-0.2 cm, heteroblastic, cylindrical. Leaves 1, apical, 1,7-4.5 ð 0.1-0.4 cm, linear-elliptic, cylindrical, the apex acute. Inflorescence lateral, 1-flowered; peduncle 0.8-1.1 cm long; rachis inconspicuous; flower bracts 0.5-0.6 cm long, ovate, the apex acute. Flower whitish to creamish; dorsal sepal 0.9-1.0 ð 0.25-0.35 cm, oblong-lanceolate, the apex acute to obtuse; lateral sepals 1.3-1.4 ð 0.6-0.7 cm, ovate to deltoid, the apex acute to obtuse, the base adnate to the column foot forming a conic mentum; petals 0.8-1.0 ð 0.25-0.3 cm, oblong-elliptic to elliptic, the apex obtuse; lip 1.4-1.5 ð 0.4-0.5 cm, oblanceolate, laterally constricted on the 3/4, whitish, margin entire to minutely denticulate, the apex rounded to retuse, callus 1 on the disc, oblong-ovoid; column 0.8-0.9 cm long; pollinia 2; ovary + pedicel 0.8-1.2 cm long. Fruit 1.2-1.4 ð 0.3-0.35 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 27.VII.2010, fr., *E. Pessoa et al. 362* (INPA, UFP); ibid., 15.IX.2010, fl./fr.. *E. Pessoa et al. 378* (INPA, SP, UFP).

Comments: Widely distributed on Neotropics, including Brazil (states of Amazonas, Goiás, Maranhão, Mato Grosso, Pará, Rondônia, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs only in "*várzea* forest". It is easily recognized among the plants with cylindrical leaves by having a conic mentum in the solitary flowers.

**20. *Cleistes rosea*** Lindley (1840: 410). [Fig. 2T]

Terrestrial. Stem 20.0-94.0 ð 0.15-0.55 cm, cylindrical. Leaves 2-4 distichous along the stem, 2.5-11.0 ð 0.7-1.3 cm, lanceolate, the apex acute. Inflorescence terminal, in a raceme, 1-2-flowered; peduncle 2.0-7.0 cm long; rachis inconspicuous to 11.5 cm long; floral bracts 3.5-11.5 cm long, lanceolate, leaf-like, the apex acute. Flower pinkish to

whitish; dorsal sepal 3.5-5.5 ð 0.5-0.75 cm, elliptic, the apex acute; lateral sepals 3.5-5.4 ð 0.6-0.7 cm, narrow-lanceolate, the apex acute; petals 3.4-5.0 ð 0.9-1.4 cm, elliptic, the apex acute; lip 3.0-5.0 ð 1,2-2.0 cm, elliptic-lanceolate, pinkish to whitish, margin erose, the apex acute, the base with 2 globose appendages, 2 longitudinal ridges, apically papillose; column 2.0-2.6 cm long; pollinia 2; ovary + pedicel 1.2-2.7 cm long. Fruits 1.7-7.0 ð 0.7-1.2, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Estrada Perdida, 19.VII.2010, fl., *Barbosa, T.D.M. et al. 1196* (INPA); ibid., 19.VII.2010, fl., *Barbosa, T.D.M. et al. 119* (INPA); ibid., 20.VII.2010, fl., *Barbosa, T.D.M. et al. 1224* (INPA); ibid., 27.III.2010, fl., *Barbosa, T.D.M. et al. 1423* (INPA); ibid., 22.VII.2010, fl., *Cavalcanti, D. et al. 198* (INPA); ibid., 22.VII.2010, fl./fr., *E. Pessoa et al. 336* (INPA, UFP); Grade PPBio, 26.VIII.2012, fr., *E. Pessoa et al. 1003* (INPA, SP, UFP).
Comments: Distributed on Central and South America, ranging from Costa Rica, Panamá, French Guyana, Guyana, Suriname, Venezuela, Colombia, Ecuador, Peru, and Bolivia to Brazil (widely distributed) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is common but occurs only in "*campinaranas*". It could be confused with *Cleistes tenuis* (Reichenbach f.) Schlechter., but differs mainly by the bigger flowers.

**21. *Cleistes tenuis*** (Reichenbach f. *ex* Grisebach) Schlechter (1926: 180). ≡ *Pogonia tenuis* Reichenbach f. *ex* Grisebach (1865: 91). [Fig. 3A]

Terrestrial. Stem 10.5-21.5 ð 0.1-0.15 cm, cylindrical. Leaves 1-2 distichous along the stem, 0.6-2.2 ð 0.2-0.7 cm, lanceolate, the apex acute. Solitary flower apical; floral bract 1.0-2.6 cm long, lanceolate, leaf-like, the apex acute. Flower white-greenish; dorsal sepal 1.5-1.7 ð 0.4 cm, elliptic, the apex acute; lateral sepals 1.6-1.7 ð 0.35 cm, elliptic, the apex acute; petals 1.3-1.5 ð 0.35-0,4 cm, elliptic, the apex acute; lip 1.2-1.4 ð 0.7 cm, oblanceolate, minutelly trilobed, whitish with purple lines, margin undulate to erose, the apex rounded, the base with 2 globose appendages, disc with yellow longitudinal ridge, apically papillose; column 0.7-0,8 cm long; pollinia 2; ovary + pedicel 1.0-1.5 cm long. Fruits 1.6 ð 0.2 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 27.VII.2010, fl./fr., *E. Pessoa et al. 360* (INPA, UFP).

Comments: Distributed on South America, from Trinidad & Tobago, French Guyana, Guyana, Suriname, and Venezuela, to Brazil (states of Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, Distrito Federal, Goiás, Mato Grosso, Minas Gerais, Paraná, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*campinaranas*". It could be confused with *Cleistes rosea*, but differs mainly by the smaller flowers.

**22. *Cohniella cebolleta*** (Jacquin) Christenson (1999: 177). ≡ *Epidendrum cebolleta* Jacquin (1760: 30). [Fig. 3B]

Epiphyte or terrestrial. Pseudobulbs 0.5-1.0 ð 0.4-0.6 cm, heteroblastic, ovoid to cylindrical. Leaves 1, apical, 13.0-31.0 ð 0.2-0.4 cm, cylindrical, the apex acute. Inflorescence lateral, in a raceme or panicule, 8-15-flowered; peduncle 37.0-39.0 cm long; rachis 4.5-8.5 cm long; floral bracts 0.15-0.7 cm long, deltoid, the apex acute. Flowers yellowish with brown dots; dorsal sepal 0.6-1.0 ð 0.4-0.65 cm, obovate, the apex cuspidate; lateral sepals 0.6-1.1 ð 0.4-0.6 cm, oblanceolate, the apex cuspidate; petals 0.75-1.0 ð 0.4-0.6 cm, oblanceolate, the apex rounded; lip 1.2-2.5 ð 1.8-3.0 cm, obovate, trilobed, yellowish, lateral lobes 0.5-1.2 ð 0.3-0.8 cm, oblanceolate, the apex rounded, central lobe 0.8-2.0 ð 1.2-3.0 cm, obovate, margin entire, the apex deeply emarginate, callus 1 on base, tri-carenate, the middle carene bigger; column 0.3-0.5 cm long; pollinia 2; ovary + pedicel 1.2-1.7 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 17.X.2011, fl., *E. Pessoa et al. 747* (INPA, UFP); Rio Anauá, 22.VIII.2012, fl., *E. Pessoa et al. 974* (INPA, UFP).

Comments: Widely distributed on Neotropics and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*várzea*" and "*terra-firme*" forests. It could be confused with others local species with cylindrical leaves, but differs mainly by a tri-carenate callus on base of the lip.

**23. *Dichaea picta*** Reichenbach f. (1872: 84). [Fig. 3C]

Epiphyte. Stem 8.0-21.0 ð 0.3-0.4 cm, dorsiventrally flattened. Leaves 20-39, distichous along the stem, 1.0-2.0 ð 0.3-0.4 cm, narrow-oblong, the apex acute. Inflorescence lateral, 1-flowered; peduncle 1.3-1.6 cm long; rachis inconspicuous; floral bracts 0.2-0.3 cm long, clasping, the apex acute. Flower whitish to cream colored with purple spots; dorsal sepal 0.55-0.6 ð 0.25-0.3 cm, ovate, the apex acute; lateral sepals 0.6-0.7 ð 0.3-0.35 cm, ovate-falcate, the apex acute; petals 0.5-0.6 ð 0.25-0.3 cm, ovate, the apex acute; lip 0.5-0.6 ð 0.7 cm, trilobed, anchoriform, whitish with purple spots, margin entire, the apex acute to obtuse; column 0.25-0.3 cm long; pollinia 4; ovary + pedicel 0.05-0.07 cm long. Fruits 1.0-1.2 ð 0.4-0.5 cm, obovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 22.IX.2011, fl., *E. Pessoa et al. 712* (INPA); ibid., 26.VII.2010, fl., *E. Pessoa et al. 357* (INPA, SP, UFP); Rio Anauá, 20.IX.2011, fr., *E. Pessoa et al. 858* (INPA, UFP); ibid., 22.VIII.2012, fl., *E. Pessoa et al. 973* (INPA, SP, UFP).
Comments: Distributed in northern South America, from Trinidad & Tobago, French Guyana, Guyana, Suriname, Venezuela, Colombia, and Ecuador to Brazil (states of Amapá, Amazonas, Maranhão, Pará, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó*" and "*várzea*" forests. It is often found in shady areas, and is easily recognized among plants without pseudobulbs by the lateral and 1-flowered inflorescences.

**24. *Dimerandra emarginata*** (G. Meyer) Hoehne (1934: 618). ≡ *Oncidium emarginatum* G.Meyer (1818: 259). [Fig. 3D]

Epiphyte. Stem 10.0-32.0 ð 0.5-0.7 cm, cylindrical. Leaves 13-16, distichous along the stem, 5.0-10.0 ð 0.7-1.0 cm, linear-lanceolate to linear-oblong, the apex emarginate. Inflorescence terminal, in a raceme, 1-3-flowered; peduncle 0.7-1.0 cm long; rachis 0.2-0.4 cm long; floral bracts 0.3-0.4 cm long, deltoid, the apex acute. Flowers pinkish; dorsal sepal 1.2-1.4 ð 0.3-0.45 cm, elliptic, the apex acute; lateral sepals 1.3-1.5 ð 0.4-0.5 cm, elliptic-falcate, the apex acute; petals 1.1-1.4 ð 0.4-0.5 cm, wide-elliptic, the apex acute; lip 0.9-1.0 ð 0.5-0.8 cm, obovate, pinkish with a basal whitish spot, margin entire, the apex cuspidate, callus 1 on base, oblong multiridged; column 0.5-0.6 cm long, adnate at base of the lip; pollinia 4; ovary + pedicel 2.7-2.8 cm long. Fruits 3.0-3.5 ð 0.4-0.6 cm, fusiform.

Examined Material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 15.VII.2010, fl./fr., *E. Pessoa et al. 379* (INPA, UFP).

Comments: Widely distributed on Neotropics, including Brazil (states of Alagoas, Amapá, Amazonas, Bahia, Espírito Santo, Maranhão, Pará Paraíba, Pernambuco, and Sergipe) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and found in "*várzea* forest". It could be confused with some *Epidendrum* species of area, but differs mainly by column adnate only at the base of the lip.

**25. *Duckeella pauciflora*** Garay (1958: 186). [Fig. 3E]

Terrestrial. Stem inconspicuous. Leaves 2-3, 16.0-24.5 ð 0.4-0.6 cm, linear, the apex acute. Inflorescence terminal, in a raceme, 3-4-flowered; peduncle 31.5-38.0 cm long; rachis 1.0-1.5 cm long; floral bracts 0.4-0.6 cm long, ovate, the apex acute. Flowers yellowish; dorsal sepal 1.7-2.1 ð 0.6-0.8 cm, elliptic to oblanceolate, the apex acute; lateral sepals 1.7-2.1 ð 06-0.8 cm, elliptic, the apex acute; petals 1.7-2.1 ð 0.8-1.2 cm, wide elliptic to ovate-rhombic, the apex acute; lip 1.6-1.9 ð 0.5-0.6 cm, oblanceolate, trilobed, yellowish, lateral lobes 0.16-0.18 ð 0.16-0.18 cm, orbicular, the apex rounded, central lobe 1.3-1.6 ð 0.25-0.3 cm, oblanceolate, margin entire, the apex acute, callus 1 on base, minutely fimbriate; column 0.65-0.7 cm long, pollinia 2; ovary + pedicel 1.0-1.2 cm long. Fruit 2.3 ð 0.2 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Iruá, 27.III.2011, fl., *Barbosa, T.D.M.. et al. 1424* (INPA); Grade PPBio, 01.VII.2006, fl., *Costa, F.R.C. 1708* (INPA).

Comments: Formerly known from Venezuela and Colombia, and recently found in Brazil (State of Roraima) (Govaerts *et al.* 2012, Pessoa *et al. in press.*). In the studied area, it is rare and occurs in "*campinaranas*". It is easily recognized by the terrestrial habit, linear leaves and yellowish flowers.

**26. *Epidendrum anceps*** Jacquin (1763: 244). [Fig. 3F]

Epiphyte. Stem 6.5-16.5 ð 0.3-0.5 cm, cylindrical. Leaves 4-6, distichous along the stem, 2.5-11.5 ð 1.0-2.0 cm, elliptic, the apex obtuse. Inflorescence terminal, in a raceme, 5-11-flowered; peduncle 14.0-21.5 cm long; rachis 1.5-2.0 cm long; floral bracts 0.1-0.2 cm long, deltoid to lanceolate, the apex acute. Flowers pinkish-orange; dorsal sepal 0.5-0.55 ð 0.2-0.25 cm, oblanceolate, the apex acute; lateral sepals 0.45-0.55 ð 0.2-0.25 cm, oblanceolate, sub-falcate, the apex acute; petals 0.4-0.5 ð 0.07-0.1 cm, linear, the apex obtuse; lip clawed, claw adnate to the column, lamina 0.3-0.4 ð 0.4-0.5 cm, ovate, trilobed, pinkish-orange, lateral lobes 0.1-0.15 ð 0.1-0.2 cm, orbicular, the apex rounded, central lobe 0.1-0.15 ð 0.15-0.2 cm, bilobulate, margin entire, the apex emarginate, callus 1 on disc, longitudinal; column 0.2-0.3 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 1.0-1.2 cm long. Fruits 1.5-1.6 ð 0.4-0.7, obovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 24.VIII.2012, fl./fr., *E. Pessoa & Melo, A. 998* (INPA, NY, SP, UFP).
Comments: Widely distributed on Neotropics and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and occurs only in "*várzea* forest". It could be confused with *Epidendrum orchidiflorum* Salzmann *ex* Lindley, but grows on dense forests and has smaller plants.

**27. *Epidendrum carpophorum*** Barbosa Rodrigues. (1882: 148). [Fig. 3G]

Epiphyte. Stem 5.0-13.5.0 ð 0.2-0.4 cm, cylindrical. Leaves 3-5, distichous along the stem, 4.3-9.5 ð 0.8-2.2 cm, elliptic, the apex minutely retuse. Inflorescence terminal, in a raceme, 1-flowered; peduncle 0.6-1.5 cm long; rachis 0.2-0.5 cm long; floral bracts 0.2-0.4 cm long, ovoid, the apex acute. Flowers greenish with whitish lip ; dorsal sepal 4.5-4.6 ð 0.4-0.5 cm, elliptic, the apex acute; lateral sepals 4.3-4.5 ð 0.6-0.65 cm, lanceolate-elliptic, the apex acute; petals 4.3-4.5 ð 0.2-0.25 cm, linear-elliptic, the apex acute; lip clawed, claw adnate to the column, lamina 4.3-4.4 ð 1.6-1.7 cm, trilobed, whitish, lateral lobes 1.5-1.6 ð 0.6 cm, lanceolate, the apex acute to obstuse, central lobe 2.4-2.5 ð 0.1-0.15 cm, linear, margin entire, the apex acute, callus 2 on base, deltoid; column 1.8-2.0 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 5.5-5.6 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 25.VIII.2012, fl., *E. Pessoa & Melo, A. 1000* (INPA, UFP).

Comments: Widely distributed on Neotropics and in Brazil (states of Amapá, Amazonas, Bahia, and Rio de Janeiro) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and found in "*várzea* forest". It could be confused with *Epidendrum nocturnum* Jacquin, but differs mainly by the bigger flowers with longer pedicellate ovary.

**28. *Epidendrum coronatum*** Ruiz & Pavón (1798: 242). [Fig. 3H]

Epiphyte. Stem 62.0-66.5 ð 0.5-0.7 cm, cylindrical. Leaves 12-19, distichous along the stem, 10.0-14.2 ð 2.5-4.2 cm, oblong to elliptic, apex obtuse to minutely retuse. Inflorescence terminal, in a raceme, 31-38-flowered; peduncle 3.0-8.5 cm long; rachis 24.0-30.0 cm long; floral bracts 0.5-0.6 cm long, deltoid, apex acute. Flowers creamish; dorsal sepal 2.2-2.3 ð 0.8-0.9 cm, oblanceolate, apex obtuse; lateral sepals 2.0-2.2 ð 0.8-0.9 cm, oblanceolate, sub-falcate, apex obtuse; petals 2.0-2.1 ð 0.5-0.6 cm, oblanceolate, apex acute; lip clawed, claw adnate to the column, lamina 1.8-2.1 ð 2.4-2.6 cm, trilobed, whitish, lateral lobes 1.0-1.1 ð 1.6-1.7 cm, suborbicular to obovate, apex rounded, central lobe 0.75-0.8 ð 1.2-1.3 cm, bilobulate, margin entire, apex rounded, callus 2 on base, deltoid, 1 on disc, longitudinal; column 1.4-1.5 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 3.0-3.2 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 21.IX.2011, st., *E. Pessoa et al. 704* (INPA); Rio Anauá, 27.XI.2011, fl., *E. Pessoa et al. 827* (INPA).

Comments: Widely distributed on Neotropics, including Brazil (states of Amazonas, Espirito Santo, Mato Grosso, Mato Grosso do Sul, Pará, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*várzea* forest". It could be confused with other species of *Epidendrum* from the area, but differs mainly by the robust habit and cream flowers.

**29. *Epidendrum nocturnum*** Jacquin (1760: 29). [Fig. 3I]

Epiphyte. Stem 9.0-21.0 ð 0.4-0.5 cm, cylindrical. Leaves 5-6, distichous along the stem, 3.5-14.5 ð 0.9-1.5 cm, narrow-elliptic, the apex minutely retuse. Inflorescence terminal, in a raceme, 1-3-flowered; peduncle 1.0-3.0 cm long; rachis 0.8-1.2 cm long; floral bracts 0.4-0.5 cm long, deltoid, the apex acuminate. Flowers yellowish-green with whitish lip; dorsal sepal 3.4-3.6 ð 0.3-0.4 cm, narrow-elliptic, the apex acuminate; lateral sepals 3.1-3.3 ð 0.4-0.5 cm, elliptic-falcate, the apex acuminate; petals 3.0-3.5 ð 0.15-0.25 cm, linear, the apex acute; lip clawed, claw adnate to the column, lamina 2.6-3.0 ð 1.1-1.2 cm, trilobed, whitish, lateral lobes 1.5-1.7 ð 0.4-0.5 cm, lanceolate, the apex acute to obtuse, central lobe 1.6-2.2 ð 0.1-0.2 cm, linear, margin entire, the apex acute, callus 2 on base, deltoid; column 1.0-1.2 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 4.5-4.8 cm long. Fruits 5.6-6.0 ð 0.9-1.2 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 17.IX.2011, fl./fr., *E. Pessoa et al. 636* (INPA, SP, UFP).
Comments: Widely distributed on Neotropics and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*terra-firme* forest". It could be confused with *Epidendrum carpophorum* Barbosa Rodrigues, but differs mainly by having smaller flowers with shorter pedicellate ovary.

**30. *Epidendrum orchidiflorum*** Salzmann *ex* Lindley (1853: 103). [Fig. 3J]

Terrestrial. Stem 54.5-117.0 ð 0.4-0.6 cm, cylindrical. Leaves 11-60, distichous along the stem, 2.7-7.5 ð 1.0-2.5 cm, lanceolate, the apex obtuse to minutely retuse. Inflorescence terminal, in a raceme, 8-28-flowered; peduncle 30.5-94.5 cm long; rachis 2.0-4.5 cm long; floral bracts 0.4-1.3 cm long, deltoid to lanceolate, the apex acute. Flowers greensh; dorsal sepal 0.8-1.2 ð 0.4-0.45 cm, oblanceolate, the apex acute; lateral sepals 0.8-1.2 ð 0.4-0.45 cm, oblanceolate, sub-falcate, the apex acute; petals 0.8-1.1 ð 0.1-0.2 cm, linear-elliptic, the apex acute; lip clawed, claw adnate to the column, lamina 1.3 ð 1.4-1.6 cm, suborbicular, greenish, margin entire, the apex retuse, callus 2 on base, globose, 1 on disc, longitudinal; column 0.4-0.5 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 1.4-1.6 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 22.IX.2011, fl., *E. Pessoa et al. 715* (INPA); Grade PPbio, 18.IX.2011, fl., *E. Pessoa et al. 654* (INPA); ibid., 01.VI.2006, fl., *Costa, F.R.C. 1517* (INPA).

Comments: Distributed in northern South America, from Guyana, Venezuela, Colombia, and Peru to Brazil (states of Alagoas, Amazonas, Bahia, Espírito Santo, Pará, Roraima, and Sergipe) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and occurs in "*campinaranas*". It could be confused with *Epidendrum anceps*, but it is found in open vegetation, and is more robust .

