ISSN 0370-6583

RODRIGUÉSIA

Revista do Jardim Botânico do Rio de Janeiro

Volume 56 Número 88 2005

RODRIGUÉSIA

Revista do Jardim Botânico do Rio de Janeiro

Volume 56 Número 88 2005

JARDIM BOTÂNICO DO RIO DE JANEIRO

INSTITUTO DE PESQUISAS
JARDIM BOTÂNICO DO RIO DE JANEIRO

Rua Jardim Botânico 1008 - Jardim Botânico - Rio de Janeiro - RJ - Tel.: 3204-2519- CEP 22460-180

ISSN 0370-6583

Indexação:
e-Journals
Index of Botanical Publications (Harvard University Herbaria)
Latindex
Referativnyi Zhurnal
Review of Plant Pathology
Ulrich's International Periodicals Directory

Edição eletrônica:
www.jbrj.gov.br

Rodriguésia
A Revista Rodriguésia publica artigos e notas científicas em todas as áreas da Biologia Vegetal, bem como em História da Botânica e atividades ligadas a Jardins Botânicos.

Ficha catalográfica:

Rodriguésia: revista do Jardim Botânico do Rio de Janeiro. -- Vol.1, n.1 (1935) - .- Rio de Janeiro: Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, 1935-

v. : il. ; 28 cm.

Quadrimestral
Inclui resumos em português e inglês
ISSN 0370-6583

1. Botânica I. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro

CDD - 580
CDU - 58(01)

Editoração
Carla M. M. Molinari

Edição on-line
Renato M. A. Pizarro Drummond

Secretária
Georgina M. Macedo

Editorial

Dentre as incontáveis peculiaridades dos vegetais terrestres, a morfologia singular das espécies de Araceae desfruta de posição de destaque. As primeiras descrições botânicas de representantes europeus da família, realizadas por L. Fuchs e J. Ray nos séculos XVII e XVIII, foram seguidas pela descoberta de centenas de espécies. No século XIX têm grande destaque as obras de H. W. Schott e H. A. Engler, que constituem base e inspiração para os muitos estudos realizados por pesquisadores contemporâneos. No entanto, ainda há muito para se conhecer sobre a sistemática deste grupo e sobre outros aspectos de sua biologia, particularmente no neotrópico, que abriga a maior diversidade de espécies.

Neste cenário e como marco do encerramento das comemorações dos 70 anos de publicação da Rodriguésia, foi proposto um número especial dedicado a estudos em Araceae no neotrópico. Este fascículo é formado por contribuições de pesquisadores oriundos de instituições do Brasil, Estados Unidos, França, Guiana Francesa, Peru e Reino Unido. A taxonomia da família é tema de uma revisão de gênero, um artigo de nomenclatura, cinco artigos com descrição de novos táxons e uma flora regional. Sessenta e uma espécies novas são descritas nestes artigos, entre elas um grande número com ocorrência em áreas pouco conhecidas. Dois estudos completam o fascículo. O primeiro trata de morfologia e forma de vida, contribuindo para esclarecer questões conceituais e de terminologia e o segundo aborda anatomia da espata e de folhas, buscando caracteres diagnósticos para espécies de *Anthurium*.

A publicação deste número contou, em diversas etapas, com a valiosa contribuição de Marcus Alberto Nadruz Coelho, ao qual somos gratos.

Leandro Freitas
Gestor do Corpo Editorial

Rafaela Campostrini Forzza
Editora-chefe

Guanghua Zhu 1964-2005

Guanghua Zhu, Associate Curator at the Missouri Botanical Garden, was born in Manzhouli, Inner Mongolia in the Peoples Republic of China on January 17, 1964. Guanghua's parents moved from Central China with some of Guanghua's older siblings, walking and carrying their belongings much of the way. His father eventually got a job with the national railroad company working in the switchyards in Manzhouli, a major railhead for merchandise exchanged with Russia. Railroad workers lived in a small community near the edge of town and some land was available to his parents to grow crops. The growing season was short at this latitude and his parents grew carrots, cabbage and potatoes. After harvesting, the crops were buried in a hole outside the house and covered with straw to provide food during the winter months. His entire family slept in a large concrete bed covered with a mattress. The stove was built into the bed and a network of chambers passed through the bed to allow the smoke to pass outside. This insured that the bed remained warm during the long, cold nights.

From these humble beginnings, Guanghua Zhu prospered and gained great prestige both in China and in the United States. In 1985 at age 21 he graduated with a BS degree in Biology at the Inner Mongolia Teacher's University in Hohhot, China. From June 1985 through May of 1988 he worked as a Teaching Assistant of Systematic Botany at the university. In 1988 he received his MS degree in plant systematics from Inner Mongolia Teacher's University. During 1986 he also worked as a Research Assistant for the Institute of Grasslands at the Chinese Department of Agriculture in Hohhot.

From June 1988 through July of 1990 Guanghua was a Ph.D. candidate and Research Assistant at the Laboratory of Evolution and Systematic Botany, Institute of Botany, Chinese Academy of Sciences in Beijing.

While Guanghua was in Beijing he met David Boufford and Bruce Bartholomew, two of the first western botanists to visit China after the reopening of the country to foreigners. Guanghua accompanied them on trips to the field and the American botanists were very impressed with him and wished to help him develop his career. David Boufford recommended that he try to come to the United States to pursue his Ph.D. degree and suggested that he try the Missouri Botanical Garden. Boufford gained the assistance of Peter Raven who was interested in greater contacts with China following the initiation of the Flora of China Project in 1988.

Guanghua applied for and received entrance into the University of Missouri-St. Louis, arriving in St. Louis in the fall of 1990 shortly after the semester had already started. From August of 1990 to August of 1992 he was a Teaching and Research Assistant at the University of Missouri. He began working for the Missouri Botanical Garden's Flora of China at Project while still a Ph.D. Candidate and held that position from September 1992 to September 1995.

I believe that it was probably in the fall of 1990 that I first met Guanghua Zhu when he walked into my office at the Garden and asked if I would consider being his major professor. David Boufford had suggested that he contact me to work on Araceae. I suggested *Dracontium*, a difficult genus but one I deemed to be about the right size for a Ph.D. thesis. Admittedly I was dubious about his ability to deal with a project of this scope and initially he was discouraged but kept forging on and eventually he completed a thorough and well-written thesis. He obtained a National Science Foundation Ph.D. thesis award, traveled to Central and South America to do field work and made numerous contacts in the horticultural and botanical community to get the necessary materials for his thesis. Understanding

Dracontium required that he accumulate living material because herbarium material was notoriously difficult to determine. He made contacts all over the neotropics and learned from them. He had nearly all species in cultivation at the Garden.

From April through June, 1992 Guanghua attended the Organization for Tropical Studies course in Tropical Ecology in Costa Rica at La Selva. During the remainder of the summer and fall of 1992 as well in 1993, he worked on a US Army Corps of Engineers project making a floristic survey of the Upper Mississippi basin. In 1993 he received a National Science Foundation Doctoral Dissertation Grant to do field work and molecular studies of *Dracontium*.

In August of 1993 Guanghua went to Japan for the XVI International Botanical Congress. Following the congress we went together to Hong Kong, visited the botanical garden in Guangzhou where we stayed at the botanical garden's guest house. Next we flew to Hohhot where Guanghua had gone to school and I met many of his old professors and close friends. While in Hohhot one of his professors drove us up onto Mongolian plateau and we had lunch in a yak herder's yurt. Later we flew north to Hailar then took a train to his hometown of Manzhouli in Inner Mongolia near the Siberian border and I met all of his immediate family. We stayed with one of his sisters who had an apartment in the middle of town and sometimes bicycled out to visit his parents who lived in a community of current and former railroad employees. Most mornings his mother would arrive at the apartment for breakfast, bringing bags of fresh deep fat-fried bread that we ate with rice porridge. The markets in Manzhouli were rich in Russian goods including many fine furs. I asked Guanghua to purchase some things for me but his mother laughed when we told her what we paid and she would go off and purchase another for a much better price.

Guanghua had a wonderful family, with an older brother and three older sisters, all living near their parents in Manzhouli. Guanghua showed me where he attended high school and talked about his odyssey of moving from a small Chinese city, to the much larger city of Hohhot for his undergraduate studies and how he later made contact with North American botanists.

On the weekend we took a family outing to Hulun Nur, a large lake whose drainage formed the border with Siberia. There we had a large fish dinner and Guanghua and I collected plants in the area. Everywhere we went in China Guanghua had the trip well organized. We were met at each stop by friends who had already made arrangements for our lodging, taking care that we received the local rate and not the tourist rate. Finally before going back to the States we spent a few days in Bejing where we participated in the IV Chinese Drug Symposium held October 4-6, 1993.

During the summer of 1994 he traveled with me to Panamá and visited most parts of the country including Bocas del Toro, Chiriquí, El Llano-Cartí Road, El Copé, Cerro Colorado, and several areas in Panamá Province. We even flew to Darién Province and made a trek up onto Cerro Pirre. This was Guanghua's first trip to the tropics and he was excited by the collecting that we did. During this trip we collected many new species including a new species of *Dracontium*.