**31. *Epidendrum purpurascens*** Focke (1851: 64) [Fig. 3K]

Epiphyte. Pseudobulb 6.0-14.0 ð 0.4-0.9 cm, heteroblastic, narrow-ellipsoid to slightly wider on apex. Leaves 1, apical, 14.5-25.0 ð 1.1-2.0 cm, narrow-elliptic, the apex acute. Inflorescence terminal, in a raceme, 3-5-flowered; peduncle 6.5-8.0 cm long; rachis 2.5-5.0 cm long; floral bracts 1.6-2.3 cm long, lanceolate, the apex acute. Flowers whitish-green; dorsal sepal 1.8-2.0 ð 0.3-0.35 cm, elliptic-oblanceolate, the apex acuminate; lateral sepals 1.8-1.9 ð 0.3-0.35 cm, oblanceolate, the apex acute; petals 1.7-1.8 ð 0.2 cm, narrow-elliptic, the apex acute; lip clawed, claw adnate to the column, lamina 0.7-0.8 ð 0.8-0.9 cm, trilobed, whitish, lateral lobes 0.3-0.4 ð 0.4-0.5 cm, ovate to elliptic, the apex acute, central lobe 0.65-0.7 ð 0.3-0.4 cm, oblanceolate, margin entire, the apex acute, callus 2 on base, globose; column 1.2-1.3 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 4.0-5.7 cm long. Fruits 3.5-5.0 ð 1.1-1.2 cm, ellipsoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 28.IX.2011, fr., *E. Pessoa & Vasconcelos, S. 846* (INPA, SP, UFP); ibid., 21.VIII.2012, fl./fr., *Pessoa, E & Melo, A. 964* (INPA).

Comments: Distributed on Central and Northern South America, from Costa Rica, French Guyana, Guyana, Suriname, Venezuela, and Colombia to Northern Brazil (states of Amapá, Amazonas, Maranhão, and Pará) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and found in "*várzea* forest". It could be confused with *Epidendrum viviparum* Lindley, but differs mainly by the smaller peduncle of inflorescence and smaller flowers.

**32. *Epidendrum rigidum*** Jacquin (1760: 29). [Fig. 3L]

Epiphyte. Stem 4.5-9.5 ð 0.2-0.3 cm, cylindrical. Leaves 3-6, distichous along the stem, 2.8-3.8 ð 0.6-0.9 cm, oblong to oblong-elliptic, the apex emarginate. Inflorescence terminal, in a raceme, 3-6-flowered; peduncle 0.6-1.2 cm long; rachis 2.0-5.0 cm long; floral bracts 0.8-1.1 cm long, ovate, the apex acute, covering the rachis and the pedicellate ovary. Flowers green; dorsal sepal 0.4-0.5 ð 0.2-0.25 cm, oblong-ovate, the apex acute; lateral sepals 0.42-0.5 ð 0.28-0.3 cm, oblong-ovate, the apex acute; petals 0.4-0.5 ð 0.1 cm, linear, the apex acute; lip clawed, claw adnate to the column, lamina 0.28-0.35 ð 0.3-0.35 cm, suborbicular, green, margin entire, the apex cuspidate, callus 2 on base, globose; column 0.25-0.3 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 0.8-1.2 cm long. Fruits 1.5-1.7 ð 0.6-0.7, obovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 21.IX.2011, fr., *E. Pessoa et al. 710* (INPA); Rio Anauá, 28.XI.2011, fl., *E. Pessoa et al. 842* (INPA); ibid., 24.VIII.2012, fr., *E. Pessoa & Melo, A*. 991 (INPA, UFP).

Comments: Widely distributed on Neotropics and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). Common In the studied area, but occuring only in "*várzea* forest". It could be confused with *Epidendrum strobiliferum* Reichenbach f., but differs mainly by the suborbicular lip and the unbranched stem.

**33. *Epidendrum strobiliferum*** Reichenbach f. (1859: 333). [Fig. 3M]

Epiphyte. Stem 14.0-35.0 ð 0.3-0.4 cm, cylindrical, branched. Leaves 12-36, distichous along the stem, 1.0-4.5 ð 0.4-0.7 cm, narrow-oblong, the apex emarginate. Inflorescence terminal, in a raceme, 4-7-flowered; peduncle 0.4-1.0 cm long; rachis 1.0-3.0 cm long; floral bracts 0.6-0.9 cm long, ovate, the apex rounded, covering the rachis and the pedicellate ovary. Flowers whitish; dorsal sepal 0.3-0.35 ð 0.08-0.12 cm, ovate, the apex rounded; lateral sepals 0.3-0.35 ð 0.1-0.12 cm, lanceolate-falcate, the apex rounded; petals 0.25-0.3 ð 0.05-0.06 cm, linear, the apex rounded; lip clawed, claw adnate to the column, lamina 0.2-0.3 ð 0.2 cm, cordate, whitish, margin entire, the apex acute, callus 2 on base, globose; column ca. 0.1 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 0.4-0.6 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 02.XII.2006, fl., *Carvalho, F.A. et al. 1080* (INPA); ibid., 15.IX.2010, fl., *E. Pessoa et al. 383* (INPA, UFP); ibid., 26.VII.2010, fl., *E. Pessoa et al. 351* (INPA, SP, UFP); ibid., 12.IX.2011, fl., *E. Pessoa et al. 713* (INPA, UFP); Rio Anauá, 27.XI.2011, fl., *E. Pessoa & Vasconcelos, S. 828* (INPA, SP, UFP); ibid., 24.VIII.2012, fl., *E. Pessoa & Melo, A. 992* (INPA, UFP).

Comments: Widely distributed on Neotropics and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó*" and "*várzea*" forests. It could be confused with *Epidendrum rigidum* Jacquin, but differs mainly by the branched stem and the cordate lip.

**34. *Epidendrum viviparum*** Lindley (1841: 10). [Fig. 3N]

Epiphyte. Pseudobulb 8.0-30.0 ð 0.4-0.7 cm, heteroblastic, cylindrical to slightly wider on apex. Leaves 2-3 apical well developed, others reduced, 9.0-19.5 ð 1.8-4.0 cm, elliptic, the apex acute. Inflorescence terminal, in a raceme, 1-4-flowered; peduncle 39.0-44.5 cm long; rachis 2.0-5.0 cm long; floral bracts 2.2-3.8 cm long, lanceolate, the apex acute. Flowers whitish; dorsal sepal 3.6-3.8 ð 0.4-0.5 cm, narrow-elliptic, the apex acuminate; lateral sepals 3.2-3.6 ð 0.4-0.5 cm, narrow-elliptic, the apex acute; petals 3.1-3.5 ð 0.3-0.4 cm, narrow-elliptic, the apex acuminate; lip clawed, claw adnate to the column, lamina 1.5-1.9 ð 1.4-1.6 cm, trilobed, whitish with yellow base, lateral lobes 0.4-0.7 ð 0.6-0.9 cm, suborbicular, the apex acute, central lobe 1.4-1.6 ð 0.5-0.6 cm, lanceolate, margin entire, the apex acute, callus 2 on disc, bilobed; column 2.0-2.2 cm long, completely adnate to the claw's lip; pollinia 4; ovary + pedicel 4.0-4.6 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 25.VII.2010, fl., *E. Pessoa et al. 349* (INPA, SP, UFP).

Comments: Distributed in northern South America, from French Guyana, Guyana, Ecuador, and Peru to Northern Brazil (states of Maranhão, Mato Grosso, Pará, and Rondônia) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is common but found only in "*várzea* forest". It could be

confused with *Epidendrum purpurascens* Focke, but differs mainly by the longer peduncle and larger flowers.

**35. *Epistephium parviflorum*** Lindley (1840: 433). [Fig. 3O]

Terrestrial. Stem 39.0-74.0 ð 0.4-1.0 cm, cylindrical. Leaves 5-10, distichous along the stem, 5.0-15.5 ð 1.5-3.7 cm, elliptic-lanceolate, the apex acute to acuminate. Inflorescence terminal, in a raceme, 8-28-flowered; peduncle 2.2-11.5 cm long; rachis 8.5-33.0 cm long; floral bracts 0.3-0.6 cm long, ovate, the apex acute. Flowers, purplish; dorsal sepal 2.0-3.0 ð 0.6-0.65 cm, elliptic, the apex acute; lateral sepals 2.1-3.0 ð 0.6-0.8 cm, oblanceolate, the apex acute; petals 2.1-2.8 ð 1.1-1.2 cm, obovate, the apex rounded to obtuse; lip 2.3-3.0 ð 2.4-2.8 cm, obovate, laterally adnate to the column up to the middle, purplish, margin undulate, the apex emarginate, two longitudinal ridges on disc, tuft of hairs on apex; column 1.7-2.0 cm long; pollinia 2; ovary + pedicel 2.0-2.5 cm long, calyculus present below the perianth. Fruits 3.0-4.0 ð 0.3-0.5 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 13.IX.2010, fl., *E. Pessoa et al. 374* (INPA, UFP); ibid., 13.VII.2010, fl./fr., *E. Pessoa et al. 339* (INPA, UFP); ibid., 18.IX.2011, fl., *E. Pessoa et al. 652* (INPA, UFP); ibid., 17.X.2011, fr., *E. Pessoa et al. 742* (INPA, UFP); ibid., 17.X.2011, fr., *Pereira. P.A. et al. 108* (INPA, UFP); ibid., 26.VIII.2012, fl., *E. Pessoa et al. 1002* (INPA); ibid., 23.X.2011, fl./fr., *Melo, A. et al. 939* (INPA, SP, UFP).
Comments: Distributed in northern South America, from Trinidad & Tobago, French Guyana, Guyana, Suriname, Venezuela, Bolivia, Colombia to Brazil (states of Acre, Amazonas, Mato Grosso, Pará, Rondônia and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common but found only in "*campinaranas*". It is easily recognized by its purplish flowers and lip with a tuft of hairs on apex.

**36. *Galeandra devoniana*** R.H. Schomburgk *ex* Lindley (1840: 37). [Fig. 3P]

Epiphyte. Pseudobulb 12.0-58.0 ð 0.4-1.0 cm, homoblastic, narrowly-fusiform. Leaves 5-15, distichous along the stem, 14.0-22.0 ð 0.5-1.0 cm, linear-lanceolate, the apex acute. Inflorescence terminal, in a raceme, 2-9-flowered; peduncle 6.0-13.0 cm long;

rachis 3.5-7.5 cm long; floral bracts 0.9-1.2 cm long, lanceolate, the apex acute. Flowers brown-yellowish and white; dorsal sepal 4.9-5.5 ð 0.5-0.7 cm, narrow-elliptic, the apex acute; lateral sepals 4.3-5.5 ð 0.7-0.8 cm, elliptic-subfalcate, the apex acute; petals 4.5-4.6 ð 0.7-0.8 cm, elliptic, the apex acute; lip 4.5-5.3 ð 5.2-5.3 cm, obovate, obscurely trilobed, whitish with purple lines, margin undulate, the apex rounded, two longitudinal ridges on base, spur 1.9-2.0 cm long, conic, curved; column 1.7-1.9 cm long; pollinia 2; ovary + pedicel 3.5-4.0 cm long. Fruits 6.0-6.5 ð 1.2-1.5 cm, obovate to ellipsoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Estrada Perdida, 22.VII.2010, fl., *E. Pessoa et al. 337* (INPA, UFP); ibid., 27.X.2011, fr., *E. Pessoa et al. 796*, fr. (INPA); ibid., 16.VII.2010, fl., *Barbosa, T.D.M. et al. 1116* (INPA); ibid., 23.VII.2010, fl., *Barbosa, T.D.M. 1286* (INPA); ibid., 22.VII.2010, fl., *Barbosa, T.D.M. et al. 1270* (INPA); Rio Iruá, 23.VIII.2012, fl., *E. Pessoa & Melo, A. 984* (INPA, UFP).

Comments: Distributed in northern South America, from Guyana and Venezuela, to Northern Brazil (States of Amazonas, Pará, Roraima, and Tocantins) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó* forest" and "*campinaranas*". It is usually found on dead trunks on flooded areas, and is easily recognized by its terminal inflorescence with large flowers with a conspicuous and curved spur.

**37. *Habenaria schwackei*** Barbosa Rodrigues (1881: 254). [Fig. 3Q]

Terrestrial. Stem 6.5-33.0 ð 0.1-0.2 cm, cylindrical. Leaves 2-4, distichous along the stem, 3.0-9.0 ð 0.1-0.25 cm, linear, the apex acute. Inflorescence terminal, in a raceme, 1-7-flowered; peduncle 11.0-23.5 cm long; rachis 1.3-11.0 cm long; floral bracts 1.1-1.6 cm long, lanceolate, the apex acuminate. Flowers whitish; dorsal sepal 0.4-0.45 ð 0.35 cm, ovate, the apex obtuse; lateral sepals 0.5-0.55 ð 0.2 cm, lanceolate-falcate, the apex obtuse; petals bifid, posterior segment 0,4-0,5 ð 0.15, elliptic-falcate, the apex obtuse, anterior segment 0,45-0,5 ð 0,15, linear, the apex obtuse; lip trifid, whitish, lateral segments 0,45-0,5 ð 0,1, linear, the apex obtuse, central segment 0.55-0.6 ð 0.18-0.2 cm, oblong-elliptic, margin entire, the apex obtuse, spur 1.4-2.0 cm long, cylindrical; column 0.2-0.25 cm long; pollinia 2; ovary + pedicel 1.3-1.5 cm long. Fruits 1.8-2.0 ð 0.2-0.3 cm, ellipsoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 22.VII.2010, fl./fr., *E. Pessoa et al. 338* (INPA, SP, UFP); ibid., 16.VII.2010, fl./fr., *Barbosa, T.D.M et al. 1141* (INPA); ibid., 24.VII.2010, fl./fr., *Barbosa, T.D.M. et al. 1309* (INPA).

Comments: Distributed on South America, from French Guyana, Guyana, Suriname, Venezuela, Colombia to Paraguay and Brazil (widely distributed) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and occurs in "*campinaranas*". It could be confused with *Aspidogyne foliosa* and *Ligeophila juruenensis* (Hoehne) Garay, but differs mainly by petals bifid and lip trifid.

**38. *Heterotaxis superflua*** (Reichenbach f.) F. Barros (2002: 113). ≡ *Maxillaria superflua* Reichenbach f. (1856: 323). [Fig. 3R]

Epiphyte. Pseudobulbs 3.5-4.0 ð 1.4-2.0 cm, heteroblastic, ovoid. Leaves, 1 apical and 4 basal, 14.0-42.0 ð 1.5-3.2 cm, narrow-oblong, the apex emarginate. Inflorescence lateral, 1-flowered; peduncle 3.5 cm long; without rachis; floral bracts 2.0 cm long, clasping, the apex acute. Flower yellowish with dark purplish lip; dorsal sepal 1.5 ð 0.4 cm, elliptic, the apex acute; lateral sepals 1.6 ð 0.4 cm, lanceolate, the apex acute; petals 1.4-1.5 ð 0.2 cm, linear-oblanceolate, the apex acute; lip 1.4 ð 0.5 cm, elliptic, obscurely trilobed, dark purplish, margin entire, the apex obtuse, callus 1 on disc, longitudinal, oblong, and 1 on apex, orbicular; column 1.1 cm long, pollinia 4; ovary + pedicel 1.3 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 17.IX.2011, fl., *E. Pessoa et al. 641* (INPA).

Comments: Distributed in northern South America, from French Guyana, Guyana, Suriname, Venezuela, Ecuador, and Peru to Northern Brazil (states of Acre, Amazonas, Maranhão, Mato Grosso, and Pará) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is common and occurs in "*igapó* forest" and "*várzea* forest". It could be confused with *Maxillariella alba* (Hooker) M.A. Blanco & Carnevali, but differs mainly by the yellowish flowers with dark purplish lip.

**39. *Laelia gloriosa*** (Reichenbach f.) L.O. Williams. (1941: 76). ≡ *Schomburgkia gloriosa* Reichenbach f. (1860: 178). [Fig. 3S]

Epiphyte. Pseudobulb 20.0-22.5 ð 2.3-2.5 cm, heteroblastic, fusiform. Leaves 2, apical, 30.0-34.0 ð 3.4-4.2 cm, oblong-elliptic, the apex obtuse. Inflorescence terminal, in a raceme, 8-12-flowered; peduncle 68.0-77.0 cm long; rachis 5.0-6.3 cm long; floral bracts 4.0-4.5 cm long, narrow-lanceolate, the apex acute. Flowers brownish with pinkish-white lip; dorsal sepal 2.0-2.1 ð 0.7-0.8 cm, elliptic to oblong, the apex obtuse; lateral sepals 2.2-2.3 ð 0.7-0.8 cm, elliptic to oblong, the apex obtuse; petals 1.8-2.0 ð 0.7-0.8 cm, elliptic to obolong, the apex obtuse; lip 1.8-1.9 ð 1.0-1.1 cm, trilobed, pinkish-white, lateral lobes 0.2-0.3 ð 0.5-0.6 cm, ovate, the apex acute, central lobe 0.7-0.8 ð 0.6-0.7 cm, oblong, margin entire, the apex rounded, longitudinal ridges on disc; column 1.1-1.2 cm long, adnate on base to the lip; pollinia 8; ovary + pedicel 4.7-5.8 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 22.VIII.2012, st., *E. Pessoa & Melo, A. 975* (INPA).
Additional material: BRAZIL. **Amazonas:** Rio Solimões, Lago Janauacá, 16.VII.1991, fl., *Mori, S. & Gracie, C. 21.729* (INPA, NY).
Comments: Distributed on South America, from French Guyana, Guyana, Suriname, Venezuela, Colombia, Ecuador, to Brazil (widely distributed) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and occurs in "*várzea* forest". It could be confused with *Epidendrum viviparum*, but differs mainly by brownish flowers with the column adnate only at base to the lip.

**40. *Ligeophila jurueneensis*** (Hoehne) Garay (1977: 195). ≡ *Physurus jurueneensis* Hoehne (1910: 30). [Fig. 3T]

Terrestrial. Stem 16.0-29.0 ð 0.1-0.3 cm, cylindrical. Leaves 3-9, distichous along the stem, 2.5-9.0 ð 0.6-1.7 cm, lanceolate, the apex acute. Inflorescence terminal, in a raceme, 9-25-flowered; peduncle 1.5-2.5 cm long; rachis 3.7-10.5 cm long; floral bracts 0.8-0.9 cm long, ovate, the apex acute. Flowers greenish and whitish; dorsal sepal 0.5-0.6 ð 0.2-0.3 cm, ovate-elliptic, the apex rounded to obtuse; lateral sepals 0.5-0.6 ð 0.3 cm, ovate-elliptic, subfalcate, the apex rounded to obtuse; petals 0.45-0.5 ð 0.2 cm,

ovate, the apex rounded to acute; lip 0.7-0.8 ð 0.8-0.9 cm, hypochile orbicular, epichile anchoriform, reflexed, whitish, margin entire, the apex acute, callus 1 on disc, bilobed, spur 0.35-0.5 cm long, cylindrical; column ca. 0.4 cm long; pollinia 2; ovary + pedicel 0.8-0.9 cm long. Fruits 1.0-1.2 ð 0.4-0.5 cm, ellipsoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 17.IX.2011, fl., *E. Pessoa et al. 635* (INPA, UFP); ibid., 17.X.2011, fr., *E. Pessoa et al. 748* (INPA); ibid., 01.VI.2006, fl./fr., *Costa, F.R.C. et al. 1670* (INPA).
Comments: Distributed on South America, from Suriname, Venezuela, Colombia, Ecuador, Bolivia, and Peru to Argentina and Brazil (states of Amapá, Amazonas, Distrito Federal, Mato Grosso, Minas Gerais, Pará, Paraná, Roraima and São Paulo) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó* forest" and "*terra-firme* forest". It could be confused with *Aspigogyne foliosa*, but differs mainly by the lanceolate leaves and the lip with an anchoriform epichile.

**41. *Liparis nervosa*** (Thunberg) Lindley (1830: 26). ≡ *Ophrys nervosa* Thunberg (1784: 814). [Fig. 4A]
Terrestrial. Pseudobulbs 1.2-3.0 ð 0.2-0.4 cm, homoblastic, ellipsoid. Leaves 3-4, distichous along the pseudobulb, 5.0-13.0 ð 1.9-4.5 cm, ovate to elliptic, the apex acute. Inflorescence terminal, in a raceme, 7-16-flowered; peduncle 12.5-30.0 cm long; rachis 5.0-13.0 cm long; floral bracts 0.2-0.6 cm long, lanceolate to ovate, the apex acute. Flowers yellow-purplish; dorsal sepal 0.7-0.8 ð 0.2-0,3 cm, oblong, the apex acute; lateral sepals 0.6-0.65 ð 0.3-0.32 cm, obovate, subfalcate, the apex acute; petals 0.6-0.7 ð 0.1-0.15 cm, linear, the apex acute; lip 0.6-0.65 ð 0.45 cm, obovate, purplish, margin entire, the apex emarginate; callus 2 on base, deltoid; column 0.4-0.5 cm long; pollinia 4; ovary + pedicel 0.5-0.8 cm long. Fruits 1.5-2.0 ð 0.3-0.4 cm, obovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 19.IX.2011, fl., *E. Pessoa et al. 667* (INPA, UFP); ibid., 27.XI.2006, fr., *Carvalho, F.A. et al. 927* (INPA); ibid., 24.VII.2010, fl., *Barbosa, T.D.M. & Costa, S.M. 1316* (INPA).
Comments: Widely distributed on the tropics and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is

rare and found in "*terra-firme* forest". It is easily recognized among the terrestrial plants by the yellow-purplish flowers with emarginate lip.