Typically we would collect most of the day then hole up in some small place with lights to process our collections. While I described the plants in my field book, Guanghua pressed the specimens. Since a lot of *Dieffenbachia* have a caustic burning sap, Guanghua was complaining one evening about getting sap burns. At the time he was pressing a specimen that I thought had non-caustic sap so as a way of showing him that he was being unnecessarily critical, I bit into the stem to show him that the stems were not really caustic. Much to my surprise this species was so caustic that I had to rush off to the bathroom to wash out my mouth (but I did not let on to Guanghua that I had been burned).

Guanghua soon grew tired of eating the food I had bought for our field trips, mostly sardines and canned meat that we ate with bread. Preferring to have a meal that included rice he decided to drive off in the vehicle one night during a rainstorm to go to a small restaurant where they served a typical Panamanian meal with rice.

Guanghua was a great believer in Chinese herbal medicine. Once when I got a serious cut in my leg caused by trying to jump over a log while wearing tree climbers, he opened his pack and sprinkled some special powder over the wound. He always claimed that he had saved my life that day since we were too far from hospital care to have the wound sewn up.

In 1995 Guanghua participated in the VI International Aroid Conference, Kunming, June 26-July 1, 1995. While in Kunming we took several side trips, one of which included Bob Thorne whom Guanghua called his "academic grandfather" because Thorne had been the professor of Jack Carter, who was my professor in college. We took another trip to western Yunnan Province and later went to Sichuan Province to collect with a friend of his. This trip took us about one day north to Juizhaigou with a side trip to Hongyuan Province out on the Mongolian plateau. Again Guanghua organized the trip so that I could take advantage of the trip to see more of China. On one occasion we went to a party given by the governor of the County.

Guanghua defended his thesis and graduated with his Ph.D. in 1996. After graduation he was offered a position as Research Assistant at the Missouri Botanical Garden working on the Flora of China Project with Ihsan Al-Shehbaz. This work took him repeatedly to China where he was responsible for interacting with collaborating Chinese authors. Guanghua was the principal translator for all of the volumes of illustrations of Chinese plants, contributed families himself and translated the 1999 Code of Botanical Nomenclature into Chinese. He regularly translated herbarium labels for Garden personnel. During the course of his career, Zhu made many collecting trips, mostly in Asia but also in Japan and Russia.

Among the noteworthy areas of recognition received by Guanghua Zhu are the Raju Mehra Award from the Department of Biology at the University of Missouri-St. Louis in 1993 and the Wang Kuanachen Award from the Chinese Academy of Sciences in 1998. He had been awarded scientific research awards, including a National Science Award for production of the Flora of China in 1996 as well as National Geographic Society Awards in 1996 and in 1999. He was a Committee Member for the Flora of China project at the Missouri Botanical Garden since 1986. Since 1999 he was the Managing Committee Member for the Orchid Society of China in Beijing and since 2000 was the Director of the International Center of Orchid Research and Conservation in Menglun, Yunnan Province in China.

Guanghua was also an adjunct Assistant staff member at the University of Missouri and had two students at the university, as well as a student at the Chinese Academy of Sciences in Beijing.

The passing of Guanghua Zhu will certainly leave a void in the Flora of China Project but his cheery and friendly personality and his particularly broad suite of skills will be sorely missed by all.

Thomas B. Croat
Missouri Botanical Garden

Sumário/Contents

Diversidade morfológica e formas de vida das Araceae no Parque Estadual do Rio Doce, Minas Gerais

Lívia Godinho Temponi[1], *Flávia Cristina Pinto Garcia*[2], *Cássia M. Sakuragui*[3] & *Rita Maria de Carvalho-Okano*[2]

Resumo

(Diversidade morfológica e formas de vida das Araceae no Parque Estadual do Rio Doce, Minas Gerais) Araceae apresenta uma morfologia e terminologia específica, que pode ocasionar dificuldades de compreensão. Além disso, alguns conceitos adotados para a família, são discordantes entre os especialistas do grupo. Para uma compreensão profunda de tal morfologia, bibliografias especializadas são requeridas. No levantamento das espécies de Araceae do Parque Estadual do Rio Doce (PERD) foram encontradas 13 espécies e oito gêneros (incluindo aqueles com maior diversidade específica, *Anthurium* e *Philodendron*). Uma síntese ilustrada da morfologia e terminologia dos gêneros e espécies do PERD é apresentada, visando uma melhor compreensão da morfologia e taxonomia geral da família.

Palavras-chave: Araceae, morfologia, formas de vida.

Abstract

(Morphological diversity and life forms in Araceae from the Rio Doce State Park, Minas Gerais) The use of specialized terms for some morphological features in Araceae can cause problems in understanding for the general reader and there are not always agreements among taxonomic specialists of the correct usage of some descriptive terminologies. For a complete understanding of this morphology, specialized literature must be consulted. In an inventory of Araceae from the Rio Doce State Park (PERD) the morphology of 13 species and 8 genera was studied (including *Anthurium* and *Philodendron*). An illustrated overview of the morphology and terminology of the genera and species from the PERD is presented aiming a better understanding of the morphology and taxonomy of the family.

Key-words: Araceae, morphology, life forms.

Introdução

Araceae pode ser caracterizada por apresentar inflorescência em espádice, associada a uma bráctea, a espata, flores pequenas, actinomorfas, sem bractéolas, gineceu gamocarpelar, fruto baga e a presença, até onde é conhecido, de taninos (Grayum 1990).

As Araceae são mais diversas e abundantes em áreas tropicais úmidas, onde são encontradas em uma grande variedade de formas de vida. De acordo com Grayum (1990) aproximadamente 70% das espécies de Araceae são epífitas, hemi-epífitas e trepadeiras, apesar de muitas espécies ocorrerem como terrestres ou aquáticas. Croat (1988) relatou que as plantas epífitas (incluindo as hemi-epífitas) crescem em árvores ou arbustos e por isso, geralmente, ocorrem em florestas de áreas úmidas, podendo ser indicadoras de umidade de uma determinada região; os gêneros terrestres, por outro lado, apresentam-se mais diversos ecologicamente, ocorrendo tanto em hábitat úmido quanto muito seco. No neotrópico, há um total de 22 gêneros estritamente terrestres e muitos destes são bem adaptados para se desenvolverem em condições extremas de

Artigo recebido em 09/2004. Aceito para publicação em 05/2005.

[1]Programa de Pós-Graduação em Botânica da Universidade Federal de Viçosa, Instituto de Biologia Vegetal, 36570-000, Viçosa, MG, Brasil. Endereço atual: Universidade de São Paulo, Departamento de Botânica, IB, Caixa Postal 11461, 05422-970, São Paulo, SP. E-mail: liviatemponi@bol.com.br

[2]Universidade Federal de Viçosa, Instituto de Biologia Vegetal, CEP 36.570-000, Viçosa, MG, Brasil.

[3]Universidade Estadual de Maringá, Av. Colombo 3690, CEP 80.001-970, Maringá, PR, Brasil.

baixa temperatura ou seca, apresentando um período de crescimento interrompido quando sob condições severas (Croat 1988).

A circunscrição das subfamílias de Araceae tem apresentado modificações desde Engler & Krause (1920). Nesta obra, os autores descrevem: Pothoideae, Monsteroideae, Lasioideae, Calloideae, Philodendroideae, Colocasioideae, Aroideae e Pistioideae. Posteriormente, Grayum (1990) circunscreve Pothoideae (incluindo Monsteroideae), Calloideae (incluindo Philodendroideae) Aroideae (incluindo Pistioideae) e mantém Lasioideae e Colocasioideae. Trabalhos mais recentes como a filogenia de French *et al.* (1995) baseada em dados moleculares (cpDNA) e o de Mayo *et al.* (1997) que se baseia na utilização de 63 caracteres morfológicos, incluindo anatômicos, propõem sete subfamílias monofiléticas; Gymnostachydoideae, Orontioideae, Pothoideae, Monsteroideae, Lasioideae, Calloideae e Aroideae. A subfamília Aroideae senso French *et al.* (1995) e Mayo *et al.* (1997) inclui duas outras; Colocasioideae e Philodendroideae, além de Lemnaceae, que foram tratadas como distintas nos sistemas de classificação anteriores. Os padrões de colênquima propostos por Gonçalves *et al.* (2004) não suportam a distinção de Colocasioideae, Aroideae e Philodendroideae, corroborando com as hipóteses de French *et al.* (1995). Através da compilação de dados anatômicos Keating (2004), propõe o mais recente tratamento para a família, descreve uma nova subfamília; Schismatoglottidoideae e mantém Gymnostachydoideae, Orontioideae, Pothoideae, Lasioideae, Calloideae, Philodendroideae, Lemnoideae e Aroideae como subfamílias distintas.

A grande plasticidade fenotípica e a heteroblastia (morfologia do caule e das folhas refletindo as diferenças das fases de desenvolvimento), são freqüentes na família como um todo. Na maioria das vezes, plantas juvenis podem produzir folhas com formas distintas das presentes em plantas adultas (Croat 1988). Esta grande variabilidade morfológica e a carência de observações no campo contribuem para gerar descrições incompletas, não abrangendo as variações morfológicas que podem ocorrer na população, ocasionando, muitas vezes, enganos na identificação das espécies ou proliferação de nomes. Além disso, muitas espécies são pouco coletadas em função do porte avantajado e das inflorescências carnosas, difíceis de serem tratadas para uma boa herborização.