**42. *Lockhartia viruensis*** Pessoa & Alves (2012: 162). [Fig. 4B]

Epiphyte. Stem 6.0-22.5 ð 0.2-0.3 cm, cylindrical. Leaves 16-48, distichous along the stem, 1.0-1.6 x 0.4-0.5 cm, laterally flattened, imbricate, laterally deltoid, the apex obtuse to rounded. Inflorescence lateral, 1-flowered; peduncle 0.3-0.5 cm long; without rachis; floral bracts 0.2-0.3 cm long, ovate-lanceolate, the acute apex. Flower yellowish with brownish spots; dorsal sepal 0.35-0.4 ð 0.22 cm, ovate-lanceolate, the apex acute; lateral sepals 0.35-0.4 ð 0.22-0.23 cm, ovate-lanceolate, the apex acute; petals 0.4 ð 0.15-0.2 cm, oblong-elliptic, the apex acute; lip 0.4-0.5 ð 0.30-0.35 cm, ovate-pandurate, yellowish with brownish spots, margin entire, the apex obtuse to rounded, callus 1 on the base of the disc, basal portion trapeziform, apical portion oblong; column 0.19-0.22 cm long; pollinia 2; ovary + pedicel 0.8-1.2 cm long. Fruits 1.6 ð 0,4, obovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 12.IX.2010, fl., *E. Pessoa et al. 372* (INPA, NY, UFP); ibid, 17.IX.2011, fl., *E. Pessoa et al.* 638 (INPA); Rio Barauana, 22.IX.2011, fl., *E. Pessoa et al.* 714 (INPA); ibid. 19.X.2011, fl., *E. Pessoa et al.* 767 (INPA); ibid., 27.XI.2006, fr., *Carvalho, F.A. et al.* 931 (INPA).

Comments: Endemic to Brazil (State of Roraima) (Pessoa & Alves 2012). In the studied area, it is common and found in "*igapó* forest", "*várzea* forest" and "*terra-firme* forest". It is easily recognized by laterally flattened imbricate leaves, and 1-flowered inflorescences with yellowish flower.

**43. *Lophiaris nana*** (Lindley) Braem (1993: 19). ≡ *Oncidium nanum* Lindl. (1842: 37). [Fig. 4C]

Epiphyte. Pseudobulbs 0.3-0.4 ð 0.25-0.4 cm, heteroblastic, cyllindrical. Leaves1, apical, 5.8-10.2 ð 2.2-3.0 cm, oblanceolate, the apex acute. Inflorescence lateral, raceme, 7-8-flowered; peduncle 6.0-6.5 cm long; rachis 1.5-3.0 cm long; floral bracts 0.2-0.4 cm long, lanceolate, the apex acute. Flowers yellowish with brownish spots; dorsal sepal 0.6-0.65 ð 0.35-0.4 cm, obovate, the apex obtuse; lateral sepals 0.7-0.75 ð

0.2-0.35 cm, elliptic to oblanceolate, the apex obtuse; petals 0.55-0.6 ð 0.3 cm, obovate, the apex rounded; lip 0.5-0.6 ð 0.6 cm, obovate, yellowish with a brownish central part, margin entire, the apex bilobed, callus 1 on disc, oblong-ovate; column ca. 0.3 cm long; pollinia 2; ovary + pedicel 0.5-0.6 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 20.IX.2011, fl., *E. Pessoa et al. 692* (INPA).

Comments: Distributed on South America, from French Guyana, Guyana, Venezuela, Colombia, Bolivia, Ecuador, and Peru to Brazil (states of Amazonas, Maranhão, Mato Grosso, Mato Grosso do Sul, Pará, Rondônia, Roraima, and Tocantins) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "terra-firme forest". It could be confused with *Trichocentrum recurvum* Lindley, but differs mainly by oblanceolate leaves and flowers without spur.

**44. *Macradenia lutescens*** R. Brown (1822: 612). [Fig. 4D]

Epiphyte. Pseudobulbs 1.0-6.0 ð 0.2-1.3 cm, heteroblastic, cyllindrical. Leaves 1, apical, 4.5-20.0 ð 1.2-3.5 cm, elliptic, the apex acute. Inflorescence lateral, in a raceme, 2-26-flowered; peduncle 1.5-5.5 cm long; rachis 1.2-11.5 cm long; floral bracts 0.2-0.6 cm long, deltoid, the apex acuminate. Flowers yellowish-brown; dorsal sepal 1.4-1.9 ð 0.5-0.6 cm, elliptic, the apex acute; lateral sepals 1.3-1.8 ð 0.35-0.4 cm, elliptic, the apex acute; petals 1.1-1.2 ð 0.3-0.35 cm, elliptic, the apex acute; lip 1.0-1.1 ð 0.7-0.75 cm, trilobed, whitish with purplish lines, lateral lobes 0.3-0.35 ð 0.5-0.55 cm, suborbicular, the apex rounded, central lobe 0.4-0.5 ð 0.1-0.15 cm, linear, curved, margin entire, the apex acute, 3 ridges on disc; column 0.8-0.9 cm long; pollinia 2; ovary + pedicel 0.9-1.0 cm long. Fruits 3.2-4.0 ð 0.5-0.7 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 20.IX.2011, fl./fr., *E. Pessoa et al. 687* (INPA, SP, UFP); Rio Anauá, 24.VIII.2012, fr., *Pessoa, E & Melo, A. 993* (INPA).

Comments: Widely distributed on Neotropics and also in Brazil (states of Acre, Amapá, Amazonas, Pará, Rondônia, Roraima, and Tocantins) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and occurs in "*várzea* forest". It is easily recognized by the yellowish-brown flowers and the lip with curved with a linear central lobe.

**45. *Maxillariella alba*** (Hooker) M.A. Blanco & Carnevali (2007: 528). ≡ *Dendrobium album* Hooker (1825: 142). [Fig. 4E-F]

Epiphyte. Pseudobulbs 2.8-4.0 ð 1.0-2.0 cm, heteroblastic, obovoid. Leaves, 1 apical and 1-2 basal, 20.0-37.5 ð 0.8-1.4 cm, linear-elliptc, the apex minutely retuse. Inflorescence lateral, 1-flowered; peduncle 2.5-4.0 cm long; without rachis; floral bracts 1.7-1.9 cm long, clasping, the apex acute. Flower whitish; dorsal sepal 1.6-1.7 ð 0.4-0.6 cm, lanceolate, the apex acute; lateral sepals 1.6-1.8 ð 0.3-0.4 cm, lanceolate, the apex acute; petals 1.3-1.5 ð 0.3-0.5 cm, lanceolate, the apex acute; lip 1.1-1.3 ð 0.4-0.5 cm, lanceoate, obscurely trilobed, whitish, margin entire, the apex obtuse, callus 1 on disc, longitudinal, oblong; column 0.7-0.8 cm long, pollinia 2; ovary + pedicel 2.3-2.5 cm long. Fruits 2.2-2.8 ð 0.3-0.5, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 23.VIII.2012, fl./fr., *E. Pessoa & Melo, A. 990* (INPA, NY, SP, UFP).
Comments: Widely distributed in the Neotropics including Brazil (states of Amazonas, Goiás, Maranhão, Mato Grosso, and Pará) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and found in "*várzea* forest". It could be confused with *Camaridium ochroleucum*, but differs mainly by having 1 apical leaf, and the lip with vestigial lateral lobes.

46. ***Nohawilliamsia pirarensis*** (Reichenbach f.) M.W.Chase & Whitten (2009: 555). ≡ *Oncidium pirarense* Reichenbach f. (1849: 846). [Fig. 4G]

Epiphyte or terrestrial. Pseudobulbs 6.5-9.0 ð 1.0-1.5 cm, heteroblastic, ellipsoid. Leaves, 1 apical and 1 basal, 13.5-35.0 ð 1.2-2.0 cm, elliptic, the apex acute. Inflorescence lateral, in a raceme, 3-13-flowered; peduncle 60.0-100.5 cm long; rachis 3.5-15.0 cm long; floral bracts 0.3-0.4 cm long, lanceolate, the apex acute. Flowers yellowish with brown; dorsal sepal 0.9-1.1 ð 0.4-0.6 cm, oblanceolate, the apex obtuse; lateral sepals 1.1-1.2 ð 0.4-0.5 cm, elliptic, the apex obtuse; petals 0.9-1.2 ð 0.4-0.5 cm, elliptic, the apex obtuse; lip 1.9-2.3 ð 2.2-2.5 cm, ovate, trilobed, yellowish, lateral lobes 0.5-0.7 ð 0.3-0.5 cm, oblong, the apex rounded, central lobe 1.2-1.8 ð 1.6-2.5

cm, obovate, margin entire, the apex deeply emarginate, callus 1 on base, triangular; column 0.6-0.8 cm long; pollinia 2; ovary + pedicel 1.2-1.6 cm long. Fruits 3.5-4.0 ð 1.3-1.5, ellipsoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 13.IX.2010, fl., *E. Pessoa et al. 375* (INPA); ibid., 17.X.2011, fl., *E. Pessoa et al. 746* (INPA); ibid., 26.VIII.2012, fl./fr., *E. Pessoa et al. 1005* (INPA, UFP).
Comments: Distributed in northern South America, from Guyana and Venezuela to Northern Brazil (states of Amazonas and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*campinaranas*", where grows on the base of shrubs or treelets. It could be confused with *Cohniella cebolleta*, but differs mainly by the leaves not cylindrical and the pseudobulbs larger ellipsoid.

**47. *Notylia angustifolia*** Cogniaux (1910: 618). [Fig. 4H]

Epiphyte. Pseudobulbs 0.6-1.3 ð 0.3-0.5 cm, heteroblastic, ellipsoid. Leaves, 1 apical and 2 basal, 1.6-4.8 ð 0.4-1.0 cm, oblong-elliptic, the apex minutely tri-denticulate. Inflorescence lateral, in a raceme, 14-22-flowered; peduncle 1.3-3.2 cm long; rachis 2.0-3.1 cm long; floral bracts 0.15-0.22 cm long, lanceolate, the apex acute. Flowers whitish-green; dorsal sepal 0.4-0.5 ð 0.2 cm, narrow-elliptic, the apex acute; lateral sepals 0.4-0.45 ð 0.15 cm, narrow-elliptic, the apex acute, connate at the base to the middle; petals 0.45 ð 0.15 cm, narrow-elliptic, the apex acute; lip 0.35-0.4 ð 0.25 cm, clawed, deltoid, whitish, margin entire, the apex acute; column 0.2-0.3 cm long; pollinia 2; ovary + pedicel 0.3-0.4 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 23.VII.2010, fl., *E. Pessoa et al. 342* (INPA); ibid., 19.X.2011, fl., *E. Pessoa et al. 773* (INPA); Grade PPBio, 19.IX.2011, fl., *E. Pessoa et al. 672* (UFP); Rio Anauá, 30.XI.2011, fl., *E. Pessoa et al. 864* (INPA).
Comments: Distributed in Trinidad & Tobago, French Guyana, Venezuela and recently known to Brazil (state of Roraima) (Govaerts *et al.* 2012, Pessoa *et al. in press.*). In the studied area, it is common and occurs in "*igapó* forest" and "*várzea* forest". It is easily recognized by the distinctive morphology of the flowers, as lateral sepals connate from the base to the middle, and the clawed, deltoid lip.

**48. *Ornithocephalus ciliatus*** Lindley (1840: 383). [Fig. 4I]

Epiphyte. Stem 1.3-2.0 ð 0.3-0.4 cm, cylindrical. Leaves 10-19, distichous along the stem, 2.5-9.0 ð 0.6-1.2 cm, laterally flattened, imbricate, flabellate, laterally ensiform, the apex acute. Inflorescence lateral, in a raceme, 10-18-flowered; peduncle 1.0-2.2 cm long; rachis 3.5-7.0 cm long; floral bracts 0.1-0.4 cm long, ovate, the apex acute. Flower whitish with green lines; dorsal sepal 0.2-0.25 ð 0.08-0.12 cm, obovate, the apex rounded; lateral sepals 0.15-0.2 ð 0.07-0.1 cm, obovate, the apex rounded; petals 0.2-0.3 ð 0.2 cm, obovate, the apex rounded; lip 0.4-0.45 ð 0.20-0.3 cm, subpandurate, whitish with green lines, yellowish to green disc, margin entire, the apex apiculate, callus 1, on the first middle of lip, discoid; column 0.15-0.2 cm long; pollinia 4; ovary + pedicel 0.3-0.4 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 25.VII.2010. fl., *E. Pessoa et al. 348* (INPA); ibid, 19.X.2010, fl., *E. Pessoa et al. 772* (INPA, UFP).

Comments: Distributed in northern South America, from Trinidad & Tobago, French Guyana, Guyana, Suriname, Venezuela, Ecuador, and Peru to Brazil (states of Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*várzea* forest". It is easily recognized by the laterally flattened and imbricate leaves, and the multi-flowered inflorescence.

**49. *Otostylis brachystalix*** (Reichenbach f.) Schlechter. (1918: 40). ≡ *Zygopetalum rachystalix* Rchb.f. (1863: 660). [Fig. 4J]

Epiphyte. Pseudobulbs 2.0-4.0 ð 1.5-2.0 cm, homoblastic, ovoid. Leaves 4-7, distichous along the pseudobulbs, 15.0-40.0 ð 1.0-1.7 cm, narrow-elliptic, the apex acute. Inflorescence lateral, in a raceme or panicle, 11-15-flowered; peduncle 50.0-70.5 cm long; rachis 16.0-24.5 cm long; floral bracts 0.3-0.45 cm long, deltoid, the apex acute. Flowers green-whitish; dorsal sepal 1.3-1.4 ð 0.7 cm, wide elliptic, the apex obtuse; lateral sepals 1.25-1.3 ð 0.8 cm, wide-elliptic to ovate, the apex acute; petals 1.1-1.2 ð 0.6-0.7 cm, wide-elliptic, the apex acute; lip 0.8-0.9 ð 0.8-0.9 cm, clawed,

cuneate, green-whitish with small purple spots, margin entire, the apex obtuse; column 0.4-0.5 cm long; pollinia 4; ovary + pedicel 0.5-0.65 cm long. Frutos not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 17.X.2011, fl., *E. Pessoa et al. 750* (INPA).

Comments: Distributed in northern South America, from Trinidad & Tobago, Guyana, Venezuela, Colombia, and Peru to Brazil (state of Pará) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and found in "*igapó* forest". It is easily recognized by the homoblastic pseudobulbs and the flowers with clawed lip.

**50. *Pabstiella yauaperyensis*** (Barbosa Rodrigues) F. Barros (2002: 296). ≡ *Lepanthes yauaperyensis* Barbosa Rodrigues (1891: 117). [Fig. 4K]

Epiphyte. Cauloma 1.2-1.8 ð 0.1 cm, cylindrical. Leaves 1, apical, 1.6-6.2 ð 0.6-1.5 cm, obovate to oblanceolate, the apex minutely tridenticulate. Inflorescence terminal, in a raceme, 1-7-flowered; peduncle 2.0-5.0 cm long; rachis 1.0-7.0 cm long; floral bracts 0.15-0.2 cm long, clasping, the apex acute. Flowers brownish; dorsal sepal 0.7-0.85 ð 0.25-0.35 cm, elliptic, the apex acute; lateral sepals 0.7-0.9 ð 0.25-0.35 cm, lanceolate, the apex acute, connate up to the apex, adnate to the column foot forming a small mentum; petals 0.35-0.4 ð 0.1-0.18 cm, oblong-elliptic, the apex rounded; lip 0.6 ð 0.3-0.32 cm, cuneate, pinkish, margin entire, the apex truncate; column 0.3-0.45 cm long; pollinia 2; ovary + pedicel 0.3-0.45 cm long. Fruits 0.85-0.9 ð 0.3 cm, obovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 27.VII.2010, fl., *E. Pessoa et al. 361* (INPA, SP, UFP); ibid., 15.IX.2010, fl., *E. Pessoa et al. 382* (INPA, UFP); ibid., 21.IX.2011, fl./fr., *E. Pessoa et al. 695* (INPA, UFP); ibid., 19.X.2011, fl., *E. Pessoa et al. 768* (INPA).

Comments: Distributed on South America, from Venezuela, Ecuador, Peru, and Bolivia to Northern Brazil (states of Acre, Amazonas, Pará, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common but occurs only in "*várzea* forest". It could be confused with *Acianthera fockei*, but differs mainly by the cuneiform lip with truncate apex.

**51. *Pleurothallis pruinosa*** Lindley (1842: 75-76). [Fig. 4L]

Epiphyte. Cauloma 0.9-2.5 ð 0.1 cm, cylindrical. Leaves 1, apical, 1.8-2.4 ð 0.55-0.7 cm, lanceolate, the apex minutely tridenticulate. Inflorescence terminal, in a raceme, 1-4-flowered; peduncle 2.0-2.5 cm long; rachis 0.2-1.2 cm long; floral bracts 0.15-0.2 cm long, clasping, the apex acute. Flowers cream; dorsal sepal 0.28-0.3 ð 0.15-0.2 cm, ovate, theapex acute; lateral sepals 0.25-0.3 ð 0.1 cm, lanceolate, the apex acute, completely connate; petals 0.2-0.22 ð 0.03-0.05 cm, linear-falcate, the apex acute; lip 0.12-0.15 ð 0.1-0.12 cm, wide-elliptic to ovate, creamish, margin entire, the apex obtuse; column ca. 0.1 cm long; pollinia 2; ovary + pedicel 0.11-0.15 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, fl., *E. Pessoa et al. 845* (INPA).

Comments: Distributed on Central America, South America and Caribe, from Costa Rica, Honduras, Panama, Cuba, Jamaica, Trinidad & Tobago, French Guyana, Guyana, Suriname, Venezuela, Colombia, Ecuador, and Peru to Brazil (states of Amapá, Amazonas, Maranhão, Pará, and Pernambuco) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and found in "*várzea* forest". It could be confused with *Acianthera fockei* and *Acianthera miqueliana*, but differs mainly by having completely connate lateral sepals.

52. ***Polystachya concreta*** (Jacquin) Garay & H.R.Sweet (1974: 206). ≡ *Epidendrum concretum* Jacquin (1760: 30). [Fig. 4M]

Epiphyte. Pseudobulbs 0.5-0.7 ð 0.5-0.8 cm, homoblastic, ovoid. Leaves 3-4, distichous along the pseudobulb, 5.0-11.0 ð 1.3-1.5 cm, elliptic, the apex retuse. Inflorescence terminal, in a panicle, 35-52-flowered; peduncle 8.3-10.0 cm long; rachis 15.0-17.5 cm long; floral bracts 0.1-0.15 cm long, deltoid, the apex acuminate. Flowers yellowish; dorsal sepal 0.35-0.4 ð 0.2 cm, ovate, the apex acute; lateral sepals 0.35-0.4 ð 0,25-0.3 cm, ovate, the apex acute; petals 0.3-0.35 ð 0.06-0.08 cm, linear, the apex acute; lip 0.35-0.4 ð 0.3-0.35 cm, ovate, trilobed, yellowish, lateral lobes 0.08-0.1 ð 0.15-0.18 cm, ovate, the apex obtuse to rounded, central lobe 0.28-0.3 ð 0.15-0.2 cm,

oblong, margin entire, the apex cuspidate, callus 1 on base, oblong, farinose; column ca. 0.2 cm long; pollinia 2; ovary + pedicel 0.4-0.5 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 21.IX.2011, fl., *E. Pessoa et al. 699* (INPA).

Comments: Widely distributed in the tropics and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*várzea* forest". It could be confused with *Polystachya foliosa* (Hooker) Reichenbach f., but differs mainly by the longer perianth, and the lip with cuspidate apex.

**53. *Polystachya foliosa*** (Hooker) Reichenbach f. (1863: 640). ≡ *Stelis foliosa* Hooker (1839: 330). [Fig. 4N]

Epiphyte. Pseudobulbs 0.5-1.0 ð 0.3-0.4 cm, homoblastic, ovoid. Leaves 2-4, distichous along the pseudobulb, 3.0-13.0 ð 0.4-1.5 cm, narrow-elliptic to narrow-oblanceolate, the apex emarginate. Inflorescence terminal, in a raceme or panicle, 8-60-flowered; peduncle 3.6-16.0 cm long; rachis 1.0-16.0 cm long; floral bracts 0.1-0.2 cm long, deltoid, the apex acuminate. Flowers yellowish; dorsal sepal 0.2-0.25 ð 0.15 cm, ovate, the apex acute; lateral sepals 0.15-0.2 ð 0.05 cm, ovate, the apex acute; petals 0.17-0.2 ð 0.05 cm, linear, the apex rounded; lip 0.2-0.3 ð 0.22 cm, ovate, trilobed, yellowish, lateral lobes 0.05-0.1 x 0.08-0.1 cm, ovate, the apex obtuse to rounded, central lobe 0.1-0.12 ð 0.1-0.15 cm, oblong, margin entire, the apex emarginate, callus 1 on base, oval, plane, farinose; column ca. 0.15 cm long; pollinia 2; ovary + pedicel 0.25-0.4 cm long. Fruits 0.9-1.2 ð 0.15-0.2 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 27.VII.2010, fl., *E. Pessoa et al. 359* (INPA); Grade PPBio, 19.IX.2011, fl./fr., *E. Pessoa et al. 668* (INPA, UFP, SP); Estrada perdida, 27.XI.2006, fr., *Carvalho, F.A. et al. 967* (INPA); Rio Anauá, 21.VIII.2012, fl./fr., *E. Pessoa & Melo, A. 966* (INPA, SP, UFP); Rio Iruá, 23.VIII.2012, fl./fr., *E. Pessoa & Melo, A. 985* (INPA, UFP).