As Araceae, pela complexidade de sua sistemática e pelas peculiaridades morfológicas de suas folhagens e inflorescências, têm despertado o interesse de muitos botânicos. Entretanto, sua morfologia bastante diferenciada dos demais grupos vegetais resulta em uma nomenclatura própria, dificultando sua compreensão. Levando-se em conta os fatores relatados, este trabalho foi realizado com o intuito de informar sobre a morfologia de alguns gêneros da família, freqüentes na flora brasileira e ocorrentes no PERD, visando contribuir para uma melhor compreensão da morfologia das Araceae em leituras posteriores.

Material e Métodos

Durante o levantamento florístico das Araceae do Parque Estadual do Rio Doce (Temponi 2001), a maior área de floresta tropical contínua de Minas Gerais (35.973 ha), representantes férteis foram coletados e preparados de acordo com as técnicas específicas para espécimes da família (Croat 1985). Posteriormente, foram incluídos no herbário VIC (sigla segundo Holmgren *et al.* 1990).

As inflorescências foram fixadas em FAA 50% e conservadas em álcool 70%, para análise posterior e ilustrações. Mudas de todas as espécies foram coletadas para o cultivo e, foram mantidas no Horto Botânico do Departamento de Biologia Vegetal da UFV, possibilitando-nos acompanhar seu desenvolvimento e observar as variações morfoló-

gicas das mesmas. Durante as coletas, também foram realizadas observações sobre a morfologia, período de floração, ambiente de ocorrência e sua posição no vegetal suporte.

Para a terminologia das partes vegetativas e reprodutivas foram utilizados os trabalhos de Madison (1977), Radford *et al.* (1979), Croat & Bunting (1979) e Mayo (1991). Para a lâmina foliar com extensões em cada lado da inserção do pecíolo, esta foi dividida em divisão anterior e divisões posteriores conforme definido por Mayo *et al.* (1997). Para os padrões de venação e os tipos básicos de inflorescência adotou-se Mayo (1991) e Mayo *et al.* (1997).

Estas espécies foram ilustradas, visando elucidar a morfologia do grupo. As ilustrações foram realizadas, a partir de material cultivado e/ou fixado em FAA 50%, com auxílio de estereomicroscópio, para estruturas menores.

Resultados e discussão

Uma representativa diversidade dos caracteres vegetativos (Tabela 1) e reprodutivos (Tabela 2) das Araceae do Brasil pôde ser verificada nas espécies encontradas no Parque Estadual do Rio Doce (PERD), Minas Gerais.

Das nove subfamílias *sensu* Keating (2004), seis ocorrem no Brasil. As três com maior número de gêneros e espécies ocorrem na área de estudo (Tabela 1): Pothoideae (com 4 gêneros no PERD), Philodendroideae (2 gêneros) e Aroideae (2 gêneros). Apenas Schismatoglottidoideae, Lasioideae e Lemnoideae, que geralmente são representadas por poucos gêneros no Brasil não foram tratadas aqui. A grande diversidade morfológica apontada neste estudo, se deve ao fato de que 21% dos gêneros de Araceae que ocorrem no Brasil foram encontrados no PERD.

As Araceae podem ocorrer como hemi-epífitas, possuindo dois tipos de raízes: as alimentadoras, para a absorção de água e nutrientes do solo, e as âncoras (grampiformes), para fixação no vegetal suporte (Fig. 1a). O hábito hemi-epífita pôde ser verificado em *Philodendron vargealtense* (Fig. 1a), assim como para a maioria das espécies do PERD. São tidas como hemi-epífitas primárias ou secundárias (Croat 1988), pois podem iniciar seu desenvolvimento como terrestre, germinando no solo e posteriormente ocupando um vegetal suporte e perdendo conexão com o chão (hemi-epífita secundária) ou inicia seu desenvolvimento como epífita, germinando no vegetal suporte e, posteriormente, suas raízes alimentadoras projetam-se até o solo da mata (hemi-epífita primária). Uma epífita se difere tanto da hemi-epífita primária ou secundária porque esta nunca se conecta ao solo, como observado para *Anthurium scandens* (Figura 1b). Esta espécie foi encontrada apenas duas vezes no PERD e estes indivíduos apresentavam suas raízes associadas às de Bromeliaceae e Cactaceae, formando um ninho de formigas.

As epífitas e hemi-epífitas representam cerca de 80% das espécies de Araceae do PERD (Tabela 1). A grande porcentagem de espécies com estas formas de vida nos indica que o Parque Estadual do Rio Doce é uma floresta úmida. Croat (1988) relatou que as plantas epífitas (incluindo as hemi-epífitas) crescem em árvores ou arbustos e por isso, geralmente, ocorrem em florestas de áreas úmidas, podendo ser indicadoras de umidade de uma determinada região. Embora em uma boa parte do ano a precipitação no Parque seja baixa (Temponi 2001), possivelmente, a ocorrência de 38 a 44 lagoas cobrindo cerca de 6% da sua área total (aproximadamente 2.150 ha), mantém a umidade da região.

Uma outra forma de vida marcante é a geófita, com caule tuberoso ou rizomatoso, subterrâneo, como ocorre em *Asterostigma luschnathianum* (Fig. 1c). Estas plantas geralmente exibem uma sazonalidade marcante com uma fase de crescimento e outra de dormência, podendo perder sua única folha.

Tabela 1 - Caracteres vegetativos das espécies de Araceae encontradas no Parque Estadual do Rio Doce, M[illegible]ub-famílias *sensu* Keating, 2004).

Táxons estudados	Caracteres vegetativos					
	Formas de vida	**Hábito**	**Tipo de crescimento**	**Ramo flageliforme**	**Formato da lâmina**	**Padrão da nervação terciária**
Pothoideae						
Anthurium pentaphyllum (Aubl.) G.Don	Hemi-epífita	Herbáceo	Simpodial	Ausente	Palmada	Reticulada
Anthurium scandens (Aubl.) Engl.	Epífita	Herbáceo	Simpodial	Ausente	Elíptica	Reticulada
Heteropsis flexuosa (Kunth) G. S. Bunting	Hemi-epífita	Herbáceo	Monopodial	Presente	Elíptica, oblonga, obovada	Reticulada
Heteropsis salicifolia Kunth	Hemi-epífita	Herbáceo	Monopodial	Não visto	Elíptica, oblonga	Reticulada
Monstera adansonii Schott	Hemi-epífita	Herbáceo	Simpodial	Presente	Elíptica, ovada	Reticulada
Monstera praetermissa E.G. Gonç. & Temponi	Hemi-epífita	Herbáceo	Simpodial	Não visto	Elíptica, ovada	Reticulada
Rhodospatha sp nov. ined.	Helófita	Arbustivo	Simpodial	Ausente	Oblonga	Paralelinérnia
Philodendroideae						
Asterostigma luschnathianum Schott	Geófita	Herbáceo	Simpodial	Ausente	Pinatífida	Reticulada
Philodendron propinquum Schott	Hemi-epífita	Herbáceo	Simpodial	Presente	Ovada	Paralelinérnia
Philodendron speciosum Schott *ex.* Engl.	Hemi-epífita	Arbustivo	Simpodial	Não visto	Sagitada	Paralelinérnia
Philodendron vargealtense Sakuragui & Mayo	Hemi-epífita	Herbáceo	Simpodial	Não visto	Sagitada	Paralelinérnia
Aroideae						
Syngonium vellozianum Schott	Hemi-epífita	Herbáceo	Simpodial	Presente	Tripartido-hastada	Reticulada
Xanthosoma maximiliani Schott	Helófita	Arbustivo	Simpodial	Ausente	Sagitada	Colocasióide

Tabela 2 - Caracteres reprodutivos das espécies de Araceae encontradas no Parque Estadual do Rio Doce, MG.

Táxons estudados	Caracteres Reprodutivos									
	Inflorescências	Espádice	Posição da espata	Deciduidade da espata	Constrição da espata	Flor	Tépalas	Filetes e anteras	Placentação	Deiscência da antera
Anthurium pentaphyllum	Solitárias	Homogêneo	Reflexa	Persistente	Ausente	Bissexual	Presentes (4)	Livres	Axial-apical	Longitudinal
Anthurium scandens	Solitárias	Homogêneo	Reflexa	Persistente	Ausente	Bissexual	Presentes (4)	Livres	Axial-apical	Longitudinal
Heteropsis flexuosa	Solitárias	Homogêneo	Ereta	Decídua	Ausente	Bissexual	Ausentes	Livres	Axial-basal	Longitudinal
Heteropsis salicifolia	Solitárias	Homogêneo	Ereta	Decídua	Ausente	Bissexual	Ausentes	Livres	Axial-basal	Longitudinal
Monstera adansonii	Solitárias/ Em simpódio	Homogêneo	Ereta	Decídua	Ausente	Bissexual	Ausentes	Livres	Axial-basal	Longitudinal
Monstera praetermissa	Solitárias	Homogêneo	Ereta	Decídua	Ausente	Bissexual	Ausentes	Livres	Axial-basal	Longitudinal
Rhodospatha sp nov. ined.	Solitárias	Homogêneo	Ereta	Decídua	Ausente	Bissexual	Ausentes	Livres	Axial	Longitudinal
Asterostigma luschnathianum	Solitárias	Heterogêneo	Ereta	Persistente	Ausente	Unissexual	Ausentes	Em sinândrio	Axial-basal	Transversal
Philodendron propinquum	Solitárias	Heterogêneo	Ereta	Persistente	Ausente	Unissexual	Ausentes	Livres	Axial	Longitudinal
Philodendron speciosum	Solitárias	Heterogêneo	Ereta	Persistente	Presente	Unissexual	Ausentes	Livres	Axial-basal	Longitudinal
Philodendron vargealtense	Simpódio	Heterogêneo	Ereta	Persistente	Presente	Unissexual	Ausentes	Livres	Axial-basal	Longitudinal
Syngonium vellozianum	Em simpódio	Heterogêneo	Ereta	Tubo persistente	Presente	Unissexual	Ausentes	Em sinândrio	Axial-basal	Longitudinal
Xanthosoma maximiliani	Em simpódio	Heterogêneo	Ereta	Tubo persistente	Presente	Unissexual	Ausentes	Em sinândrio	Axial	Poricida

As espécies de *Rhodospatha* e *Xanthosoma* do PERD apresentam a forma vida helófita como definido por Mayo *et al.* (1997), pois ocorrem em ambientes brejosos ou alagáveis, pelo menos, nos períodos de maiores precipitações.

Para alguns autores como Mayo *et al.* (1997), espécies maiores podem apresentar o hábito arbustivo com o eixo principal, formando um caule carnoso, como em *Alocasia* e *Xanthosoma* (Fig. 1d), ou fibroso, como em *Philodendron* (Fig. 1e). No PERD, o hábito arbustivo foi verificado para *Philodendron speciosum*, *Rhodospatha* sp. e *Xanthosoma maximiliani* (Tabela 1). Embora o padrão de crescimento em diâmetro e o porte sejam muito distintos dos verificados nas espécies arbóreas e arbustivas de dicotiledôneas, o termo arbustivo vem sendo usado para algumas espécies de Araceae, que apresentam hábito semelhante ao arbóreo. Nesta situação peculiar, o caule não se ramifica e ocorre um aumento do diâmetro devido à produção de meristemas apicais maiores em unidades simpodiais sucessivas.

O caule, quando aéreo, é bastante variável e dentro da família, ele pode ser taxonomicamente útil. Trabalhos clássicos como os de Ray (1987a, 1987b) que discutem e definem a diversidade da organização do caule e tipos de folha na família devem ser estudados para um melhor entendimento sobre este tópico. De uma forma simplificada podemos dizer que em muitos gêneros, o caule maduro é um simpódio composto de unidades simpodiais como em *Anthurium scandens* (Fig. 1f). Cada unidade simpodial começa com um profilo (primeira folha), seguido de um número variável de catafilos (folhas reduzidas) e eufilos, de acordo com o grupo e, termina com uma inflorescência (Fig. 1f) ou inflorescência abortada. Neste tipo de crescimento simpodial o ramo principal é substituído pelo ramo lateral. O tipo de crescimento monopodial foi relatado para *Heteropsis* e para muitos representantes da tribo Potheae. O tipo de crescimento monopodial foi verificado para as espécies de *Heteropsis* encontradas no PERD (Fig. 1g). Neste tipo de crescimento, as inflorescências ocorrem em ramos laterais e o ramo principal continua seu crescimento, aparentemente, indeterminado.

Caules especializados para a reprodução vegetativa, chamados de ramos flageliformes, têm sido observados em vários gêneros como *Philodendron*, *Syngonium*, *Heteropsis* (Mayo *et al.* 1997) e *Monstera* (Andrade & Mayo 1998). Os ramos flageliformes também ocorrem em algumas espécies de *Rhodospatha* como *R. latifolia* Poepp. & Endl. e *R. oblongata* Poepp. & Endl. (ambas hemi-epífitas), mas não foram observados na espécie de *Rhodospatha* (uma helófita), que ocorre no PERD. Eles consistem de ramos nos quais os entrenós tornam-se muito mais longos e esguios do que a parte do caule florífero e as folhas tornam-se reduzidas em tamanho, ficando semelhante a catafilos ou escamas. Estes ramos crescem rapidamente e ocupam novas árvores suporte, nas quais, posterior-mente, caules floríferos se desenvolverão. Durante o levantamento florístico das Araceae do PERD o desenvolvimento de ramos flageliformes foi verificado em quatro espécies (Tabela 1): *Heteropsis flexuosa*, *Monstera adansonii*, *Philodendron propinquum* e *Syngonium vellozianum* (Fig. 1h).

O termo bainha peciolar nem sempre é utilizado para a família. Para Mayo *et al.* (1997) a folha é claramente diferenciada em bainha peciolar, pecíolo e lâmina expandida. Porém, de acordo com a definição de Madison (1977), por ser difícil determinar os limites de cada estrutura, a bainha e o pecíolo juntos foram tratados de pecíolo (Fig. 2a), que pode ser descrito como sendo invaginado, alado (Fig. 2e), canaliculado ou com uma bainha na base. A inserção do pecíolo é normalmente anular, porque este envolve o entrenó, exceto em algumas espécies, como a maioria dos *Heteropsis*, nas quais a inserção do pecíolo não chega a envolver o caule.

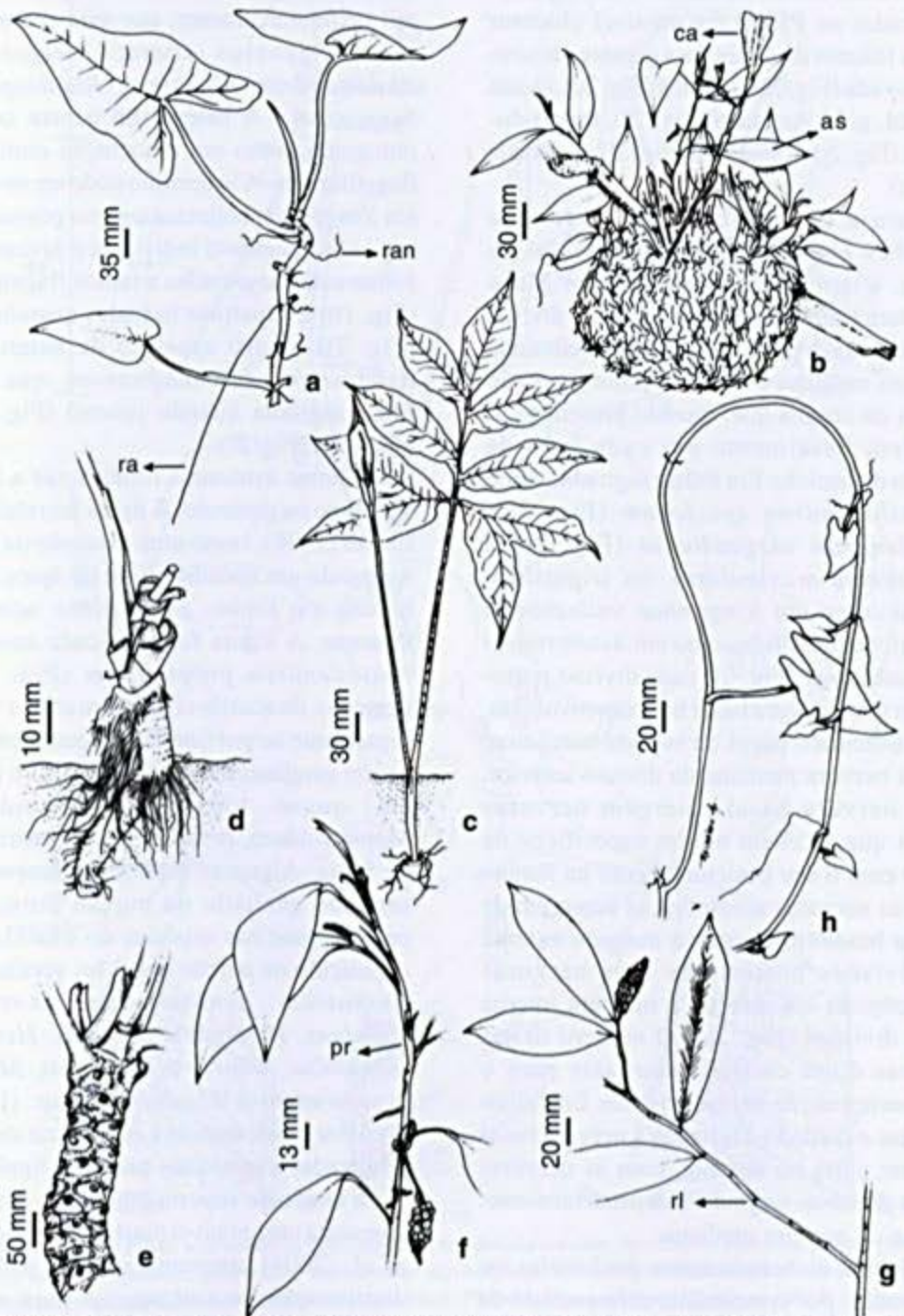


Figura 1 - Hábitos e tipos de crescimento de caule: a. *Philodendron vargealtense*: erva, hemi-epífita, ra=raiz alimentadora e ran=raiz âncora (*Temponi 223*); b. epífita, raízes formando ninho de formigas, ca=Cactaceae, as=*Anthurium scandens*; (*Temponi 193*); c. *Asterostigma luschnathianum*: erva, geófita de caule rizomatoso, subterrâneo (*Temponi 221*); d. *Xanthosoma maximiliani*: arborescente, helófita de caule tuberoso, parcialmente subterrâneo (*Temponi 178*); e. *Philodendron speciosum*: arborescente, hemi-epífita (*Temponi 179*); f. *Anthurium scandens:* caule com crescimento simpodial, pr=profilo (*Temponi 193*); g. *Heteropsis flexuosa*: caule com crescimento monopodial, rl=ramos laterais (*Temponi 138*); h. *Syngonium vellozianum*: ramo flageliforme (*Temponi 224*).