Comments: Widely distributed on Neotropic and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó* forest",

"*várzea* forest" and "*terra-firme* forest". It could be confused with *Polystachya concreta*, but differs mainly by the shorter perianth, and the lip with emarginate apex.

**54. *Polystachya stenophylla*** Schlechter. (1925: 113). [Fig. 5A]

Epiphyte. Pseudobulbs 0.3-0.5 ð 0.25-0.35 cm, homoblastic, ovoid. Leaves 2-3, distichous along the pseudobulb, 3.5-8.0 ð 0.1-0.2 cm, linear, the apex emarginate. Inflorescence terminal, in a raceme or panicle, 8-11-flowered; peduncle 2.0-3.6 cm long; rachis 0.6-1.0 cm long; floral bracts 0.05-0.1 cm long, deltoid, the apex acute. Flowers greenish; dorsal sepal 0.2-0.21 ð 0.12 cm, elliptic-ovate, the apex acute; lateral sepals 0.19-0.2 ð 0.13-0.15 cm, ovate, the apex acute; petals 0.19-0.2 ð 0.02-0.03 cm, linear, the apex obtuse; lip 0.15-0.17 ð 0.20-0.22 cm, ovate, trilobed, greenish, lateral lobes 0.07-0.08 ð 0.08-0.1 cm, obovate, the apex obtuse, central lobe 0.05-0.06 ð 0.05 cm, oblong, margin entire, wrinkly, the apex rounded, callus 1 on base, oval, plane, farinose; column ca. 0.1 cm long; pollinia 2; ovary + pedicel 0.15-0.25 cm long. Fruits 0.5-0.6 ð 0.15-0.2 cm, fusiform.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 19.IX.2011, fl./fr., *E. Pessoa et al. 673* (INPA).

Comments: Distributed in northern South America, from French Guyana, Guyana, Suriname, Venezuela, Ecuador, and Peru to Northern Brazil (states of Amazonas, Maranhão, Pará, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and occurs in "*terra-firme* forest". It could be confused with *Polystachya foliosa*, but differs mainly by the lateral lobes of lip longer than the central one and the linear leaves.

**55. *Prosthechea fragrans*** (Swartz) W.E. Higgins (1998: 377). ≡ *Epidendrum fragrans* Sw. (1788: 123). [Fig. 5B]

Epiphyte. Pseudobulbs 4.2-5.5 ð 0.7-1.1 cm, heteroblastic, narrow-ellipsoid. Leaves 1, apical, 15.5-16.0 ð 2.2-2.3 cm, elliptic, the apex obtuse. Inflorescence terminal, in a raceme, 3-4-flowered; peduncle 3.5-4.0 cm long; rachis 1.7-2.2 cm long; floral bracts 0.2 cm long, deltoid, the apex acute. Flowers whitish with purple lines; dorsal sepal 1.7-2.1 ð 0.25-0.3 cm, elliptic, the apex acuminate; lateral sepals 2.0-2.1 ð 0.3-0.4 cm,

lanceolate, theapex acuminate; petals 1.6-1.7 ð 0.4-0.5 cm, oblanceolate to elliptic, the apex acuminate; lip 1.2-1.3 ð 1.0-1.2 cm, ovate, whitish with purplish lines, margin entire, the apex acuminate, callus 1 on base, discoid; column 0.5 cm long, adnate to the middle to the lip; pollinia 4; ovary + pedicel 0.9-1.0 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 21.IX.2011, fl., *E. Pessoa et al. 705* (INPA).

Comments: Widely distributed on Neotropics and also in Brazil (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and found in "*várzea* forest". It could be confused with *Prosthechea vespa* (Vellozo) W.E. Higgins, but differs mainly by the longer lip with acuminate apex.

**56. *Prosthechea vespa*** (Vellozo) W.E. Higgins (1998: 381). ≡ *Epidendrum vespa* Vellozo (1831: 27). [Fig. 5C]

Epiphyte. Pseudobulbs 4.0-14.0 ð 1.4-3.4 cm, heteroblastic, ellipsoid. Leaves 1-2, apical, 13.5-27.0 ð 2.5-4.5 cm, elliptic, the apex obtuse. Inflorescence terminal, in a raceme, 7-18-flowered; peduncle 5.0-11.0 cm long; rachis 7.0-12.5 cm long; floral bracts 0.2-0.3 cm long, deltoid, the apex acute. Flowers yellowish to green-yellowish with brownish spots; dorsal sepal 1.1-1.2 ð 0.4-0.45 cm, oblong-elliptic, the apex acute; lateral sepals 1.0-1.1 ð 0.3-0.45 cm, oblong-elliptic, the apex acute; petals 1.0-1.1 ð 0.35-0.4 cm, oblanceolate, the apex acute; lip 0.7-0.8 ð 0.6-0.7 cm, obtrullate, whitish with purplish lines, margin entire, the apex acute to obtuse, callus 1 on base, discoid; column 0.7-0.8 cm long, adnate to the middle to the lip; pollinias 4; ovary + pedicel 1.0-1.6 cm long. Fruits 2.6-3.0 ð 2.7-3.0 cm, globose, winged.

Examined Material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 26.VII.2010, fl., *E. Pessoa et al. 358* (INPA, SP, UFP); Rio Anauá, 29.XI.2011, fl., *Pessoa E. & Vasconcelos*, S. 860 (INPA); ibid, 22.VIII.2012, fr., *E. Pessoa & Melo, A. 970* (INPA); Rio Iruá, 23.VIII.2012, fl., *E. Pessoa & Melo, A. 983* (INPA, UFP).

Comments: Distributed on Central and South America, from Costa Rica, French Guyana, Guyana, Suriname, Venezuela, Colombia, Ecuador, Peru, and Bolivia to Brazil (states of Acre, Amazonas, Goiás, Mato Grosso do Sul, Minas Gerais, Pará,

Pernambuco, Rio de Janeiro, and Roraima) (Carnevali *et al.* 2003, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó* forest", "*várzea* forest" and "*terra-firme* forest". It could be confused with *Prosthechea fragrans*, but differs mainly by shorter lip with acute to obtuse apex.

**57. *Quekettia microscopica*** Lindley (1939: 3). [Fig. 5D]

Epiphyte. Pseudobulbs 0.6-0.9 ð 0.2-0.3 cm, heteroblastic, cylindrical to ellipsoid. Leaves 1, apical, 4.0-11.0 ð 0.2-0.3 cm, cylindrical, the apex acute. Inflorescence lateral, in a panicle, 40-50-flowered; peduncle 9.0 cm long; rachis 1.0-4.0 cm long; floral bracts 0.1-0.15 cm long, ovate, the apex acute. Flowers yellowish; dorsal sepal 0.38-0.4 ð 0.11 cm, elliptic, the apex acute; lateral sepals 0.4-0.5 ð 0.1 cm, narrow-elliptic, the apex acute, connate up to the 2/3; petals 0.3-0.35 ð 0.1 cm, oblong-elliptic, the apex acute; lip 0.35 ð 0.2-0.25 cm, obovate to elliptic, yellowish, margin entire, the apex acute to obtuse; column 0.3 cm long; pollinia 2; ovary + pedicel 0.17-0.2 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 21.IX.2011, fl., *E. Pessoa et al. 707* (UFP); Rio Anauá, 21.VIII.2012, st., *E. Pessoa & Melo, A. 965* (INPA).

Comments: Distributed in northern South America, from French Guyana, Guyana, Suriname, and Venezuela to Northern Brazil (states of Amazonas, Maranhão, Pará, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*várzea* forest". It could be confused with other local species with cylindrical leaves, but differs mainly by smaller and yellowish flowers with an obovate to elliptic lip.

**58. *Sarcoglottis amazonica*** Pabst (1969:1). [Fig. 5E]

Terrestrial. Stem inconspicuous. Leaves 3-5, rosulate, 13.5-17.5 ð 3.5-7.5 cm, oblanceolate to elliptic, the apex acute to obtuse. Inflorescence terminal, in a raceme, 2-5-flowered; peduncle 24.0-28.5 cm long; rachis 3.5-8.5 cm long; floral bracts 2.5-3.2 cm long, lanceolate, the apex acute. Flowers greenish; dorsal sepal 1.7-2.5 ð 0.3-0.4 cm, elliptic, the apex acute; lateral sepals 4.5-5.0 ð 0.5-0.6 cm, oblanceolate, falcate,

the apex acute, connate on base; petals 1.7-2.3 ð 0.2-0.3 cm, narrow-oblanceolate, the apex acute; lip 4.0-4.3 ð 0.7-0.8 cm, oblanceolate, greenish, margin entire, the apex obtuse, two basal appendages; column 1.3-1.4 cm long; pollinia 2; ovary + pedicel 2.5-2.8 cm long. Fruits 3.0-3.2 ð 0.8-1.0 cm, ellipsoid .

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 20.X.2011, fl./fr., *E. Pessoa et al. 778* (INPA, UFP).

Comments: Distributed in northern South America, from French Guyana and Suriname to Northern Brazil (state of Amazonas) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and found in "*várzea* forest". It is easily recognized among the terrestrial plants by the inconspicuous stem and the flowers with two basal appendages on lip.

**59. *Scaphyglottis sickii*** Pabst (1956: 7). [Fig. 5F]

Epiphyte. Pseudobulbs 1.5-8.0 ð 0.1-0.3 cm, heteroblastic, cylindrical-fusiform, superposed. Leaves 2, apical, 1.7-6.5 ð 0.3-0.7 cm, narrow-oblong, the apex emarginate. Inflorescence terminal, in a fascicle, 1-4-flowered; peduncle inconspicuous; rachis 0.1-0.15 cm long; floral bracts 0.3-0.5 cm long, laneolate, the apex acute. Flowers whitish; dorsal sepal 0.2-0.3 ð 0.05-0.1 cm, oblanceolate to oblong, the apex acute; lateral sepals 0.2-0.3 ð 0.05-0.1 cm, oblanceolate to oblong, the apex acute, connate up to the middle; petals 0.2-0.3 ð 0.03-0.05 cm, linear, the apex acute; lip 0.2-0.3 ð 0.1-0.15 cm, obovate to wide-elliptic, clawed, whitish, margin entire, the apex acute; column ca. 0.1 cm long; pollinia 4; ovary + pedicel 0.25-0.3 cm long. Fruits 0.4-0.5 ð 0.15-0.25 cm, ovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 02.XII.2006, fl./fr., *Carvalho, F.A. et al. 1085* (INPA); ibid, 26.VII.2010, fl./fr., *E. Pessoa et al. 354* (INPA, UFP, SP); ibid, 12.IX.2010, fl./fr., *E. Pessoa et al. 367* (INPA, UFP); Grade PPBio, 19.IX.2011, fr., *E. Pessoa et al. 669* (INPA, UFP); Rio Anauá, 29.XI.2011, fr., *E. Pessoa & Vasconcelos, S. 857* (INPA, UFP).

Comments: Distributed in northern South America and Caribe, from Trinidad & Tobago, West Indies, French Guyana, Guyana, Suriname, Venezuela, Colombia, Ecuador, and Peru to Brazil (states of Alagoas, Amapá, Amazonas, Maranhão, Mato

Grosso, Pará, Pernambuco, Roraima, and Sergipe) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is common and occurs in "*igapó* forest", "*várzea* forest" and "*terra-firme* forest". It is easily recognized by the superposed pseudobulbs.

**60. *Solenidium lunatum*** (Lindley) Schlechter. (1914: 525). ≡ *Oncidium lunatum* Lindley (1837: 1929). [Fig. 5G]

Epiphyte. Pseudobulbs 3.6-4.5 ð 1.2-2.2 cm, heteroblastic, ellipsoid. Leaves, 1 apical and 1 basal, 3.0-11.0 ð 0.9-2.5 cm, oblong-elliptic, the apex acute. Inflorescence lateral, in a raceme, 11-26-flowered; peduncle 6.2-9.0 cm long; rachis 5.8-18.5 cm long; floral bracts 0.5-1.0 cm long, lanceolate, the apex acute. Flowers yellowish-brown; dorsal sepal 0.8-0.9 ð 0.3 cm, oblanceolate, the apex obtuse; lateral sepals 0.9-1.1 ð 0.3 cm, oblanceolate, the apex acute to obtuse; petals 0.8-0.9 ð 0.25-0.3 cm, oblanceolate, the apex obtuse; lip 0.8-0.9 ð 0.5-0.6 cm, clawed, suborbicular to sub-deltoid, whitish with red spots, margin entire, the apex rounded to obtuse; column 0.5-063 cm long; pollinia 2; ovary + pedicel 1.4-1.5 cm long. Fruits 3.5-3.6 ð 0.9-1.0 cm, ellipsoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Anauá, 30.XI.2011, fr., *E. Pessoa & Vasconcelos, S. 865* (INPA).
Additional material: BRAZIL. Roraima: Mucajaí, Rio Mucajaí, 14.III.1971, fl., *Prance, G. et al. 11.000* (INPA).
Comments: Distributed in northern South America, from Guyana, Venezuela, Ecuador, and Peru to Brazil (states of Goias, Maranhão, Mato Grosso, Pará, Rondônia, and Roraima) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*várzea* forest". It could be confused when sterile, with *Aspasia variegata*, but in flower differs mainly by the free clawed lip.

**61. *Trichocentrum recurvum*** Lindley (1843: 9). [Fig. 5H]

Epiphyte. Pseudobulbs 0.2-0.5 ð 0.2-0.25 cm, heteroblastic, globose to ellipsoid. Leaves 1, apical, 4.0-6.2 ð 1.0-1.9 cm, elliptic, the apex acute. Inflorescence lateral, in a raceme, 1-2-flowered; peduncle 1.0-1.2 cm long; rachis 0.3-0.6 cm long; floral bracts 0.3-0.5 cm long, deltoid to lanceolate, the apex acute. Flowers whitish with a purplish

spot; dorsal sepal 0.8-0.9 ð 0.3-0.4 cm, elliptic, the apex acuminate; lateral sepals 1.0-1.1 ð 0.4 cm, elliptic-falcate, the apex acute; petals 0.65-0.8 ð 0.4 cm, elliptic, the apex obtuse; lip 0.9 ð 0.7 cm, obovate, withish with a purple spot, margin undulate, the apex retuse, callus 2 on base, keels, spur 0.9-1.2 cm long, cylindrical, recurved; column ca. 0.5 cm long; pollinia 2; ovary + pedicel 1.0-1.2 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Grade PPBio, 18.IX.2011, fl., *E. Pessoa et al. 655* (INPA, UFP).
Comments: Distributed from Guyana and Suriname and recently known expanding to Brazil (state of Roraima) (Govaerts *et al.* 2012, Pessoa *et al. in press*.). In the studied area, it is common and occurs in "*várzea* forest" and "*terra-firme* forest". It could be confused with *Lophiaris nana*, but differs mainly by the elliptic leaves and the flowers with spur.

**62. *Trichosalpinx egleri*** (Pabst) Luer (1983: 395). ≡ *Pleurothallis egleri* Pabst (1964: 14). [Fig. 5I]

Epiphyte. Cauloma 1.5-5.0 ð 0.1-0.2 cm, cylindrical. Leaves 1, apical, 2.0-4.5 ð 0.9-1.3 cm, elliptic to wide-elliptic, the apex minutely tridenticulate. Inflorescence terminal, in a raceme, 5-8-flowered; peduncle 1.0-1.4 cm long; rachis 0.4-1.2 cm long; floral bracts ca. 0.1 cm long, infundibuliform, the apex acute. Flowers violet; dorsal sepal 0.35-0.37 ð 0.13-0.15 cm, oblong, the apex obtuse; lateral sepals 0.28-0.3 ð 0.08-0.1 cm, lanceolate, the apex acute, connate up to the second third, adnate to the column foot forming a small mentum; petals 0.2-0.22 ð 0.04-0.05 cm, falcate, the apex acute; lip 0.25-0.27 ð 0.6-0.8 cm, oblong, violet, margin ciliate, the base with 2 appendages, the apex rounded; column 0.17-0.2 cm long; pollinia 2; ovary + pedicel 0.12-0.15 cm long. Fruits 0.3-0.4 ð 0.2 cm, obovoid.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 15.IX.2010, fl., *E. Pessoa et al. 384* (INPA, UFP, SP); ibid., 21.IX.2011, fl., *E. Pessoa et al. 694* (INPA, UFP, SP); Rio Anauá, 28.XI.2011, fl., *E. Pessoa & Vasconcelos, S. 843* (INPA, UFP); ibid., 23.VIII.2012, fl., *E. Pessoa & Melo, A. 988* (INPA).

Comments: Distributed on South America, from French Guyana, Guyana, Suriname, Venezuela, and Bolívia to Northern Brazil (states of Acre and Pará) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is common and found in "*várzea* forest". It could be confused with *Acianthera fockei*, but differs mainly by the oblong lip with rounded apex and ciliate margin.

**63. *Trigonidium acuminatum*** Bateman *ex* Lindley (1838: 74). [Fig. 5J]

Epiphyte. Pseudobulbs 1.7-4.0 ð 0.4-2.0 cm, heteroblastic, ovoid. Leaves 1, apical, 13.5-28.0 ð 0.5-1.0 cm, linear-oblong, the apex acute. Inflorescence lateral, 1-flowered; peduncle 6.5-8.0 cm long; rachis inconspicuous; floral bracts 2.5-2.8 cm long, lanceolate, the apex acute. Flower yellowish with brownish lines; dorsal sepal 1.7-2.3 ð 0.2-0.5 cm, elliptic, the apex acute to acuminate; lateral sepals 1.6-2.4 ð 0.4-0.8 cm, wide-elliptic, reflexed, the apex acuminate; petals 0.8-1.0 ð 0.15-0.3 cm, elliptic, the apex cuspidate; lip 0.5-0.6 ð 0.2-0.25 cm, trilobed, brown-yellowish, lateral lobes 0.1-0.15 ð 0.05 cm, deltoid, the apex obtuse, central lobe 0.15-0.2 ð 0.1-0.15 cm, ovate, margin entire, the apex acute, callus 1 on disc, obovoid; column 0.35-0.4 cm long, pollinia 4; ovary + pedicel 2.8-3.0 cm long. Fruits not observed.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 27.IX.2011, fl., *E. Pessoa et al. 703* (INPA, UFP).
Comments: Distributed on South America, from French Guyana, Guyana, Suriname, Venezuela, Colombia, Ecuador, and Peru to Brazil (states of Acre, Alagoas, Amazonas, Distrito Federal, Goiás, Maranhão, Pará, Pernambuco, Rio de Janeiro, Rondônia, Roraima, and Sergipe) (Govaerts *et al.* 2012, Barros *et al.* 2012). In the studied area, it is rare and found in "*várzea* forest". It is easily recognized by one-flowered inflorescences with peduncles longer than 5.0 cm long.

**64. *Vanilla appendiculata*** Rolfe (1895: 178). [Fig. 5K]

Hemiepiphyte. Stem climbing internodes 5.0-8.0 ð 0.3-0.4 cm, cylindrical. Leaves numerous, distichous along the stem, 8.0-19.5 ð 2.5-6.0 cm, obovate to wide-elliptic, the apex acute to acuminate, base attenuate. Inflorescence lateral, in a raceme, 10-18-flowered; peduncle 0.5-1.7 cm long; rachis 2.0-3.5 cm long; floral bracts 0.3-0.4 cm

long, ovate, the apex acute. Flowers creamish; dorsal sepal 5.0-7.5 ð 0.5 cm, narrow-elliptic, the apex acute; lateral sepals 4.7-7.3 ð 0.5-0.6 cm, narrow-elliptic to narrow-oblanceolate, the apex acute; petals 4.8-7.0 ð 0.5-0.6 cm, narrow-elliptic to narrow-oblanceolate, the apex acute; lip 4.4-6.0 ð 1.5 cm, oblanceolate, creamish, margin erose, laterally adnate to the column up to the second third, the apex acute, callus 1 on disc, multiridged, and a tuft of fleshy hairs on apex; column 3.7-5.0 cm long; pollinia 2; ovary + pedicel 2.0-3.2 cm long. Fruits 6.0-11.0 ð 0.3-0.5 cm, cylindrical.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Rio Barauana, 26.VII.2010, fl., *E. Pessoa et al. 356* (INPA, UFP); ibid., 21.IX.2011, fl., *E. Pessoa et al. 696* (INPA); Grade PPBio, 17.IX.2011, fl., *E. Pessoa et al. 639* (INPA, UFP); Rio Anauá, 28.XI.2011, fr., *E. Pessoa & Vasconcelos, S. 841* (INPA); ibid. 22.VIII.2012, fl., *E. Pessoa & Melo, A. 969* (INPA, UFP).

Comments: Distributed in northern South America, from Guyana, Suriname, and Peru to Northern Brazil (states of Amazonas and Pará) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is common and occurs in "*igapó* forest", "*várzea* forest" and "*terra-firme* forest". It could be confused with *V. bicolor* Lindley, but it grows on dense forest and has a lip with one multiridged callus on the disc and 1 tuft of fleshy hairs on apex.