O tamanho e a forma da lâmina são bastante diversos dentro da família e nas espécies encontradas no PERD foi possível observar lâminas foliares de diminuta a gigante, de simples obovada (Fig. 2b), elíptica (Fig. 2c), ovada (Figs. 2d, g, h), sagitada (Fig. 2f), tripartido-hastada (Fig. 2j) e pinatífida (Fig. 2l) a palmada (Fig. 2n).

Para a lâmina foliar que apresenta extensões em cada lado da inserção do pecíolo, a terminologia proposta por Mayo (1991) tem sido bastante empregada. A divisão anterior é toda a parte da lâmina que circunda a nervura mediana e divisões posteriores são porções da lâmina que, quando presentes, se estendem basalmente em cada lado da inserção do pecíolo. Em folhas sagitadas como em *Philodendron speciosum* (Fig. 2a), *Philodendron vargealtense* (Fig. 2f) e *Xanthosoma maximiliani*, ou tripartido-hastada como em *Syngonium vellozianum* (Fig. 2j), ou pinatífida como em *Asterostigma luschnathianum* (Fig. 2l) cada divisão posterior tem uma nervura basal bem desenvolvida, a qual executa o papel de suporte mecânico, como a nervura mediana da divisão anterior. Desta nervura basal emergem nervuras laterais que recebem nomes específicos de acordo com o seu posicionamento na lâmina foliar; as nervuras acroscópicas emergem da nervura basal em direção à margem externa das divisões posteriores e as nervuras basioscópicas em direção à margem interna destas divisões (Fig. 2a). O número destas nervuras é um caráter importante para o reconhecimento de muitas espécies. Em folhas cordadas e cordado-sagitadas a nervura basal pode ser curta ou ausente, com as nervuras laterais primárias surgindo, independentemente, na base da nervura mediana.

Folhas elaboradamente perfuradas ou fenestradas, por crescimento diferenciado da margem, ou por necroses de partes da lâmina, ou ainda a combinação de ambos os processos, ocorrem em alguns gêneros como *Monstera* e pôde ser observado nas duas espécies encontradas no PERD: *M. adansonii* e *M. praetermissa* (Fig. 2g). Heterofilia é uma outra característica notável e, algumas vezes, útil taxonomicamente, que está presente em muitos gêneros como: *Asterostigma, Philodendron, Monstera, Rhodospatha* e *Syngonium*. A heterofilia ocorre tanto na ontogenia como em associação com ramos flageliformes. A heterofilia pôde ser observada em *Syngonium vellozianum* que possui folhas sagitadas quando o indivíduo é juvenil ou as folhas estão associadas a ramos flageliformes (Fig. 1h) e tripartido-hastadas quando adulto (Fig. 2j). Outro exemplo de heterofilia é *Asterostigma luschnathianum* que possui folha sagitada quando juvenil (Fig. 2m) e pinatífida (Fig. 2l).

Outras estruturas foliares são a lígula e o pulvino ou genículo. A lígula foi relatada por Engler (1878), como uma extensão da bainha, formando um apêndice livre no ápice, entre a bainha e o limbo, assim como ocorre nas Poaceae. A lígula foi verificada apenas em *Philodendron propinquum* (Fig. 2e). O genículo, de acordo com Mayo *et al.* (1997), é semelhante ao pulvino das Leguminosae, mas ocorre geralmente na porção distal do pecíolo, em quase todas as Pothoideae e Monsteroideae, permitindo uma reorientação da folha. Algumas espécies apresentam um segundo genículo na porção proximal do pecíolo, mas nas espécies do PERD, apenas o genículo na porção distal foi verificado em *Anthurium pentaphyllum, Anthurium scandens, Heteropsis flexuosa, Heteropsis salicifolia, Monstera adansonii, Monstera praetermissa* e *Rhodospatha* sp. (Fig. 2i). O colênquima, devido à ocorrência de células de paredes espessadas mas não lignificadas, é um tecido de suporte em órgãos aéreos que apresenta uma notável plasticidade. Gonçalves *et al.* (2004) apresentaram três padrões de distribuição de colênquima para a região central do pecíolo: colênquima ausente com esclerênquima como principal tecido de suporte; anel periférico de colênquima (padrão philodendróide) e cordões de colênquima (padrão colocasióide). Para alguns gêneros

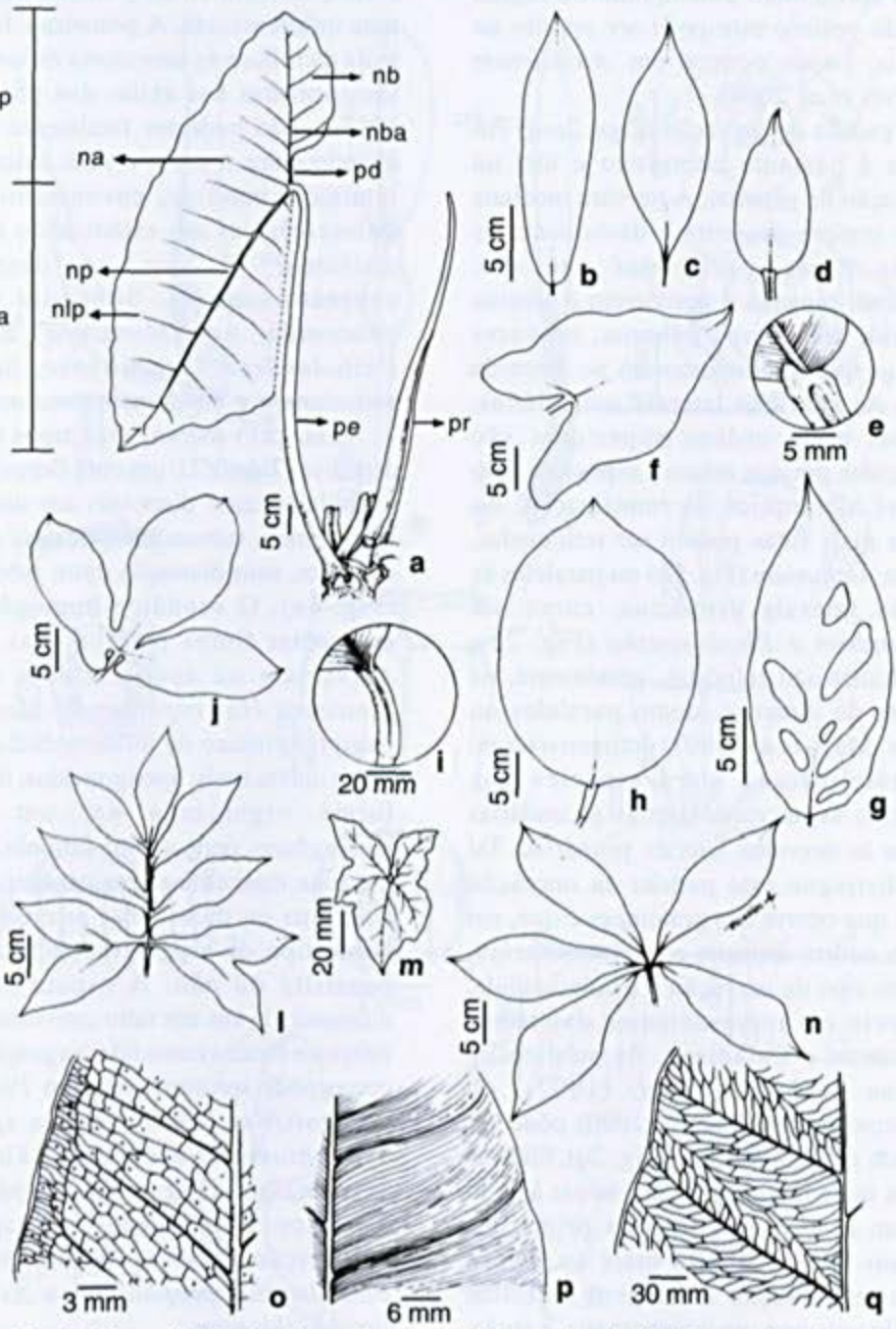


Figura 2 - Morfologia foliar: a. divisões da folha sagitada, da=divisão anterior, dp=divisão posterior, pd=porção desnuda da nervura basal, pe=pecíolo, pr=profilo, na=nervuras acroscópicas, nb=nervuras basioscópicas, nba=nervura basal, nlp=nervura lateral primária, np=nervura principal ou central, *Philodendron speciosum* (*Temponi 179*); b. lâmina obovada, *Heteropsis flexuosa* (*Temponi 138*); c. lâmina elíptica, *Anthurium scandens* (*Temponi 193*); d-e. *Philodendron propinquum* (*Temponi 181*), d. lâmina ovada, e. lígula; f. lâmina sagitada, *Philodendron vargealtense* (*Temponi 223*); g. lâmina ovada, fenestrada *Monstera praetermissa* (*Temponi 84*); h-i. *Rhodospatha* sp. nov. ined. (*Temponi 220*), h. lâmina oblonga, i. genículo; j. lâmina tripartido-hastada, *Syngonium vellozianum*. (*Temponi 192*); l-m. *Asterostigma luschnathianum* (*Temponi 221*), l. lâmina pinatífida, m. lâmina jovem sagitada; n. folha palmada, *Anthurium pentaphyllum* (*Temponi 217*); o. padrão de nervação reticulado, *Anthurium scandens* (*Temponi 193*); p. padrão peniparalelinérveo, *Rhodospatha* sp. nov. ined. (*Temponi 220*); q. padrão colocasióde, *Xanthosoma maximiliani* (*Temponi 178*).

que não apresentam colênquima na região central do pecíolo este pode ser restrito ao genículo, como ocorre em *Anthurium* (Gonçalves *et al.* 2004).

O padrão de nervação (Figs. 2o-q) em Araceae é bastante complexo e útil na identificação de gêneros. A nervura mediana é quase sempre presente e desta saem as nervuras laterais primárias que são, geralmente, pinadas e percorrem a lâmina formando, em alguns gêneros, nervuras marginais, que se anastomosam no ápice da lâmina. As nervuras laterais secundárias, terciárias e de ordens superiores são reconhecidas por sua relativa espessura e/ou seu nível hierárquico de ramificação. As nervuras mais finas podem ser reticuladas, como em *Anthurium* (Fig. 2o) ou paralelas às nervuras laterais primárias, como em *Philodendron* e *Rhodospatha* (Fig. 2p). Estas últimas são referidas, geralmente, na literatura de Araceae, como paralelas ou estriadas. Mayo *et al.* (1997) definem o termo peniparalelinérvea, para espécies que apresentam as nervuras laterais secundárias paralelas às nervuras laterais primárias. Tal termo distingue este padrão da nervação paralela que ocorre nas gramíneas e que, em Araceae, ocorre somente em *Gymnostachys*. Um outro tipo de nervação é a colocasióide, que ocorre em representantes das tribos Colocasieae e Caladieae, da subfamília Aroideae de Mayo *et al.* (1997), ou Colocasioideae de Grayum (1990) pôde ser verificado em *Xanthosoma* (Fig. 2q), onde as nervuras mais finas ramificam-se em ângulo reto com as nervuras laterais primárias, arqueiam-se de maneira mais ou menos sinuosa, em direção à margem da folha, formando uma nervura interprimária, e então, finalmente, fundem-se na margem, formando uma nervura coletora submarginal.

As inflorescências podem formar um simpódio floral ou ocorrerem isoladas nas axilas foliares. A produção de inflorescências, para formar o simpódio floral, representa o desenvolvimento de unidades simpodiais curtas, consistindo de somente um profilo e uma inflorescência. A primeira é formada na axila da folha e as sucessivas inflorescências, são formadas nas axilas dos profilos (Ray 1987a). Isto pode ser facilmente percebido quando entre o caule e uma única folha de lâmina expandida, encontram-se várias inflorescências em estádios de maturação distintos, já que se desenvolvem consecutivamente. Simpódio floral foi observado em *Monstera adansonii, Philodendron vargealtense, Syngonium vellozianum* e em *Xanthosoma maximiliani*.

Há, pelo menos, dois tipos básicos de espádice (Tabela 2): um com flores bissexuais espiraladamente dispostas em um espádice homogêneo, subtendido por uma espata não constrita, sem distinção entre tubo e lâmina (Fig. 3a). O espádice homogêneo pode apresentar flores perigoniadas como em *Anthurium* ou aperigoniadas como em *Monstera Heteropsis* e *Rhodospatha*. O outro tipo básico de inflorescência apresenta flores unissexuais, aperigoniadas, dispostas de forma organizada em um espádice heterogêneo, onde a zona feminina é inferior e a zona masculina superior, freqüentemente com uma ou duas zonas estéreis (Fig. 3c). Neste tipo de espádice a espata pode ser constrita ou não. A espata constrita é diferenciada em um tubo convoluto, na parte inferior e lâmina estendida, na porção superior, como pôde ser verificado em *Philodendron vargealtense, Philodendron speciosum, Syngonium vellozianum* e *Xanthosoma maximiliani* (Figs. 3b). Espécies com espádice heterogêneo e espata sem constrição também foram observadas: *Philodendron propinquum* e *Asterostigma luschnathianum*.

Flores bisexuais em Araceae podem ser perigoniadas ou aperigoniadas (Tabela 2). Em flores perigoniadas (Figs. 3d, e) as tépalas, mais ou menos carnosas e fornicadas apicalmente, quando livres, são organizadas em dois verticilos. Os estames, nestas flores e nas bissexuais nuas, como na maioria das