**65. *Vanilla bicolor*** Lindley (1838: 37). [Fig. 5L-M]

Hemiepiphyte. Stem climbing, internodes 7.8-12.0 ð 0.25-0.35 cm, cylindrical. Leaves numerous, distichous along the stem, 7.6-10.5 ð 3.5-4.5 cm, wide-elliptic, the apex acuminate, base obtuse to rounded. Inflorescence lateral or terminal, in a raceme, 6-7-flowered; peduncle 1.0-1.7 cm long; rachis 2.5-3.0 cm long; floral bracts 0.5-0.9 cm long, ovate, the apex acute to rounded. Flowers yellowish; dorsal sepal 4.5-6.0 ð 0.4-0.6 cm, narrow-oblanceolate, the apex acute; lateral sepals 4.5-6.0 ð 0.4-0.6 cm, narrow-oblanceolate, the apex acute; petals 4.5-6.0 ð 0.4-0.5 cm, elliptic-oblanceolate, the apex acute; lip 4.5-6.0 ð 1.3-1.5 cm, oblanceolate, yellowish, margin undulate, laterally adnate to the column up to the middle, the apex acute to obtuse, pubescent lines on the distal half; column 3.0-3.3 cm long; pollinia 2; ovary + pedicel 3.2-5.0 cm long. Fruits 8.5-11.0 ð 0.3-0.4 cm, cylindrical.

Examined material: BRAZIL. **Roraima:** Caracaraí, Parque Nacional do Viruá, Estrada Perdida, 13.IX.2010, fl./fr., *E. Pessoa et al. 376* (INPA); ibid. 23.VII.2010, fl., *Barbosa, T.D.M. et al. 1293* (INPA).

Comments: Distributed on South America and West Indies, from Cuba, Jamaica, Trinidad & Tobago, Haiti, French Guyana, Guyana, Suriname, Venezuela, Colombia, and Ecuador to Brazil (state of Amazonas) (Govaerts *et al.* 2012, Barros *et al.* 2012). It is a new record for the state of Roraima. In the studied area, it is rare and occurs in "*campinaranas*". It is often found on *Mauritia flexuosa* Linnaeus f. (1782: 454) (Arecaceae), and could be confused with *V. appendiculata*, but differs by growing on "*campinarana*" and having a lip with pubescent lines on the distal half.

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**Figure Captions:**

**Figure 1:** Map of the stuied area. **A.** Roraima state highlighted on Brazil; **B.** The Parque Nacional do Viruá highlighted on Roraima; **C.** Map of the Parque Nacional do Viruá.

**Figure 2:** Dissected perianths. **A.** *Acianthera fockei* (Lindl.) Pridgeon & M.W. Chase (*E. Pessoa et al. 364*); **B.** *Acianthera miqueliana* (H. Focke) Pridgeon & M.W. Chase (*E. Pessoa et al. 859*); **C.** *Aganisia cyanea* (Lindl.) Rchb. f. (*E. Pessoa et al. 369*); **D.** *Aspasia variegata* Lindl. (*E. Pessoa et al. 698*); **E.** *Aspidogyne foliosa* (Poepp. & Endl.) Garay (*E. Pessoa et al. 718*); **F.** *Brassavola martiana* Lindl. (*E. Pessoa et al. 996*); **G.** *Brassia caudata* (L.) Lindl. (*E. Pessoa et al. 350*); **H.** *Camaridium ochroleucum* Lindl. (*E. Pessoa & Melo, A. 989*); **I.** *Campylocentrum huebneri* Mansf. (*E. Pessoa et al. 355*); **J.** *Campylocentrum micranthum* (Lindl.) Rolfe (*E. Pessoa et al. 1001*); **K.** *Campylocentrum poeppigii* (Rchb.f.) Rolfe (*E. Pessoa et al. 863*); **L.** *Catasetum discolor* (Lindl.) Lindl. (*E. Pessoa et al. 343*); **M.** *Catasetum longifolium* Lindl. (*Pessoa, E et al. 798*); **N.** *Catasetum macrocarpum* Rich. *ex* Kunth (*E. Pessoa et al. 711*); **O.** *Catasetum* ð *roseoalbum* (Hook.) Lindl. (*E. Pessoa et al. 650*); **P.** *Catasetum saccatum* Lindl. (*E. Pessoa & Melo, A. 997*); **Q.** *Cattleya violacea* (Kunth) Rolfe (*E. Pessoa et al. 700*); **R.** *Caularthron bicornutum* (Hook.) Raf. (*E. Pessoa & Melo, A. 987*); **S.** *Christensonella uncata* (Lindl.) Szlach., Mytnik, Górniak & Śmiszek (*E. Pessoa et al. 378*); **T.** *Cleistes rosea* Lindl. (*E. Pessoa et al. 336*).

**Figure 3:** Dissected perianths. **A.** *Cleistes tenuis* (Rchb. f. *ex* Griseb.) Schltr. (*E. Pessoa et al. 360*); **B.** *Cohniella cebolleta* (Jacq.) Christenson (*E. Pessoa et al. 747*); **C.** *Dichaea picta* Rchb.f. (*E. Pessoa et al. 712*); **D.** *Dimerandra emarginata* (G. Mey.) Hoehne (*E. Pessoa et al. 379*); **E.** *Duckeella pauciflora* Garay (*Barbosa, T.D.M.. et al. 1424*); **F.** *Epidendrum anceps* Jacq. (*E. Pessoa & Melo, A. 998*); **G.** *Epidendrum carpophorum* Barb. Rodr. (*E. Pessoa & Melo, A. 1000*); **H.** *Epidendrum coronatum* Ruiz & Pav. (*E. Pessoa et al. 704*); **I.** *Epidendrum nocturnum* Jacq. (*E. Pessoa et al. 636*); **J.** *Epidendrum orchidiflorum* Salzm. *ex* Lindl. (*E. Pessoa et al. 715*); **K.** *Epidendrum purpurascens* Focke (*Pessoa, E & Melo, A. 964*); **L.** *Epidendrum rigidum* Jacq. (*E. Pessoa et al. 842*); **M.** *Epidendrum strobiliferum* Rchb.f. (*E. Pessoa et al. 383*); **N.** *Epidendrum viviparum* Lindl. (*E. Pessoa et al. 349*); **O.** *Epistephium*

*parviflorum* Lindl. (*E. Pessoa et al. 374*); **P.** *Galeandra devoniana* R.H. Schomb. *ex* Lindl. (*E. Pessoa et al. 337*); **Q.** *Habenaria schwackei* Barb. Rodr. (*E. Pessoa et al. 338*); **R.** *Heterotaxis superflua* (Rchb.f.) F. Barros (*E. Pessoa et al. 641*); **S.** *Laelia gloriosa* (Rchb.f.) L.O. Williams (*Mori, S. & Gracie, C. 21.729*); **T.** *Ligeophila juruenensis* (Hoehne) Garay (*E. Pessoa et al. 635*).

**Figure 4:** Dissected perianths and habit. **A.** *Liparis nervosa* (Thunb.) Lindl. (*E. Pessoa et al. 667*); **B.** *Lockhartia viruensis* Pessoa & Alves (*E. Pessoa et al. 372*); **C.** *Lophiaris nana* (Lindl.) Braem (*E. Pessoa et al. 692*); **D.** *Macradenia lutescens* R. Br. (*E. Pessoa et al. 687*); **E-F.** *Maxillariella alba* (Hook.) M.A. Blanco & Carnevali (*E. Pessoa & Melo, A. 990*); **G.** *Nohawilliamsia pirarensis* (Rchb.f.) M.W.Chase & Whitten (*E. Pessoa et al. 375*); **H.** *Notylia angustifolia* Cogn. (*E. Pessoa et al. 342*); **I.** *Ornithocephalus ciliatus* Lindl. (*E. Pessoa et al. 348*); **J.** *Otostylis brachystalix* (Rchb.f.) Schltr. (*E. Pessoa et al. 750*); **K.** *Pabstiella yauaperyensis* (Barb. Rodr.) F. Barros (*E. Pessoa et al. 361*); **L.** *Pleurothallis pruinosa* Lindl. (*E. Pessoa et al. 845*); **M.** *Polystachya concreta* (Jacq.) Garay & H.R.Sweet (*E. Pessoa et al. 699*); **N.** *Polystachya foliosa* (Hook.) Rchb.f. (*E. Pessoa et al. 359*).

**Figure 5:** Dissected perianths and habit. **A.** *Polystachya stenophylla* Schltr. (*E. Pessoa et al. 673*); **B.** *Prosthechea fragrans* (Sw.) W.E. Higgins (*E. Pessoa et al. 705*); **C.** *Prosthechea vespa* (Vell.) W.E. Higgins (*E. Pessoa et al. 358*); **D.** *Quekettia microscopica* Lindl. (*E. Pessoa et al. 707*); **E.** *Sarcoglottis amazonica* Pabst (*E. Pessoa et al. 778*); **F.** *Scaphyglottis sickii* Pabst (*E. Pessoa et al. 367*); **G.** *Solenidium lunatum* (Lindl.) Schltr. (*Prance, G. et al. 11.000*); **H.** *Trichocentrum recurvum* Lindl. (*E. Pessoa et al. 655*); **I.** *Trichosalpinx egleri* (Pabst) Luer (*E. Pessoa et al. 384*); **J.** *Trigonidium acuminatum* Bateman *ex* Lindl. (*E. Pessoa et al. 703*); **K.** *Vanilla appendiculata* Rolfe (*E. Pessoa et al. 356*); **L-M.** *Vanilla bicolor* Lindl. (*E. Pessoa et al. 376*).

FIGURE 1

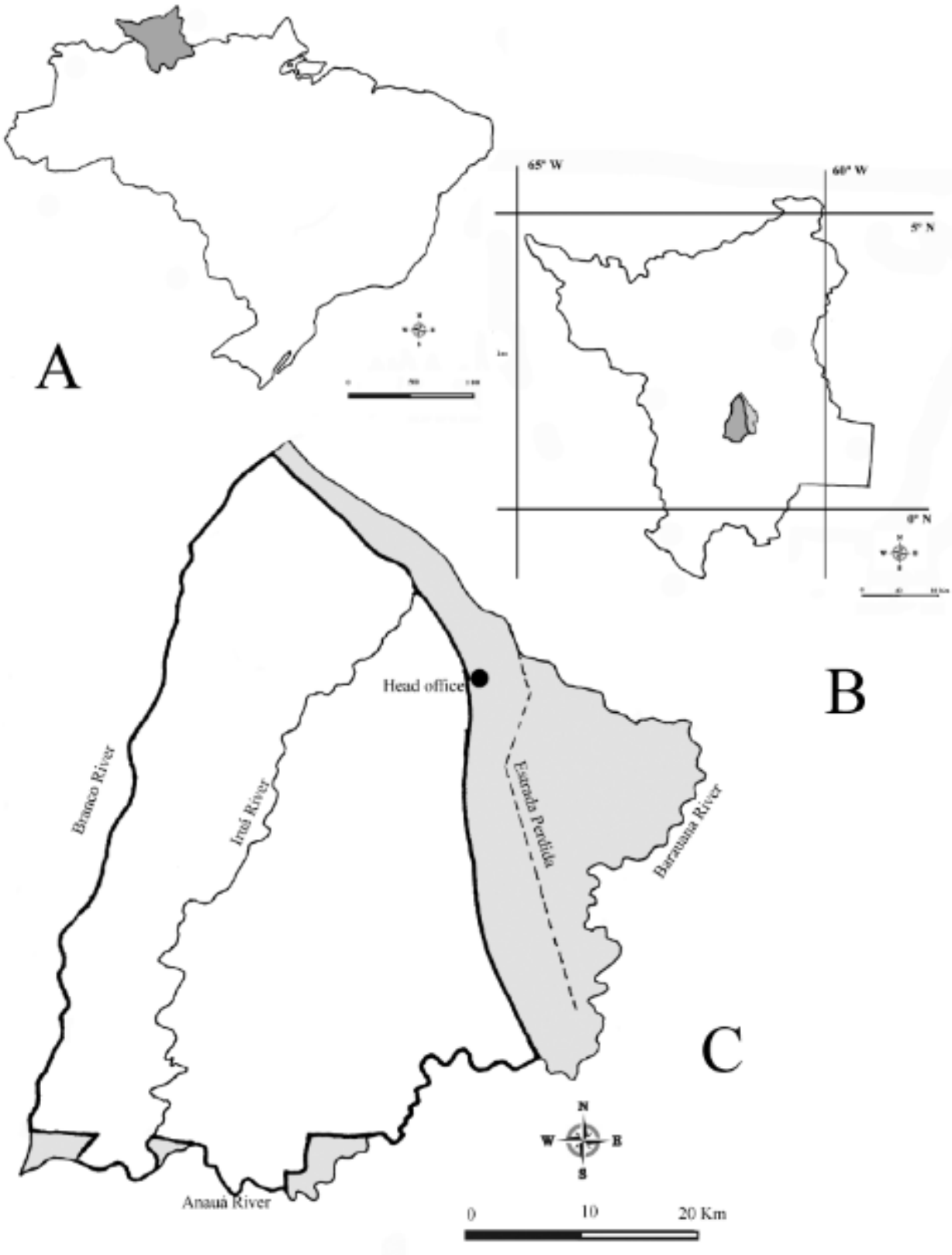
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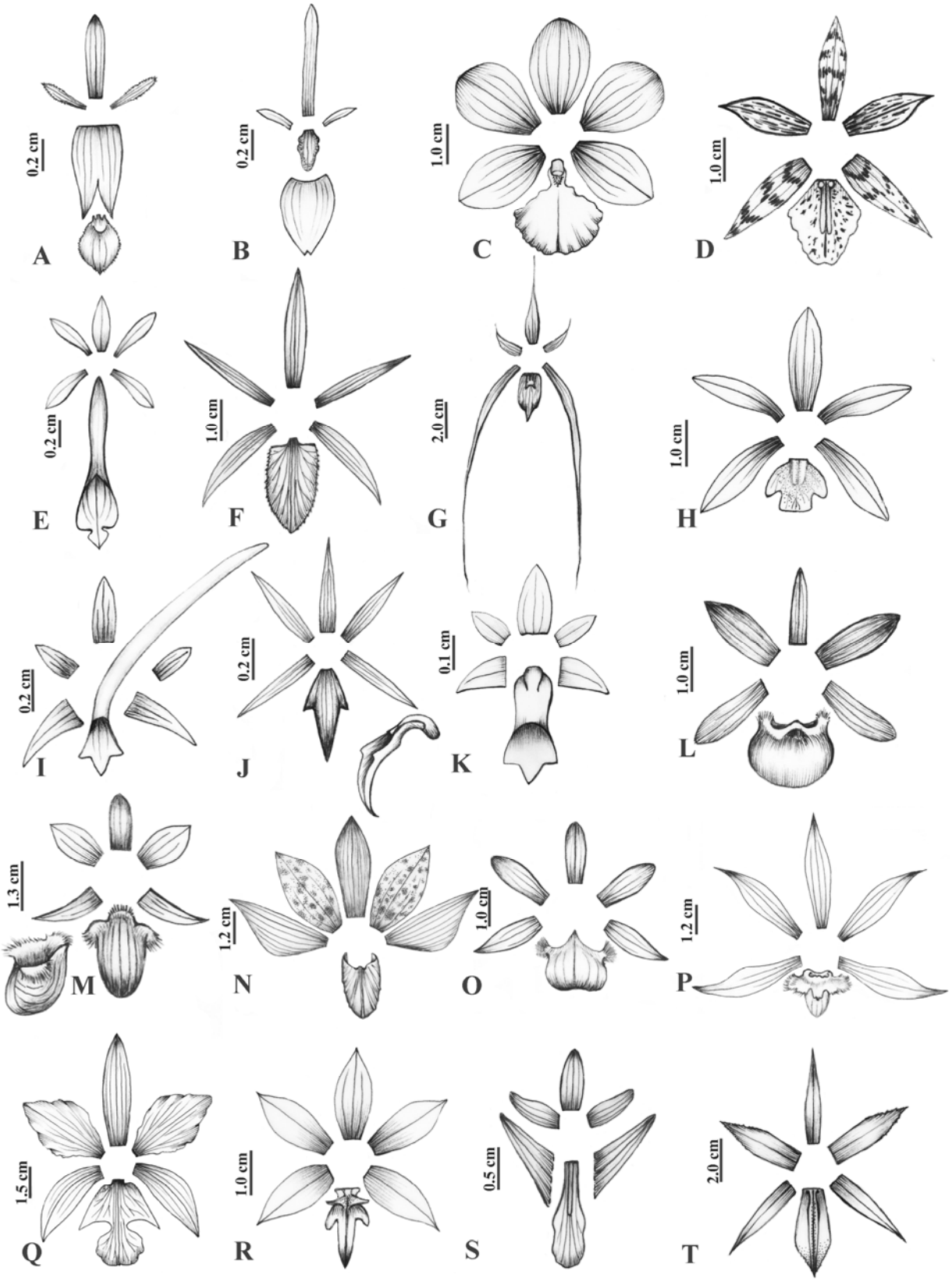
FIGURE 2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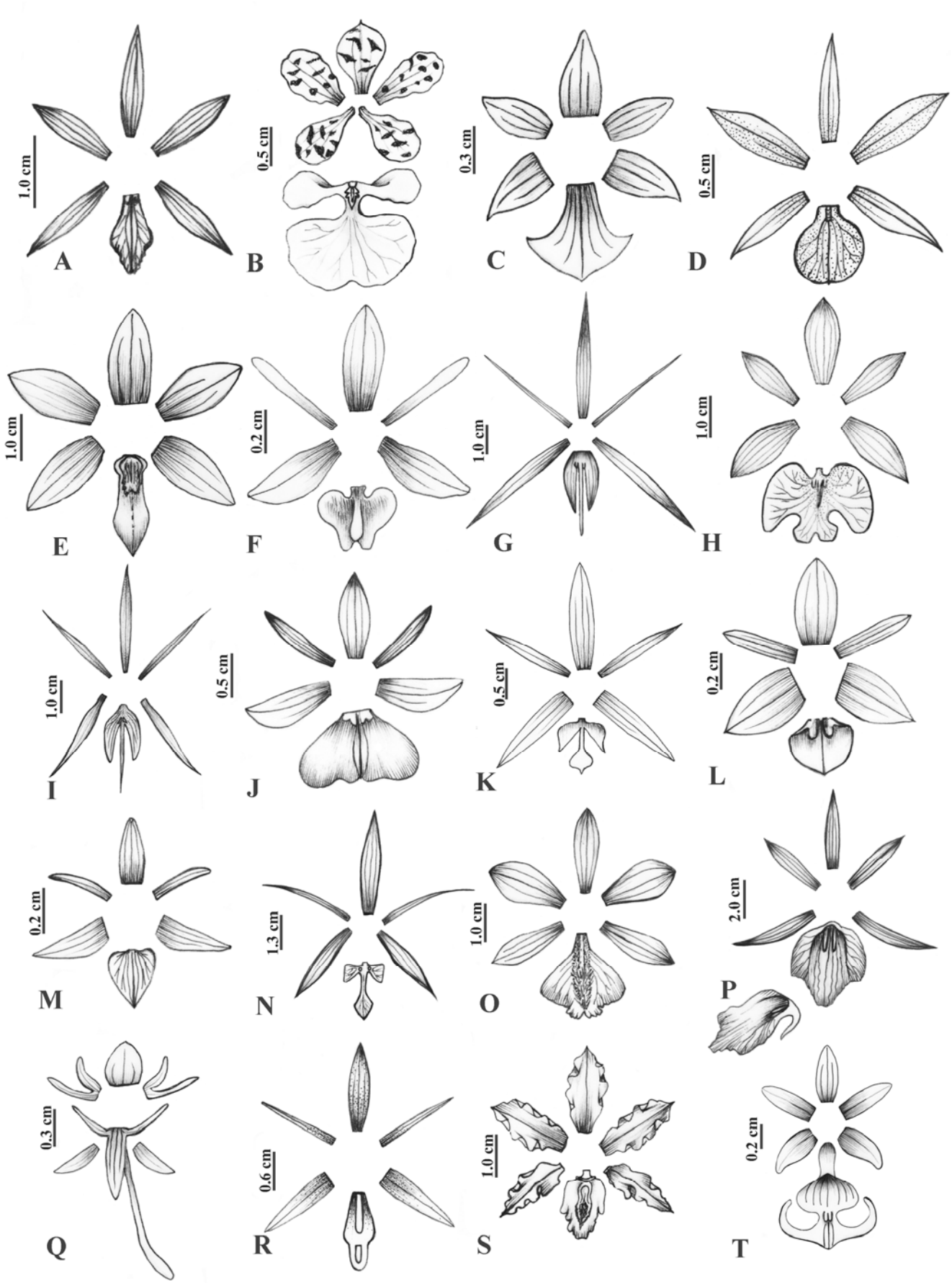
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FIGURE 4

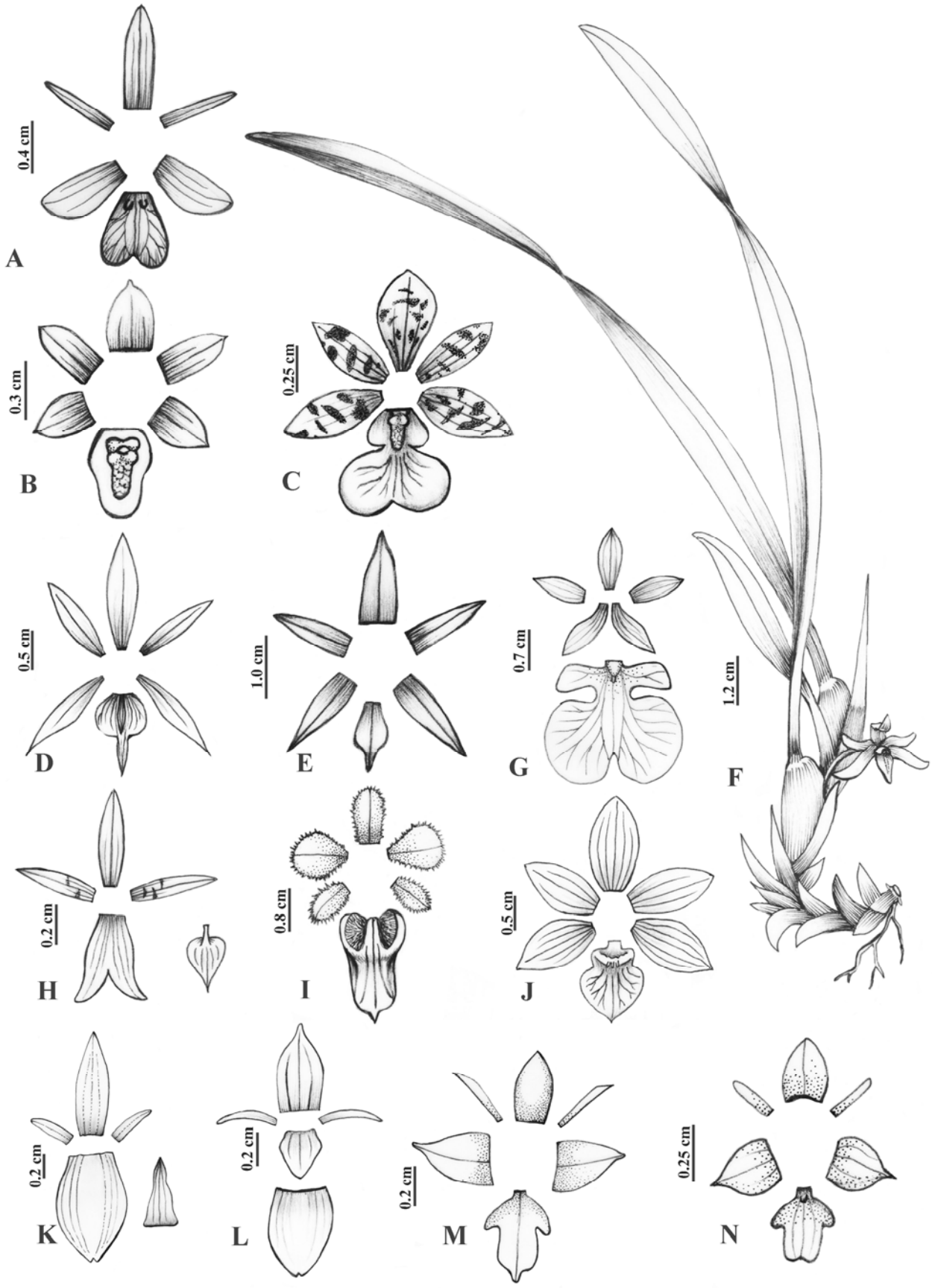
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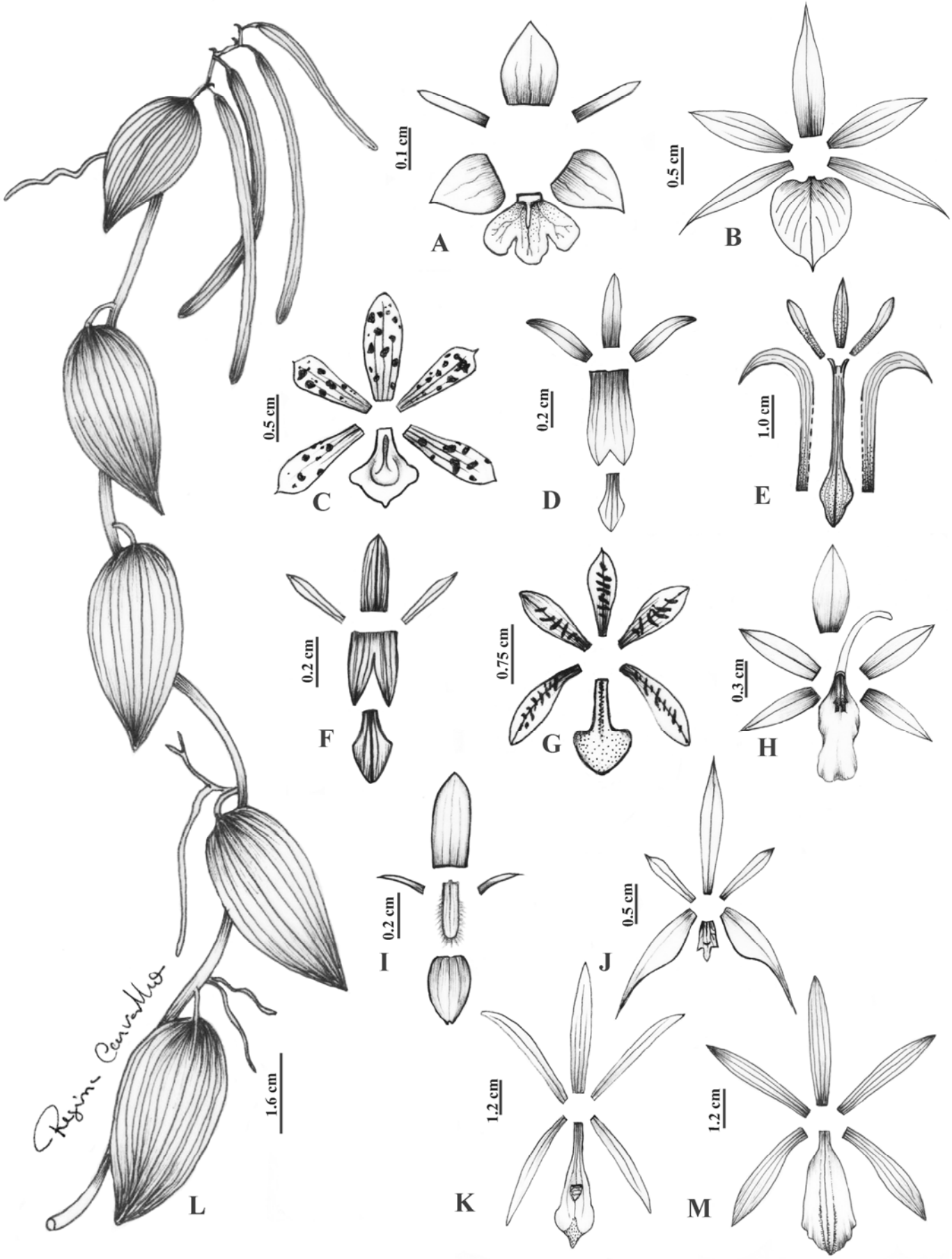
FIGURE 5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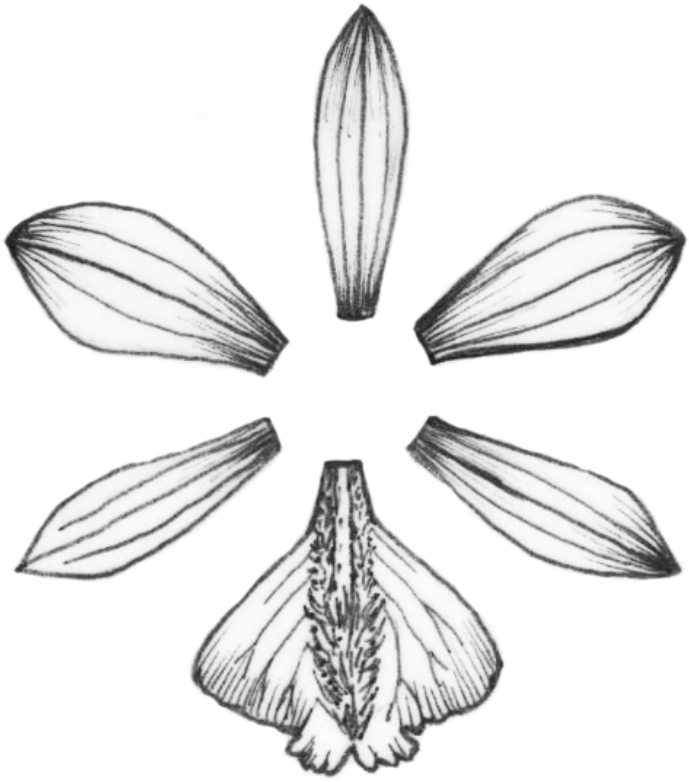

**CAPÍTULO 4:** ASPECTS OF ORCHIDACEAE DISTRIBUTION ON NORTHWESTERN SOUTH AMERICA: ENDEMISM CENTERS × ENVIRONMENTAL CONDITIONS

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A ser submetido ao periódico Edinburg Journal of Botany

# Aspects of Orchidaceae distribution in northwestern South America: endemism centers x environmental conditions

Edlley Pessoa[1,3]; Ivo Abraão Araújo da Silva[2] & Marccus Alves[1]

[1]Laboratório de Morfo-Taxonomia Vegetal, Departamento de Botânica, Universidade Federal de Pernambuco, CEP 50670-901, Recife, Pernambuco, Brazil
[2] Laboratório de Pteridófitas Departamento de Botânica, Universidade Federal de Pernambuco, CEP 50670-901, Recife, Pernambuco, Brazil
[3]Author for correspondence (edlley_max@hotmail.com)

**Abstract**

Northwestern South America is characterized by a large diversity of ecosystems, and the Amazon Forest is the biggest plant formation in the area. It is a mosaic of eight centers of endemism. Wind dispersal of orchid seeds makes orchids a good taxon for distribution studies. The distributional patterns may be explained by physical or historical factors. The aim of this study is to compare the floristic composition of the Orchidaceae in different areas of Northwestern South America, searching for correlations with physical features, geographical closeness, or endemism centers. This study relies only on Orchidaceae surveys already published or in press, conducted in the area of interest. We selected 11 surveys conducted in northwestern South America and two in Central America (Costa Rica). The cluster analysis was conducted using the software MVSP. The result was a split pattern between Amazonian and non-Amazonian floristic compositions. The environmental conditions analyzed appear to be important factors in explaining the orchid composition of areas outside the Amazon basin. Mid-elevation, precipitation, vegetation and average temperature distinguish the Costa Rican areas and the Chocó, whereas the presence of rock outcrops distinguishes the Venezuelan areas. The Amazonian group is environmentally very uniform, and no physical features were determinant of the internal segregation in two subgroups. Historical factors may explain the pattern observed.

## Introduction

Orchidaceae is one of the most diverse families of angiosperms with ca. 25,500 species (Dressler, 2005) and 800 genera (Dressler, 1993). Orchids are widely distributed (Christenson, 2004), but their diversity center is in the tropics, especially in the Neotropics and in the Indo-Malayan region (Dressler, 1993).

In the Neotropics, Brazil, Colombia and Peru are the countries richest in Orchidaceae species (Pabst & Dungs, 1975). The family is very well represented in the Atlantic Forest of Brazil (Stehmann et al., 2009) and in the Amazon Forest (Ribeiro, 1999; Funk & Hollowell, 2007).

Northwestern South America is characterized by a large diversity of ecosystems and among those are the Amazon forest, the Amazon savannas ("*Campinaras*" or "*Lavrados*"), the Tepui vegetation, the Paramos, the Chocó, the Llanos, and the Andean vegetation (Daly & Mitchell, 2000).

The Amazon Forest is the largest and most exuberant plant formation in the area, located in the Amazon river basin, and comprises mainly lowland forests (Ab'Sáber, 2006). The large area of evergreen moist forest mistakenly suggests a homogeneous vegetation. However, nowadays it is known that it is a mosaic of several centers of endemism (Silva et al., 2005), with "islands" of open vegetation (Daly & Mitchell, 2000).

Studies with vertebrates (Haffer & Prance, 2001), butterflies (Hall & Harvey, 2002), and woody plants (Prance, 1982) have suggested the occurrence of distinct centers of endemism within the Amazon Forest. However, herbaceous and epiphyte species have never been used to test this bio-geographical hypothesis.

The homogeneous wind-dispersal mechanism of the seeds in the family makes orchids a good case for distribution studies. The distributional patterns may be

explained by ecological, geographical or historical factors (Trejo-Torres & Ackerman, 2001).

The aim of this study is to compare the floristic composition of Orchidaceae among different areas of Northwestern South America using similarity and grouping analysis, and to search for correlations with physical features (elevation, precipitation, temperature, presence of rock outcrops and vegetation), geographical closeness, or potential endemism centers.

## Materials and Methods

### Distribution data

Surveys already published or in press focused on Orchidaceae and conducted in the area of interest were selected for the analysis (Tab. 1; Fig. 1). The main selection criterion was the accuracy of taxonomic identification of orchids. Consequently, 11 areas from northwestern South America, and two from Central America (Costa Rica) were selected. This study avoided the inclusion of online data available from herbarium collections due to the usual problems with taxonomic identification. It often compromises broad studies in bio-geography, conservation and phylogeny (Iganci & Morim, 2012; Kury et al., 2006).

### Taxonomic Adjustments

In recent years, profound taxonomic changes have been proposed for Orchidaceae, especially related to generic circumscription. Because of the different times of publication of the surveys selected for this study, they followed different taxonomic classifications. Therefore, before performing any analysis, a careful updating of the names used for each survey selected was mandatory.

Generally speaking, for this study, Pleurothallidinae are treated according to Pridgeon & Chase (2001); *Gomesa* R. Br. includes some species of *Oncidium* Sw.

according to Chase et al. (2009); *Maxillaria* Ruiz & Pav. is segregated according to Blanco et al. (2007); *Scaphyglottis* Poepp. & Endl. is considered under Dressler et al.'s (2004) circumscription; and *Trichocentrum* Poepp. & Endl. is considered according to Braem (1993), Christenson (1999) and Pupulin (1995).

Synonyms and valid species names were standardized according to The Plant List database.

**Studied Areas**

The areas chosen (13) are located in the Neotropics. Two of them are in Central America (Costa Rica), the others in South America. Three of the South American areas are outside the limits of the Amazon forest: the Chocó, on the Pacific coast of Colombia, and two areas near the Venezuelan Caribbean Coast (Fig. 1).

The Amazon Basin combines eight selected areas which are distributed in Brazil (seven) and French Guyana (one). Based on the Centers of Endemism published by Silva et al. (2005), those areas can be placed in four of these centers – Inambari (IEC), Guyana (GEC), Xingú (XEC) and Belém (BEC).

The selected areas include a large variation in altitude, ranging from lowland forests (Ilha do Combu, 10 m mid-elev.) to highland forests (Chocó, 1400 m mid-elev.). Furthermore, they include open vegetation such as "*Llanos*" in Venezuela, "*Campinaranas*" in Brazil, and also dense forest.

**Data Analysis**

A database of species consisting of a binary (presence/absence) matrix based on the thirteen surveys previously selected was built.

The relationship among the biological variable "richness" and "mid-elevation", "average temperature", "vegetation" and "precipitation" of each study site was analyzed according to Generalized Linear Models (GLM) (McCulloch & Searle, 2001) generated

in the program Statistica 7.0 (StatSoft, 2004). The GLMs test for a series of relationships between the dependent and independent variables and manage the data using link functions and exponential family (e.g., normal, Poisson or binomial) distributions (Baldwin and Bradfield 2007; Bolker et al. 2008).

So that the GLMs could be applied based on a normal distribution, in some situations, response variables were transformed to improve the linearity and homogeneity of the variance. Thus, the values of the "mid-elevation" and "precipitation" variables were transformed into Log10 to obtain normality of the data and homogeneity of variances. In all cases, values of $p \leq 0.05$ were considered significant.

A cluster analysis was conducted to compare similarities in species composition among the study areas, quantified with the Jaccard index (Legendre & Legendre, 1998) using UPGMA (Unweighted Pair-Group Method using Arithmetic Averages) as a clustering algorithm (Sneath & Sokal, 1973) according with MVSP 3.1 (multivariate statistical package program) (Kovach, 2000). This type of analysis is suitable for the presence–absence data available in this study, and the Jaccard index determines the proportion of species shared by a pair of sites in relation to the total number of species present in these sites.

The Jaccard indices and geographical distances among sites were evaluated through the application of a simple linear regression, performed using the Statistica 7.0 (StatSoft, 2004). The regression analysis was performed to test the hypothesis that species similarity decays with geographical distance because environmental conditions are always spatially auto-correlated, so that nearby sites tend to be more similar in their environmental conditions than distant sites (Legendre, 1993).

To analyze the variation of species composition per area related to environmental variables (mid-elevation, average temperature, vegetation, precipitation and rock outcrop), the Canonical Correspondence Analysis (CCA), a multivariate technique that evaluates the patterns of co-variation between groups of species and a series of site variables (Ter Braak, 1987), was used. The CCA was conducted on species composition-environmental variables matrices using the software MVSP 3.1 (Kovach, 2000).

Whenever necessary, the data were transformed to meet the assumptions of normality and heterogeneity of variances. Thus, the values of the "mid-elevation" and "precipitation" variables were transformed into Log10 to obtain normality on the data and homogeneity of variances. In all cases, p-values $\leq 0.05$ were considered significant.

## Results

From the total number of species (525) included in the analysis, 185 (35%) were shared by at least two areas, and about 65% were restricted to a single area. Few species (14, about 2.7 %) were widely distributed and found in at least half of the areas included in this study.

The total complement of species belong to 153 genera, the most representative ones being *Epidendrum* L. (54 spp.), *Habenaria* Willd. (18 spp.), *Catasetum* Rich *ex* Kunth (14 spp.), and *Sobralia* Ruiz & Pav. (12 spp.). Nevertheless, 61 genera were represented by only one species.

Furthermore, *Campylocentrum micranthum* (Lindl.) Rolfe, *Dimerandra emarginata* (G. Mey.) Hoehne, *Epidendrum nocturnum* Jacq., *E. strobiliferum* Rchb.*f.* and *Rodriguezia lanceolata* Ruiz & Pav. were the most frequent species in the analyzed lists, having been found in at least around 70% of the areas.

Based on the GLMs test, "mid-elevation" could explain the variation of richness ($F = 6.05$ and $p = 0.04$) (Fig. 2). In contrast, the independent variables "average temperature" ($F = 3.26$ and $p = 0.11$), "vegetation" ($F = 1.02$ and $p = 0.40$), and "precipitation" ($F = 1.51$ and $p = 0.25$) did not generate any significant effect on the richness values.

The cluster analysis results show a split pattern between the Amazonian and extra-Amazonian orchid diversity composition (Figs. 3-4). The areas located in the Amazon Basin emerge together as a group with about 10% similarity basis, and reaching a maximum of 38% between Serra de Carajás (CArB) and Serra das Andorinhas (AND) (both located in the state of Pará, Brazil).

Extra-Amazonian areas are arranged in three different groups. The first one consists of areas from Costa Rica, the second one is formed by a single area (Chocó, Colombia), and the third one combines Venezuelan areas.

The linear regression test (LRT) shows that the geographic closeness has no influence on the species composition arrangement ($R^2 = -0.06$ and $p = 0.56$) for the areas studied.

According to the canonic correspondence analysis (CCA), the environmental physical features analyzed were partially determinant of the species composition variation among the studied areas. The analysis shows five significant axes, with cumulative percentage of explanation of 46.7% for the observed variation. It suggests that part of the variation in species composition found is truly affected by other factors which were not included in the present analysis.

Figure 5 shows the results from the two first axes (eigenvalues: Axis 1 = 0.73 and Axis 2 = 0.67; Canonic correlation: Axis 1 = 0.99 and Axis 2 = 0.98). In the first axis, the extra-Amazonian group formed by Chocó (CHC) (Colombia), Barra Honda

(BHC) and Queops (QUC) (both located in Costa Rica) shared similar species composition. This could be explained by shared physical attributes such as vegetation, temperature, precipitation and elevation. The Amazonian group and the Venezuelan areas are probably affected by the occurrence of rock outcrops. Moreover, the observation of Axis 2 shows that the distinction of the two cited groups is possibly related to the variation in elevation and precipitation.

## Discussion

This study showed that the South American areas studied are related in terms of the species composition of orchids. It disagrees with Cracraft & Prum (1988), Morrone (2004, 2006), Quijano-Abril et al. (2006), and Amorim & Pires (1996), who pointed out the close relationship between the species composition of the Chocó (CHC) (Colombia) and continental Central America (Darién province). The Andean uplift could be the main reason to segregate the northern South America lowland forest, whereas Pacific areas such as the Chocó remain in contact with the Central America and the Caribbean flora (Hooghiemstra & Hammen, 2001; Franco-Rosselli & Berg, 1997; Gentry, 1982).

The wind-dispersal mechanism of the Orchidaceae diaspora would provide the possibility of long-distance dispersal (Gentry & Dodson, 1987). Cross-Andean dispersal has also been observed in Euglossini bees (Dick et al., 2004), a group of insects strictly related to the orchid pollination (Van der Pijl & Dodson, 1966). Both factors could explain the disjunct pattern found in our analysis.

The two areas of the Venezuelan Caribbean Coast included in this study represent a distinct bio-geographic province called the “Coastal Cordillera” by Daly & Michell (2000) or “Venezuelan Coast” by Morrone (2006). They emerge as an independent group, but related with the Amazon cluster. Both areas, based on Pennington et al. (2000), share a distinct physiognomy from the Amazon, as coastal

vegetation, highland humid forest and seasonal forests. The CCA also shows that rock outcrops (axis 2) would be the main physical feature to distinguish them from the Amazon portion. Trejo-Torres & Ackerman (2001) also suggested a close floristic relationship among the Venezuelan coast and Caribbean areas (Lesser Antilles). It helps to understand the position of the group in the cluster.

The dry Llanos vegetation between the Venezuelan coast and the wet Amazon forest (Pennington et al., 2000) could represent an ecological barrier to dispersal for several species. However, it seems to be less effective than the Andes, because the Venezuelan areas used in this study emerge as a sister group of the Amazon areas with around 5% similarity (Fig. 3).