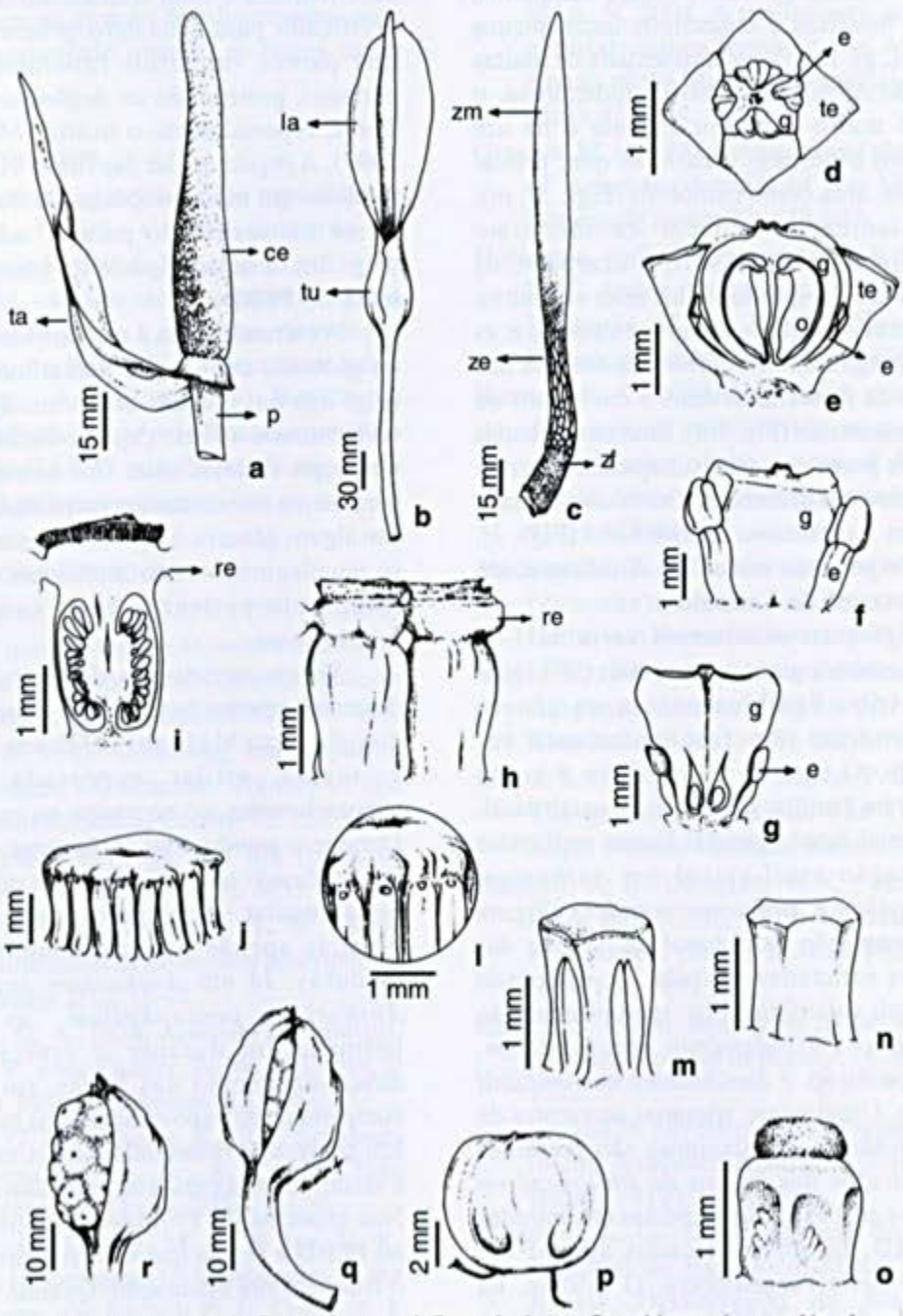


Figura 3 - Morfologia da inflorescência, flores e frutos: a. inflorescência com flores bissexuais, p=pedúnculo, ce=espádice homogêneo, ta=espata não constrita, *Anthurium pentaphyllum* (*Temponi 119*); b-c. *Xanthosoma maximiliani* (*Temponi 201*), b. espata, tu=tubo e la=lâmina, c. espádice heterogêneo, zf=zona feminina, ze=zona masculina estéril e zm=zona masculina; d-e. flor de *A. scandens* (*Temponi 193*), te=tépala, e=estame, g=gineceu e o=óvulo, d. vista frontal, e. corte longitudinal; f-g. flor de *Heteropsis salicifolia* (*Temponi 102*), e=estame e g=gineceu, f. vista longitudinal, g. corte longitidinal; h-l. *Xanthosoma maximiliani* (*Temponi 201*), h. visão longitudinal de flores femininas, re=região estilar, i. corte longitudinal da flor feminina, re=região estilar, j. sinândrio, l. poro subapical; m-o. *Philodendron vargealtense* (*Temponi 164*), m. vista longitudinal da flor masculina, n. vista longitudinal da flor masculina estéril, o. vista longitudinal da flor feminina; p. baga isolada, *Anthurium scandens* (*Temponi 193*); q-r. bagas em sincarpia, *Syngonium vellozianum* (*Temponi 157*).

Monsteroideae, possuem filetes achatados, anteras basifixas e conectivos inconspícuos (Figs. 3f, g). Em flores unissexuais de muitas tribos de Aroideae, como Philodendreae, o filete é muito curto ou ausente e há um conectivo espessado e carnoso que, provavelmente, atua como osmóforo (Figs. 3l, m); em Caladieae, como em *Xanthososma maximiliani* (Fig. 3j) e Spathicarpeae, os estames são sempre fundidos num sinândrio. As anteras são quase sempre extrorsas e as fendas longitudinais ocorrem na maioria dos gêneros de flores bissexuais e em alguns de flores unissexuais (Fig. 3m). Entretanto, fendas curtas ou poros apicais e subapicais, ocorrem geralmente em gêneros de flores unissexuais, como em *Xanthosoma maximilianii* (Figs. 3j, l), uma espécie da subfamília Aroideae e, em representantes de Lasioideae.

O gineceu usualmente varia de 1-3-locular, embora gineceu com mais de 3 lóculos na tribo Spathicarpeae e no gênero *Philodendron* seja freqüentemente encontrado. O tipo de placentação é muito variável na família: axial-apical, axial-basal, axial, apical, basal e parietal. Foram verificadas placentação axial-apical em *Anthurium pentaphyllum* e *Anthurium scandens* (Figura 3e), placentação axial-basal na maioria das espécies estudadas (Tabela 2), incluindo *Heteropsis salicifolia* (Fig. 3g) e placentação axial em *Philodendron propinquum*, *Rhodospatha* sp. e *Xanthosoma maximilianii* (Fig. 3i). Usualmente, tricomas secretores de uma substância mucilaginosa são presentes nos funículos dos óvulos de *Philodendron* (Mayo *et al.* 1997). Nas espécies encontradas no PERD, foram verificados apenas em *Philodendron vargealtense*. O estilete, na maioria dos gêneros, é inconspícuo externamente ou pouco mais largo que o ovário como em *Philodendron vargealtense* (Fig. 3o) mas, muito freqüentemente, há uma região estilar espessada entre os lóculos do ovário e o estigma, como na tribo Monstereae, e em *Xanthosoma maximiliani*. Em Monstereae, esta região é especialmente bem desenvolvida e com tricoesclereídes, como verificado para *Monstera praetermissa*, o que parece substituir funcionalmente o perianto, protegendo os órgãos sexuais das flores, especialmente o ovário (Mayo *et al.* 1997). A região estilar das flores vizinhas são fundidas em muitas espécies de *Xanthosoma* e isto foi verificado para *X. maximiliani* (Fig. 3h), a única espécie do gênero encontrada no PERD.

A infrutescência é usualmente cilíndrica ou globosa, com bagas parcialmente livres (Fig. 3p) ou, conatas como em *Syngonium vellozianum* (Figs. 3q, r), formando um sincarpo indeiscente. As sementes são geralmente embebidas em polpa mucilaginosa. Em alguns gêneros o tegumento externo torna-se mucilaginoso e em *Anthurium* a camada interna do pericarpo pode também ser mucilaginosa.

Vários mecanismos de proteção para o desenvolvimento do fruto e da semente foram discutidos por Madison (1977); em *Monstera*, a região estilar espessada e com tricoesclereídes, só se rompe na maturidade. Durante o estudo com as Araceae do PERD foi verificado que em *Monstera adansonii* a região estilar se rompe expondo as bagas brancas apenas quando completamente maduras. Já em *Anthurium scandens* e *Anthurium pentaphyllum*, as tépalas permanecem durante o crescimento e desenvolvimento das bagas, tornando-se completamente exposta apenas na maturidade. Em gêneros de flores unissexuais, esta função é assumida pela espata ou pelo tubo da espata. Nas espécies de *Philodendron* encontradas no PERD a espata que é persistente, envolve o fruto até sua maturação. Quando maduro a espata se decompõe e expõe as bagas. Em espécies como *Xanthosoama maximilianii* e *Syngonium vellozianum* que apresentam apenas o tubo persistente, envolvendo a zona de flores femininas do espádice, este se mantém até o desenvolvimento das bagas (Fig. 3q). Em *Syngonium vellozianum* o tubo da espata parece funcionar não apenas na

proteção durante o desenvolvimento do fruto, mas também na atração dos dispersores, pois se torna alaranjado quando as bagas estão maduras.

AGRADECIMENTOS

As autoras agradecem aos especialistas Marcus A. Nadruz Coelho, Eduardo G. Gonçalves e Simon J. Mayo pelo envio de bibliografia, valiosos esclarecimentos sobre a morfologia do grupo e sugestões na redação deste texto. Ao Reinaldo Antônio Pinto pelas ilustrações. À Fundação O Boticário/ Macarthur Foundation pelo financiamento do projeto e a CAPES pela bolsa de mestrado concedia à primeira autora.

REFERÊNCIAS BIBLIOGRÁFICAS

Andrade, I. M. & Mayo, S. J. 1998. Dynamic shoot morphology in *Monstera adansonii* Schott var. *klotzchiana* (Schott) Madison (Araceae). Kew Bulletin 53(2): 399-417.

Croat, T. B. 1985. Collecting and preparing specimens of Araceae. Annals of the Missouri Botanical Garden 72: 252-258.

_____. 1988. Ecology and life forms of Araceae. Aroideana 11(3): 4-55.

Croat, T. B. & Bunting, G. S. 1979. Standardization of *Anthurium* descriptions. Aroideana 2(1): 15-25.

Engler, H. G. A. 1878. Araceae. *In:* Martius, C. F. P. von; Eichler, A. W. & Urban, I. (eds.). Flora brasiliensis 3(2): 26-223.

Engler, H. G. A. & Krause, K. 1920. Aroideae-Colocasioideae. *In*: A. Engler. Das Pflanzenreich 71 (IV. 23E): 1-139.

French, J. C.; Chung, M. G. & Jur, Y. K. 1995. Chloroplast DNA phylogeny of the Ariflorae. *In:* Rudall, P. J., Cribb, P. J. Cuttler, D. F., Humphries. Monocotyledons: systematics and evolution. pp. 255-275. Royal Botanic Gardens, Kew.

Gonçalves, E. G.; Paiva, E. A. S. & Coelho, M. A. N. 2004. A preliminary survey of petiolar collenchyma in the Araceae. Annals of the Missouri Botanical Garden 91(3): 473-484.

Grayum, M. H. 1990. Evolution and phylogeny of Araceae. Annals of the Missouri Botanical Garden 77: 628-697.

Holmgren, P. K; Holmgren N. H. & Barnett, L. C. Index Herbariorum Part I: The Herbaria of the World. New York Botanical Garden, New York, 693p.

Keating, R. C. 2004. Vegetative anatomical data and its relationship to a revised classification of the genera of Araceae. Annals of the Missouri Botanical Garden 91(3): 485-494.

Madison, M. T. 1977. A revision of *Monstera* (Araceae). Contributions from the Herbarium Harvard University 207: 1-101.

Mayo, S. J. 1991. A revision of *Philodendron* subgenus *Meconostigma* (Araceae). Kew Bulletin 46(1): 601-681.

Mayo, S. J.; Bogner, J. & Boyce, P. C. 1997. The genera of Araceae. The Trustees, Royal Botanic Gardens, Kew, 370 p.

Radford, A. E.; Dickison, W. C.; Massey, J. R. & Bell, C. R. 1979. Vascular plant systematics. Harper & Row Publishers, New York, 891 p.

Ray, T. S. 1987a. Leaf types in the Araceae. American Journal of Botany. 74 (9): 1359-1372.