The Amazonian group of areas shares similar environmental conditions as shown by the CCA analysis, with no physical variables to explain the two subgroups formed in the cluster analysis (Fig. 3-4).

The first subgroup includes the two areas in the Inambari Center of Endemism [Reserva Ducke (DUB) and Acre, (ACB) and Saül (SFG) (French Guyana), which is part of the Guyana Center of Endemism (GEC). Although the two Inambari areas have a large geographical distance (LRT: geographical closeness is not relevant), the huge similarity found in the composition of orchid diversity may be explained by historical factors [Endemism Center, according Silva et al. (2005)]. However, there is no clear explanation available from the methods used to explain the occurrence of Saül (SFG) in this group. Even so, a similar distribution pattern between areas located in the Center of Endemism of Inambari and Guyana was found for some species of frogs (Garda & Cannatella, 2007).

The other Amazon subgroup is formed by two areas included in the Center of Endemism Guyana (CEG) [Viruá (VIB) and Caxiuanã (CaxB)] and three areas in the

Center of Endemism Xingú (CEX) [Ilha do Combu (COB), Serra de Carajás (CArB) and Serra das Andorinhas (AND)], some of them located on the border of the Center of Endemism Belém (CEB).

The analysis agrees in part with the biogeographic hypothesis presented by Amorim (2001) and Cracraft & Prum (1988) for the Amazon Basin, where the authors proposed historical relationships among the three Centers of Endemism (GEC, XEC and BEC) based on cladistic biogeography. However, Viruá (VIB) and Caxiuanã (CaxB), despite belonging to the same Center of Endemism as assumed by Silva et al. (2005), do not emerge together. This means they do not share a high level of common diversity in the orchid composition. It may be due to the geographic position, because both areas are located on the border of the Centers of Endemism. Those areas could be considered homologous to the border of ecosystems (contact zones), where plant diversity is a mix of influences from distinct ecosystems (Odum, 1988).

As previously mentioned, the areas located in the Guyana Center of Endemism [Saül (SFG), Viruá (VIB) and Caxiunã (CAxB)] do not settle in the same group in any of the analyses performed. Based on the province subdivisions of Latin America suggested by Morrone (2006), through the methods of panbiogeography, they are part of three different bio-geographic provinces in South America with major differences in the floristic composition and ecological features. Saül (SFG) would be part of the "humid Guyana" province, Viruá (VIB) in the "Roraima" province, and Caxiuanã (CaxB) in the "Amapá" province.

## Conclusions

The analysis of the areas for this study shows the poor knowledge we have about the orchid floristic composition in the western, and central-eastern Amazon. The authors encourage taxonomic studies in these portions.

The environmental conditions analyzed appear to be important factors to explain the orchid composition of areas outside the Amazon basin. Mid-elevation, precipitation, vegetation and average temperature distinguish the Costa Rican areas and the Chocó (Colombia), whereas the presence of rock outcrops distinguishes the Venezuelan areas.

The Amazonian group is environmentally very uniform, and no physical features were determinant of the internal segregation in two subgroups. Historical factors, which are the basis of the theory of the Centers of Endemism, may explain the pattern shown.

In an overview of the analysis, the pattern observed is similar to several other studies with invertebrates, vertebrates and plants.

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**Figure 1**: Map of the distribution of the areas analyzed in this study. **A.** Countries with areas in the analysis. **B.** Amazonian endemism centers, and the areas analyzed: 1. Chocó (Colombia) – CHC; 2. Saül (French Guyana) – SFG; 3. Acre (Brazil) – ACB; 4. Sucre (Brazil) – SUV; 5. Floresta Nacional Caxiuanã (Brazil) – CAxB; 6. Ilha do Combu (Brazil) – COB; 7. Parque Nacional Barra Honda (Costa Rica) – BHC; 8. Parque Nacional Quéops (Costa Rica) – QUC; 9. Parque Nacional Viruá (Brazil) – VIB; 10. Reserva Ducke (Brazil) – DUB; 11. Serra das Andorinhas (Brazil) – ANB; 12. Serrania Cuchila (Venezuela) – CUV; 13. Serra de Carajás (Brazil) – CArB.

**Figure 2:** Effects of the mid-elevation on the richness of species in northwestern South America and Costa Rica.

**Figure 3:** UPGMA analysis of floristic similarity of Orchidaceae species in northwestern South America and Costa Rica. The cluster matches some values of Jaccard index obtained from presence/absence data of species.

**Figure 4:** Map with a synthesis of the biogeographic pattern of the Orchidaceae distribution in northwestern South America and Costa Rica.

**Figure 5:** Ordination diagram representing the two first axes (Eigenvalues: Axis 1= 0.73 and Axis 2= 0.67; Canonic correlation: Axis 1= 0.99 and Axis 2= 0.98) generated by Canonic Correspondence Analysis for study areas (triangles) and environmental conditions (arrows).

# Figure 1


Costa Rica
Venezuela
Colombia
French Guyana
Brazil
4
12
7
8
1
2
Guyana
Imeri
9
5
Belém
6
Napo
10
Xingú
11
Inambari
13
Tapajós
3
Rondônia
0 170 340 km

**Figure 2**

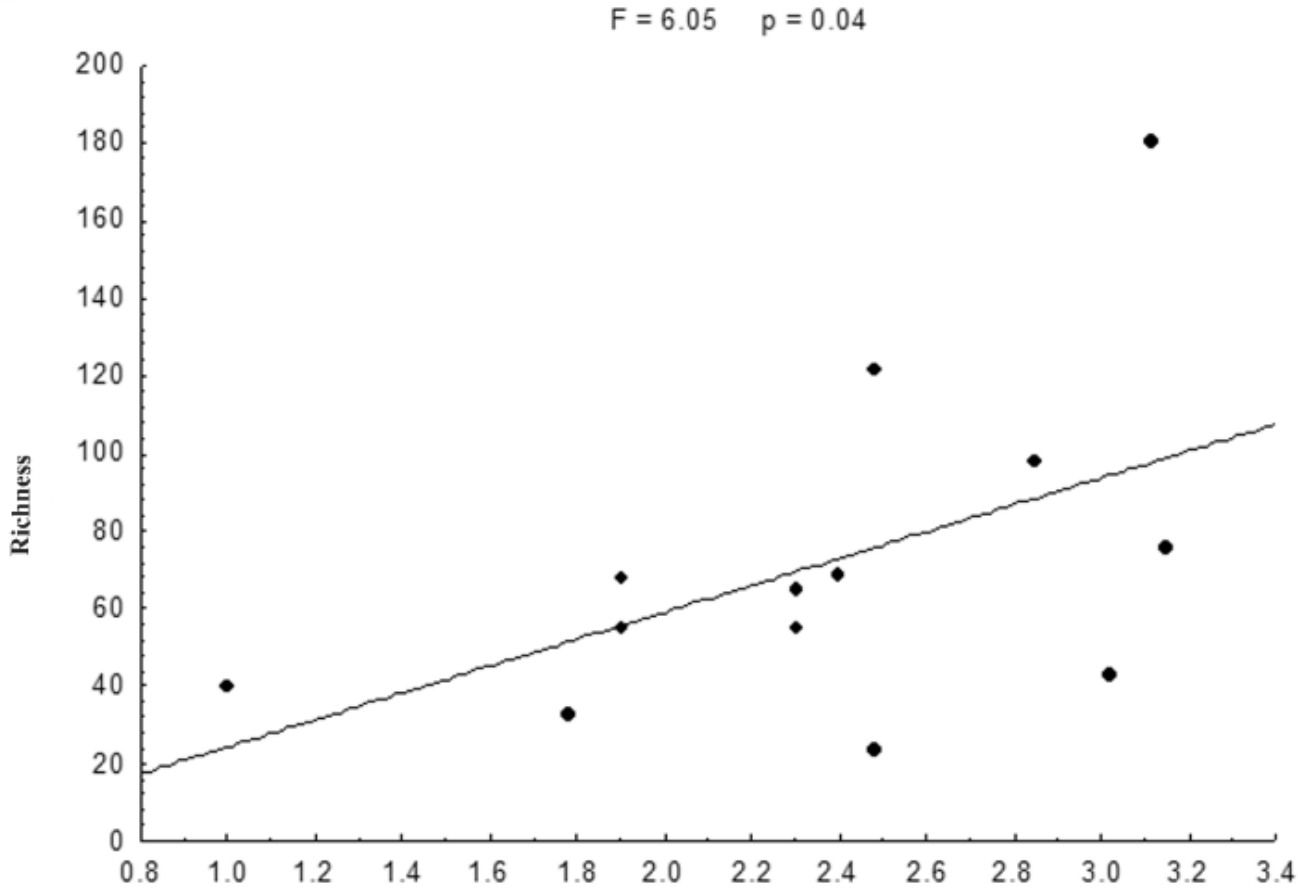
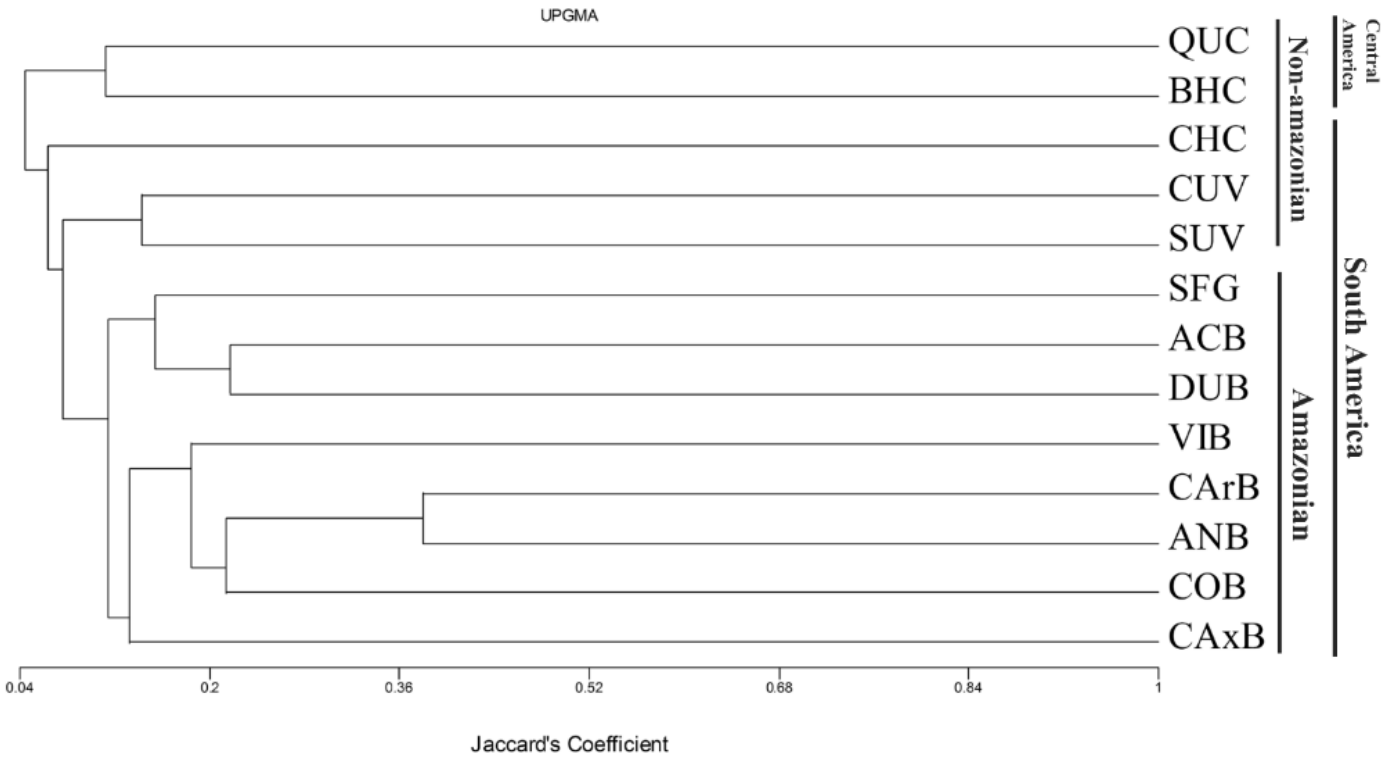
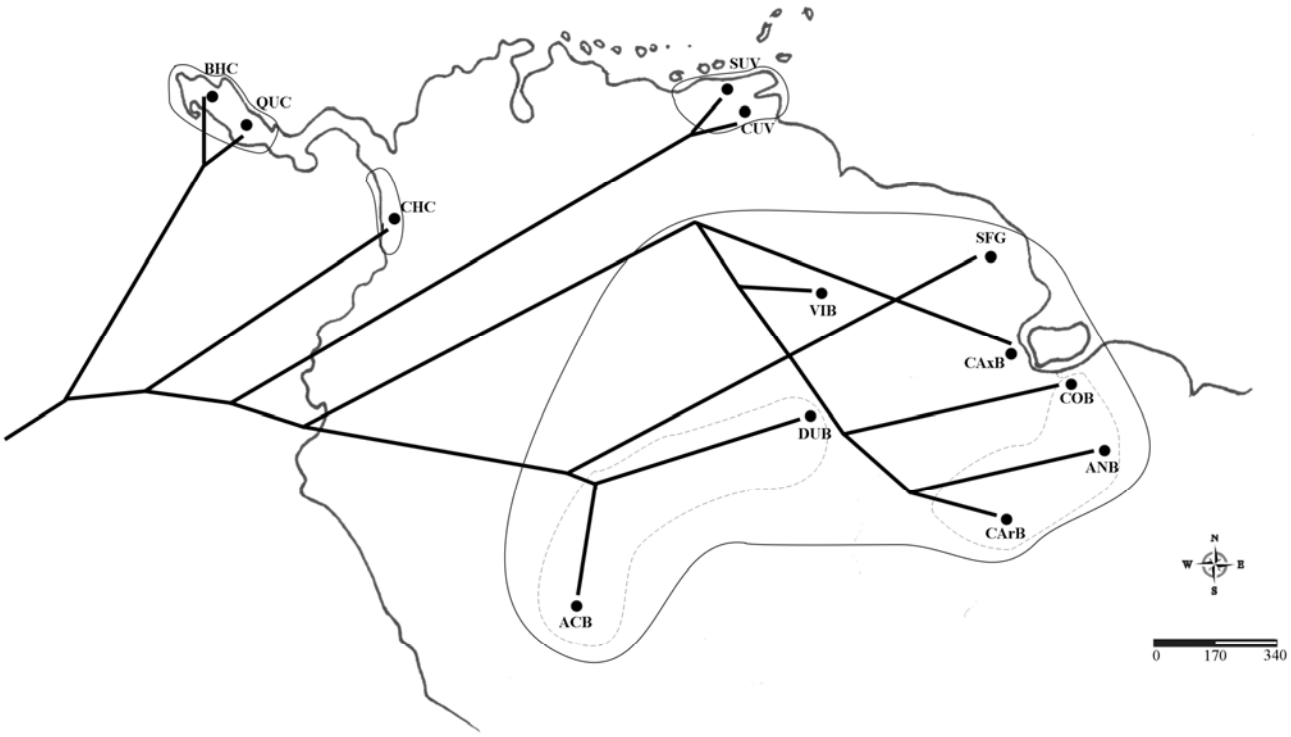



**Figure 3**



# Figure 4




# Figure 5

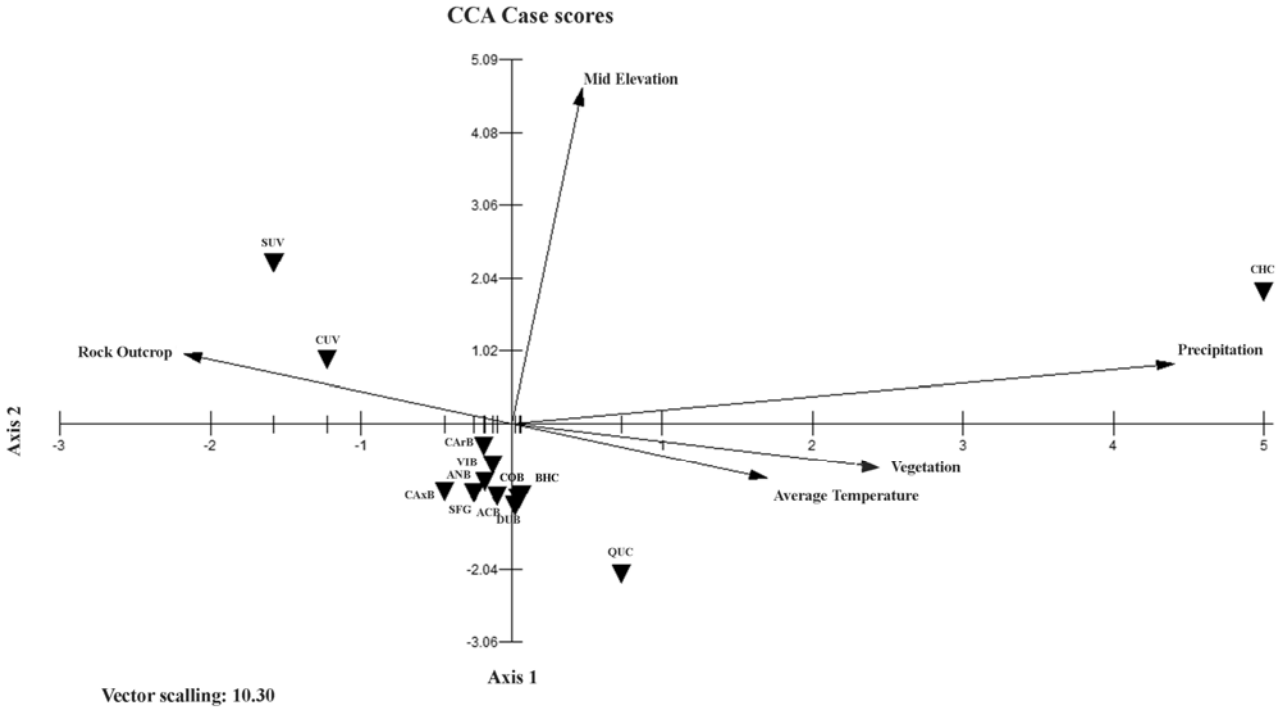


**Table 1.** Analysed areas, with country, geographical coordinates, number of species and reference.

| Abbreviation | Area name | Country | Geographic Coordinates | Species number | Reference |
|---|---|---|---|---|---|
| ACB | Estado do Acre | Brazil | 10º 07' S and 69º21'W | 55 | Christenson, 2008 |
| AND | Serra das Andorinhas | Brazil | 06º 10' S and 48º35' W | 69 | Atzingen et al., 1996 |
| BHC | Parque Nacional Barra Honda | Costa rica | 10º10' N and 85º21' W | 24 | Borarín & Pupulin, 2007 |
| CArB | Serra de Carajás | Brazil | 05º54' S and 48º25' W | 98 | Silveira et al., 1995 |
| CAxB | Flona Caxiuanã | Brazil | 01º42' S and 51º31' W | 33 | Koch et al, in press. |
| COB | Ilha do Combu | Brazil | 01º25' S and 48º25' W | 40 | Cardoso et al., 1996 |
| CHC | Departamento do Chocó | Colombia | 05º29' N and 77º10' W | 76 | Gutiérrez & Mosquera, 2006 |
| CUV | Seranía de La Cuchila | Venezuela | 10°07' N and 63°33' W | 43 | Leopardi, 2010 |
| DUB | Reserva Ducke | Brazil | 03º 00' S and 59º 52' W | 68 | Ribeiro, 1999 |
| SFG | Departamento de Saul | French Guyana | 03º30' N and 53º28' W | 122 | Christenson, 1997 |
| SUV | Estado do Sucre | Venezuela | 10º38' N and 63º 02' W | 181 | Leopardi & Cumana, 2008 |
| VIB | Parque Nacional do Viruá | Brazil | 01º42' N and 61º10' W | 65 | Pessoa et al, in prep. |
| CUV | Seranía de La Cuchila | Venezuela | 10°07' N and 63°33' W | 43 | Leopardi, 2010 |

# CONSIDERAÇÕES FINAIS

● O estudo revelou uma expressiva riqueza de espécies no PARNA Viruá, apresentando 69 espécies distribuídas em 45 gêneros.

● Entre estas, uma é um novo taxon para ciência (*Lockhartia viruensis* Pessoa & Alves), três são novos registros para o Brasil, e 19 são registradas pela primeira vez para o estado de Roraima.

● As 69 espécies presentes no PARNA Viruá representam 25% do total de espécies conhecidas até agora para o estado, e os 45 gêneros representam 50%.

● Os gêneros mais diversos foram *Epidendrum* L. (nove spp.) e *Catasetum* Rich. *ex* Kunth (cinco spp.).

● Cerca de 40% das espécies são endêmicas da Floresta Amazônica, e aproximadamente 10% endêmicas do escudo Guianense.

● Na área de estudo as áreas florestais se mostraram mais ricas em espécies que as áreas abertas (Campinaranas). Já entre as áreas florestais, obsevou-se que as florestas inundáveis são mais ricas que as florestas de terra-firme.

● Durante a procura por inventários da família Orchidaceae para a região noroeste da América do Sul pode-se perceber o pobre conhecimento sobre a composição florística de Orchidaceae no Oeste e Centro-Oeste da Amazônia.

● As análises biogeográficas de uma forma geral corroboraram com estudos prévios de biogeografia da Améica do Sul, o Parque Nacional Viruá (parte do Centro de Endemismo Guiana) se agrupou com áreas no Pará que fazem parte do Centro de Endemismo Guiana (Caxiuanã), Belém (Ilha do Combu) e Xingú (Serra das Andorinhas e Serra de Carajás).

# APÊNDICES

**1.** A new *Anathallis* Barb. Rodr. (Orchidaceae: Pleurothallidinae) from the Brazilian Amazon. Phytotaxa 73: 13-16.

**2.** Orchidaceae from Viruá National Park, Brazilian Amazon, Guyana Shield – Guia de Imagens Field Museu**m**

**3.** Normas dos periódicos

## A new *Anathallis* Barb. Rodr. (Orchidaceae: Pleurothallidinae) from the Brazilian Amazon

EDLLEY PESSOA[1] & MARCCUS ALVES[2]

[1]*Programa de Pós-Graduação em Biologia Vegetal, Departamento de Botânica, Universidade Federal de Pernambuco, CEP: 50670-901, Recife, Pernambuco, Brazil; e-mail: edlley_max@hotmail.com*

[2]*Departamento de Botânica, Universidade Federal de Pernambuco, CEP: 50670-901, Recife, Pernambuco, Brazil; e-mail: alves.marccus@gmail.com*

**Abstract**

A new *Anathallis* Barb. Rodr. species is described from the Brazilian Amazon, state of Amazonas. It is known only from the central Amazon. The unlobed lip distinguishes it from morphologically related species.

**Keywords:** Amazon, Diversity, *Anathallis*, Epiphytes, *Panmorphia*.

**Resumo**

Uma nova *Anathallis* Barb. Rodr. é descrita para a Amazônia brasileira, estado do Amazonas. É conhecida apenas para Amazônia central. O labelo não lobado distingue-a das espécies morfologicamente relacionadas.

## Introduction

*Anathallis* Barbosa Rodrigues (1877: 23) is a neotropical orchid genus with about 161 spp. (Govaerts *et al.* 2012; Luer & Toscano-de-Brito 2011). The genus was re-established by Pridgeon & Chase (2001), and comprises species originally placed in *Pleurothallis* sect. *Muscosae* Lindley (1842: 82) and *P.* subg. *Acuminatia* Luer (1999: 98).

Species of *Anathallis* are epiphytic, caespitose to repent plants with a secondary stem about as long as the leaf, with an annulus. Lateral sepals may be totally free to connate and the lip is hinged to the column foot (Pridgeon & Chase 2001).

Barros *et al.* (2012) cited 80 spp. of *Anathallis* from Brazil, ten of which were recorded from the Amazon Basin. These ten species are morphologically similar, and according to Luer (2006), they should be treated under the genus *Panmorphia* Luer (2006: 144).

In a recent study conducted at the Brazilian herbaria INPA and HUAM (Herbarium of the Universidade Federal do Amazonas), several vouchers of a new Amazonian *Anathallis* species were found. It is clearly related to the *Panmorphia* group, and it is described and illustrated below, and its affinities with the allied species are also discussed.

### ***Anathallis amazonica*** **E.Pessoa & M.Alves**, ***sp. nov.*** **(Fig. 1)**

Type:—BRAZIL. Amazonas: Coari, Campo Petrolífero do Rio Urucu, 04º08'25"S, 65º33'13"W, 70m, 09 May 1993, *J. da Cruz 242* (fl,fr) (holotype INPA, isotypes: UFP, HUAM).

*A. amazonica* is morphologically related to *A. holstii* (Carnevali & Ramírez) Luer, *A. polygonoides* (Griseb.) Pridgeon & M. W. Chase and *A. sertularioides* (Sw.) Pridgeon & M. W. Chase, but differs especially by having an oblong entire lip, it is tri-lobed in the others.

Epiphytic, sub-repent herb. Roots fasciculate, about 0.5–1.0 mm wide. Rhizome 0.9–1.1 mm wide, branched. Secondary stem 2.2–5.1 × 0.4–0.7 mm, cylindrical, unifoliate, concealed by one white to gray, close-fitting, membranaceous sheath, 2.5–5.0 mm long,

acute or obtuse apex, striate, entire margin. Leaf 5.0–19.0 × 1.2–3.0 mm, oblanceolate to elliptic, pale green, coriaceous, glabrous, acute apex, rarely minutely tridenticulate, attenuate to obtuse base, entire margin. Inflorescence terminal, congested, fasciculate, erect; peduncle and rachis inconspicuous; floral bracts about 1.0–1.1 mm long, amplexicaule, membranaceous, acute to acuminate apex, entire margin. Flowers 1–4, reddish maroon (according to the collector), these opening successively; pedicellate ovary 1.2–1.5 × 0.1–0.3 mm; dorsal sepal 3.0–3.5 × 0.8–1.3 mm, free, lanceolate, membranaceous, acute apex, entire margin, 3–nerved; lateral sepals 3.0–3.5 × 0.6–1.0 mm, connate up to ¼ from base, lanceolate, sub-falcate, membranaceous, acute apex, entire margin, 3–nerved, forming a small mentum with the column foot; petals 1.8–2.6 × 0.3–0.6 mm, free, narrow elliptic, sub-falcate, membranaceous, acute to rounded apex, entire margin, 1–nerved; lip 1.5–2.0 × 0.3–0.5 mm, free, oblong, rounded apex, with two basal appendages, ciliate margin from the base up to the middle, entirely ciliate or sometimes not ciliate, papillose, 3–nerved, articulated with the column foot; column about 1.0–1.3 mm long, broadly winged, clinandrium 5–dentate, obtuse apex, entire margin, column foot about 0.2 mm long. Fruit 2.5–3.0 × 1.2–1.5 mm, obovoid, glabrous.

**Distribution and Ecology:**—This species is known only from the type locality, in the central Brazilian Amazon, state of Amazonas. The vegetation is characterized by moist tropical lowland forest, locally called "terra firme" forest (Lima *et al.* 2008). The flowering period is poorly known, but based on the cited vouchers, flowers can be observed in Feb-July.

**Etymology:**—The new species is named on behalf of the area of occurrence, Brazilian Amazon basin.

**Morphological affinities:**—*Anathallis amazonica* is morphologically related to species placed in *Panmorphia* by Luer. The new species has a sub-repent habit like *A. holstii* (Carnevali & I. Ramírez 1986: 18) Luer (2009: 258) and *A. polygonoides* (Grisebach 1864: 609) Pridgeon & M. W. Chase (2001: 250). Leaf shape appears to vary: the leaves on the mature branches are oblanceolate like *A. sertularioides* (Swartz 1788: 122) Pridgeon & M. W. Chase (2001: 250), while on the immature branches they are elliptic as is found in *A. holstii* and *A. polygonoides*. The inflorescences have an inconspicuous peduncle and the flowers appear to arise from the same point like *A. holstii* and *A. polygonoides.* In *A. sertularioides,* the inflorescence is long pedunculate. The flowers on *A. amazonica* have narrow elliptic petals like *A. sertularioides*, but *A.*

*polygonoides* and *A. holstii* have broadly elliptic petals. The lip of *A. amazonica* is oblong and ciliate from the base up to the middle, entirely ciliate or sometimes not ciliate. However, the three related species have a slightly tri-lobed to clearly tri-lobed lip with an entire margin (Table 1).

**Additional specimens examined:**—BRAZIL. Amazonas: Coari, Campo Petrolífero do Rio Urucu, 10 February 1992, fl., *J. da Cruz 240* (INPA); 03 April 1992, fl., *J. da Cruz 241* (INPA); 11 May 1992, fl., *J. da Cruz 243* (INPA); 17 June 1992, fl., *J. da Cruz 239* (INPA); 03 July 1992, fl., *J. da Cruz 244* (HUAM) 05 May 1996, fl., *J. da Cruz et al. 471* (HUAM).

**Acknowledgments**

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**FIGURE 1.** *Anathallis amazonica* (*J. da Cruz 242* – holotype; *J. da Cruz 240* – paratype; *J. da Cruz 243* – paratype) **A.** Flowering habit with oblanceolate leaves. **B**. Fruiting habit with elliptic leaves. **C.** Tridenticulate leaf apex. D. Acute distended leaf apex. E. Acute twitched leaf apex. F. Detail of the inflorescence. G. Dissected perianth. H. Lip ciliate on the base. I. Lip entirely ciliate. J. Lip not ciliate. K. Column.

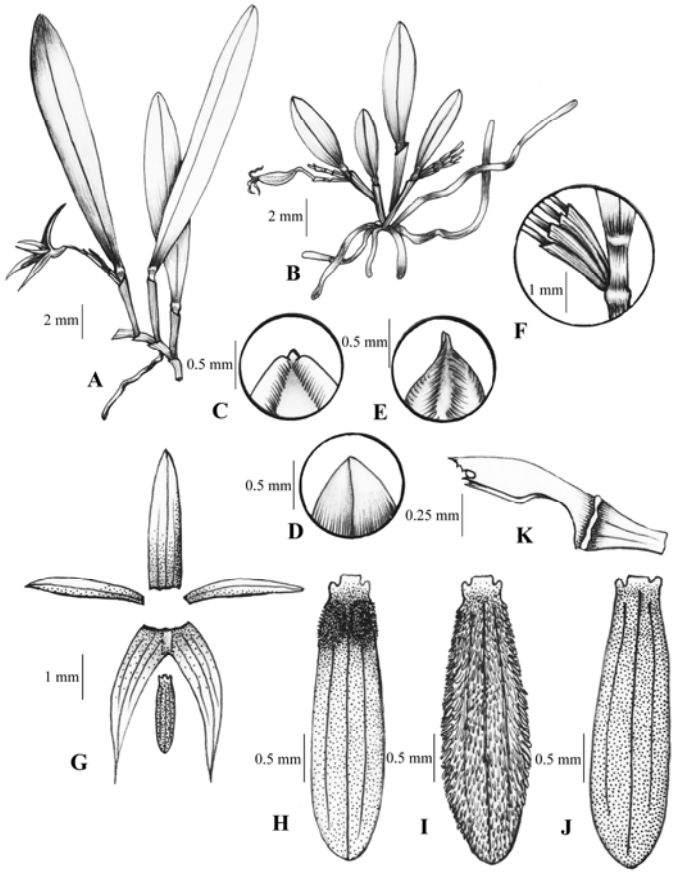



**TABLE 1.** Comparison of morphological characteristics of *A. amazonica* and the related species.

| Characters | *A. holstii* | *A. polygonoides* | *A. sertularioides* | *A. amazonica* |
|---|---|---|---|---|
| **Habit** | sub-repent to caespitose | sub-repent | sub-repent | sub-repent |
| **Leaves** | elliptic, broadly elliptic, or obovate | elliptic | oblanceolate | elliptic to oblanceolate |
| **Inflorescence** | inconspicuous peduncle | inconspicuous peduncle | long pedunculate | inconspicuous peduncle |
| **Petals** | broadly elliptic | brodly elliptic | narrowly elliptic | narrowly elliptic |
| **Lip** | minutely trilobed to trilobed | trilobed | minutely trilobed | entire |

## Orchidaceae from Viruá National Park, Brazilian Amazon, Guyana Shield

# Orchidaceae from Viruá

**Edlley Max Pessoa[1]; Fábio de Barros[2] & Marccus Alves[1]**

1 Universidade Federal de Pernambuco (UFPE), Departamento de Botânica, Laboratório de Morfo-taxonomia Vegetal, Recife/PE, Brazil

2. Instituto de Botânica de São Paulo (IBT), Núcleo de Pesquisa Orquidário Carlos Hoehne, São Paulo/SP, Brazil.

Photos by E. Pessoa, except #75 (J. Vaslko) and #69 (I. Coelho).



**1** Plant Formation: Campinarana

**2** Plant Formation: Transition Campinarana/Ombrophylous forest

**3** Plant Formation: Flooded forest

**4** **Acianthera** miqueliana (Flower) Epiphyte

**5** **Acianthera** miqueliana (Flowering plant) Epiphyte

**6** **Aganisia** cyanea (Flowers) Epiphyte

**7** **Aganisia** cyanea (Flowering plant) Epiphyte

**8** **Aspasia** variegata (Flowers) Epiphyte

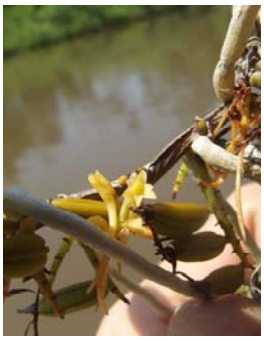
**9** **Aspasia** variegata (Plant) Epiphyte

**10** **Aspidogyne** foliosa (Flowers) Terrestrial

**11** **Aspidogyne** foliosa (FloweringPlant) Terrestrial

**12** **Brassavola** martiana (Flowers) Epiphyte

**13** **Brassia** caudata (Flowers) Epiphyte



**14** **Campylocentrum** huebneri (Flowers) Epiphyte

**15** **Campylocentrum** micranthum (Flowers) Epiphyte

**16** **Campylocentrum** micranthum (Flowering Plant) Epiphyte

**17** **Campylocentrum** poeppgii (Flowers) Epiphyte

**18** **Campylocentrum** poeppgii (Flowering Plant) Epiphyte

## Orchidaceae from Viruá National Park, Brazilian Amazon, Guyana Shield

**2**

# Orchidaceae from Viruá

**Edlley Max Pessoa[1]; Fábio de Barros[2] & Marccus Alves[1]**

1 Universidade Federal de Pernambuco (UFPE), Departamento de Botânica, Laboratório de Morfo-taxonomia Vegetal, Recife/PE, Brazil

2. Instituto de Botânica de São Paulo (IBT), Núcleo de Pesquisa Orquidário Carlos Hoehne, São Paulo/SP, Brazil.

Photos by E. Pessoa, #75 (J. Vaslko) and #69 (I. Coelho).



19 **Catasetum** discolor ♀
(Flowers)
Epiphyte/terrestrial

20 **Catasetum** discolor ♂
(Flowers)
Epiphyte/terrestrial

21 **Catasetum** discolor ♂
(Flowering plant)
Epiphyte-terrestrial

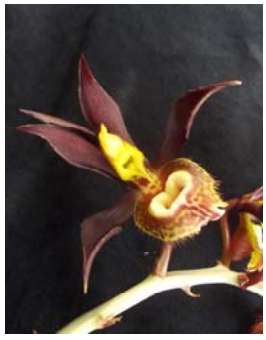
22 **Catasetum** longifolium
(Flowers)
Epiphyte

23 **Catasetum** longifolium
(Plant epiphyting Mauritia flexuosa)
Epiphyte

24 **Catasetum** macrocarpum
(Flowers)
Epiphyte

25 **Catasetum** *x* roseoalbum
(Flowers)
Epiphyte

26 **Catasetum** *x* roseoalbum
(Flowering plant)
Epiphyte



27 **Catasetum** saccatum
(Flower)
Epiphyte

28 **Cattleya** violacea
(Flowers)
Epiphyte

29 **Christensonella** uncata
(Flower)
Epiphyte

30 **Christensonella** uncata
(Flowering plant)
Epiphyte

31 **Cleistes** rosea
(Flower)
Terrestrial

32 **Cleistes** rosea
(Flowering plant)
Terrestrial

33 **Cohniella** cebolleta
(Flowers)
Epiphyte

34 **Cohniella** cebolleta
(Flowering plant)
Epiphyte

35 **Dichaea** picta
(Flower)
Epiphyte

36 **Dichaea** picta
(Flowering plant)
Epiphyte

37 **Dimerandra** emarginata
(Flower)
Epiphyte

38 **Epidendrum** anceps
(Flowers)
Epiphyte

## Orchidaceae from Viruá National Park, Brazilian Amazon, Guyana Shield

**3**

# Orchidaceae from Viruá

**Edlley Max Pessoa[1]; Fábio de Barros[2] & Marccus Alves[1]**

1 Universidade Federal de Pernambuco (UFPE), Departamento de Botânica, Laboratório de Morfo-taxonomia Vegetal, Recife/PE, Brazil

2. Instituto de Botânica de São Paulo (IBT), Núcleo de Pesquisa Orquidário Carlos Hoehne, São Paulo/SP, Brazil.

Photos by E. Pessoa, #75 (J. Vaslko) and #69 (I. Coelho).



**39** **Epidendrum** carpophorum
(Flower)
Epiphyte

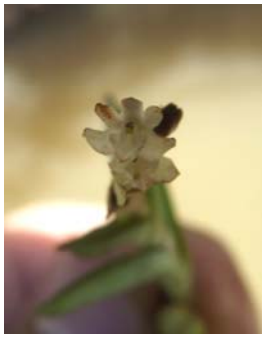
**40** **Epidendrum** coronatum
(Flowers)
Epiphyte

**41** **Epidendrum** nocturnum
(Flower)
Epiphyte

**42** **Epidendrum** orchidiflorum
(Flowers)
Terrestrial

**43** **Epidendrum** purpurascens
(Flowers)
Epiphyte

**44** **Epidendrum** rigidum
(Flowers)
Epiphyte



**45** **Epidendrum** strobiliferum
(Flowers)
Epiphyte

**46** **Epidendrum** viviparum
(Flowers)
Epiphyte

**47** **Epistephium** parviflorum
(Flower)
Terrestrial

**48** **Epistephium** parviflorum
(Flowering plant)
Terrestrial

**49** **Galeandra** devoniana
(Flowers)
Epiphyte

**50** **Galeandra** devoniana
(Fruited plant)
Epiphyte

**51** **Habenaria** schwackei
(Flowers)
Terrestrial

**52** **Ligeophila** juruenensis
(Flowers)
Terrestrial

**53** **Liparis** nervosa
(Flowers)
Terrestrial

**54** **Liparis** nervosa
(Flowering plant)
Terrestrial

**55** **Lockhartia** viruensis
(Flower)
Epiphyte

**56** **Lockhartia** viruensis
(Flowering plant)
Epiphyte

**57** **Lophiaris** nana
(Flower)
Epiphyte

**58** **Macradenia** lutescens
(Flowers)
Epiphyte

## Orchidaceae from Viruá National Park, Brazilian Amazon, Guyana Shield **4**

# Orchidaceae from Viruá

**Edlley Max Pessoa[1]; Fábio de Barros[2] & Marccus Alves[1]**

1 Universidade Federal de Pernambuco (UFPE), Departamento de Botânica, Laboratório de Morfo-taxonomia Vegetal, Recife/PE, Brazil

2. Instituto de Botânica de São Paulo (IBT), Núcleo de Pesquisa Orquidário Carlos Hoehne, São Paulo/SP, Brazil.

Photos by E. Pessoa, #75 (J. Vaslko) and #69 (I. Coelho).



**59** **Maxillariella** alba
(Flower)
Epiphyte

**60** **Maxillariella** alba
(Flowerinf plant)
Epiphyte

**61** **Nohawilliamsia** pirarensis
(Flower)
Terrestrial

**62** **Notylia** angustifolia
(Flowers)
Epiphyte

**63** **Ornithocephalus** ciliatus
(Flowers)
Epiphyte

**64** **Ornithocephalus** ciliatus
(Flowering plant)
Epiphyte

**65** **Pabstiella** yauaperiensis
(Flowers)
Epiphyte

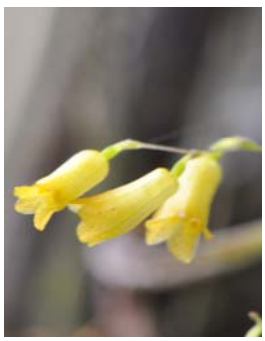
**66** **Pabstiella** yauaperiensis
(Flowering plant)
Epiphyte

**67** **Pleurothallis** pruinosa
(Flowers)
Epiphyte

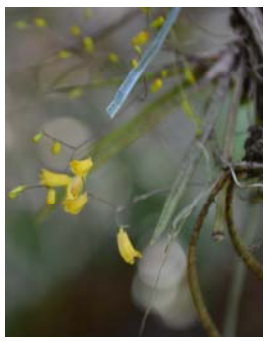
**68** **Polystachya** foliosa
(Flowers)
Epiphyte

**69** **Prosthechea** fragrans
(Flowers)
Epiphyte

**70** **Prosthechea** vespa
(Flowers)
Epiphyte



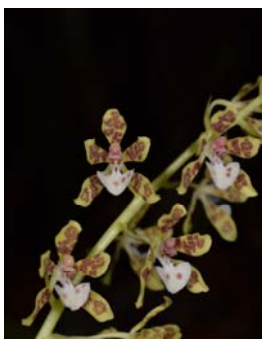
**71** **Quekettia** microscopica
(Flowers)
Epiphyte



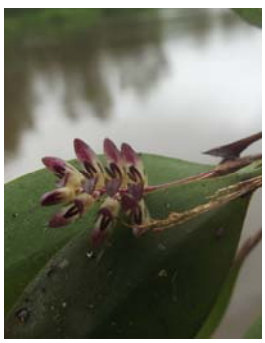
**72** **Quekettia** microscopica
(Flowering plant)
Epiphyte

**73** **Sarcoglottis** amazonica
(Flower)
Terrestrial

**74** **Scaphyglottis** sickii
(Fruits and Flowers)
Epiphyte



**75** **Solenidium** lunatum
(Flowers)
Epiphyte



**76** **Trichosalpinx** egleri
(Flowers)
Epiphyte

**77** **Trigonidium** acuminatum
(Flowers)
Epiphyte

**78** **Vanilla** appendiculata
(Flowering plant)
Hemi-epiphyte

## NORMAS DOS PERIÓDICOS

**Brittonia:** www.springer.com/life+sciences/plant+sciences/journal/12228

**Checklist:** www.checklist.org.br/guidelines

**Phytotaxa:** www. Mapress.com/phytotaxa/author.htm

**Edinburg Journal of Botany:** http://assets.cambridge.org/EJB/EJB_ifc.pdf