_____. 1987b. Diversity of shoot organization in the Araceae. American Journal of Botany 74 (9): 1373-1387

Temponi, L. G. 2001. Araceae do Parque Estadual do Rio Doce, Minas Gerais, Brasil. Dissertação de Mestrado. Universidade Federal de Viçosa, Viçosa, MG.

A NEW SECTION OF *ANTHURIUM*, SECT. *DECURRENTIA* – REVISION OF THE *ANTHURIUM DECURRENS* POEPPIG COMPLEX IN AMAZONIA

Thomas B. Croat[1], *Jorge Lingán*[2] & *Douglas Hayworth*[3]

ABSTRACT

(A new section of *Anthurium*, sect. *Decurrentia* - Revision of the *Anthurium decurrens* Poeppig complex in Amazonia) A revision of 6 closely related species from the Amazon basin in Colombia, Ecuador and Peru is presented, and 4 new species of *Anthurium* are published as new: *Anthurium ceronii* Croat, *A. payaminoense* Croat & Lingán, *A. sydneyi* Croat & Lingán and *A. whitmorei* Croat & Lingán. Two species, *A. decurrens* Poeppig and *A. longispadiceum* K. Krause are redescribed because they have been, until recently, totally unknown or misrepresented by other taxa. The species are all members of a new section named *Decurrentia*, newly named here for the first time. All members of section *Decurrentia* have in common short internodes, elongated, epunctate leaf blades, and peduncles tending to be weakly or prominently ridged or winged. In addition, several of the species have early-emergent, elongated berries. All species treated here occur in the lowlands of Amazonia and have been confused with one another by botanists for a long time.

Key-words: *Anthurium*, new section, *Decurrentia*, Amazonia, new species.

RESUMO

(Uma nova seção de *Anthurium*, sect. *Decurrentia* - Revisão do complexo *Anthurium decurrens* Poeppig na Amazônia) É apresentada uma revisão de seis espécies estreitamente relacionadas da bacia amazônica na Colômbia, Equador e Peru, sendo quatro espécies novas: *Anthurium ceronii* Croat, *A. payaminoense* Croat & Lingán, *A. sydneyi* Croat & Lingán e *A. whitmorei* Croat & Lingán. Duas espécies, *A. decurrens* Poeppig e *A. longispadiceum* K. Krause, são novamente descritas porque foram, até recentemente, totalmente desconhecidas ou confundidas com outros taxa. As espécies são membros de uma seção nova, *Decurrentia*, descrita aqui pela primeira vez. Todos os membros da seção *Decurrentia* têm em comum internós curtos, alongados, lâminas da folha sem pontuações e pedúnculos que tendem a ser fraca ou proeminente rígidos ou alados. Além disso, várias espécies têm bagas precocemente emergentes e alongadas. Todas as espécies tratadas aqui ocorrem na planície amazônica e têm sido confundidas umas com as outras por botânicos durante muito tempo.

Palavras-chave: *Anthurium*, nova seção, *Decurrentia*, Amazônia, espécie nova.

INTRODUCTION

This paper discusses a group of species related to *A. decurrens* Poeppig. All are species with short internodes, elongated leaf blades, often many times longer than wide or oblanceolate, and all have peduncles that are either winged or ribbed. These species, and many others like them, do not really fit into any currently recognized section.

Schott (1860) placed *A. decurrens* Poepp. in his grex *Oxycarpium* along with *A. oxycarpum* Poepp. and *A. consobrinum* Schott, but the latter two species have both proven to be members of section *Pachyneurium* (Croat 1991) and Schott's description of grex *Oxycarpium* (as well as the fact that he chose to name the section *Oxycarpium*) clearly show that this sectional name should be synonymous with section *Pachyneurium*.

Engler (1905) adopted Schott's grex *Oxycarpium*, renaming it sect. *Oxycarpium*, and changed the section only by adding *A. pittieri* Engl. In the revision of *Anthurium* for Central America (Croat 1983, 1986), Croat followed the same sectional classification. The species in this presumed section have little in common overall since two species, *A. decurrens* and *A. pittieri* are not easily assigned to any other natural section of

Artigo recebido em 07/2004. Aceito para publicação em 02/2005.

[1]Missouri Botanical Garden. P.O. Box 299. St. Loius, MO 63166-0299, USA. e-mail: Thomas.Croat@mobot.org
[2]Museo Historia Natural, UNMSM, Lima, Peru.
[3]Washington University, St. Louis, MO, USA.

Anthurium. The senior author has long contemplated creating a new section of *Anthurium* to accommodate these and other similar species and this new section is described here and revised for the Amazonian basin.

Anthurium section ***Decurrentia*** Croat, sect. nov. **Type**: *Anthurium decurrens* Poeppig (the name "decurrentia" is based on the type species).

Internodia brevia; petiolus elongatus; lamina elongata, plerumque acute ad basim, eglandulosa.

Only a few sections of *Anthurium* have species with elongated blades. These include *Anthurium* sect. *Xialophyllium*, which has elongated internodes, *Anthurium* sect. *Porphyrochitonium*, which has short internodes but conspicuously glandular punctuations on one or more blade surfaces, and *Anthurium* sect. *Urospadix* which has typically short internodes and blades epunctate or punctate, but with the punctuations not obviously glandular (rather more diffuse and not conspicuously rounded). It is our belief that the section *Urospadix* is restricted to eastern South America and the Lesser Antilles in the West Indies, and that the group is absent from the much younger Andean regions of western South America. Hopefully, molecular studies being carried out by Monica Carlsen will confirm these beliefs.

The exact number of species in section *Decurrentia* is at this time unknown, but there are probably many, especially in South America. Currently the only Central American species in the section is *Anthurium pittieri* Engl., but in addition to those species treated here there are still more undescribed species in South America, especially in the Amazon basin. This paper deals with only those species known from the Amazon basin. A future paper will describe more species in this section and list other species believed to be in section *Decurrentia*.

Key to species in *Anthurium decurrens* Poeppig complex

1. Leaf blade usually more than 6 times longer than wide, usually broadest at the middle, rarely above the middle.
   2. Plants more or less erect; blades about twice as long as petioles; petioles only weakly sheathed at base; peduncle terete; spadix green at anthesis, long and slender, ca. 60 times longer than wide, to 25 cm long, 4 mm diam., widest at base, green; berries red at maturity ..... *A. longispadiceum*
   2. Plants more or less pendent; blades 3.6–5.3 times longer than petioles; petioles conspicuously sheathed (1.2–2.3 their length); peduncles quadrangular; spadix olive (B & K yellow 5/5) at anthesis, bluntly tapered at apex, ca. 32 times longer than wide, 6–13 cm long, 4 mm diam. at base and middle, 3 mm diam. at apex, turning reddish at maturity; berries white at maturity ..... *A. ceronii*
1. Leaf blade <6 times longer than wide (sometimes >6 times longer than wide in *A. longispadiceum*).
   3. Leaf blades with the primary lateral veins and the collective veins drying conspicuous; collective veins of leaf blade usually relatively remote from the margins; leaf blade surfaces drying blackened.
      4. Stems with the cataphylls persisting intact; flowers 4 visible per principal spiral, 3–4 mm long in direction of axis ..... *A. payaminoense*
      4. Stems with the cataphylls deciduous or persisting as fibers; flowers 6 visible per spiral, 1.5–1.7 mm long ..... *A. whitmorei*
   3. Leaf blades with the primary lateral veins and collective veins drying inconspicuous; blade surfaces drying yellowish brown (except sometimes blackened in *A. longispadiceum*); fruits early emergent and much longer than wide.

5. Spathe prominently decurrent on the peduncle; peduncle more or less as long as the petioles ..... *A. decurrens*
5. Spathe not prominently decurrent, attached more or less at a single point on the peduncle; peduncle typically considerably longer than petioles.
   6. Spadix more than 12.5 cm long, 60 times longer than wide; spathe weakly decurrent ..... *A. longispadiceum*
   6. Spadix less than 7.5 cm long, less 12 times longer than wide; spathe not at all decurrent on peduncle..... *A. sydneyi*

Anthurium ceronii Croat, sp. nov. **Type**: Ecuador. Napo, 5.7 km W of Tena at Río Tena, 0°01'S, 77°51'W, ca. 500 m, *T. B. Croat 58849* (holotype, MO-3154535; isotypes, AAU, NY, QCA, US). Fig. 1 a-d.

Epiphytica; internodia 0.5--1.5 cm longa, 0.4–1.8 cm diam.; cataphylla 5–8 cm longa, persistens intacta; petiolus 3.5–18 cm longus; lamina oblonga vel anguste elliptica, 30–60 cm longa, 2–4.5 cm lata; nervis primariis lateralibus 12–18 utroque; pedunculus 16–25 cm longus, 3 mm diam., quadrangularis; spatha flavo-virens, 6–10 cm longa, 1–1.5 cm lata, stipitata 12–20 mm; spadix olivaceous, 6–13 cm longus, 4 mm diam.; bacca lutea.

Epiphyte; stems pendent, ca. 20 cm long, to 1 cm diam.; **internodes** 0.5–1.5 cm long, 0.4–1.8 cm diam.; **cataphylls** 5–8 cm, green, 1-ribbed and acuminate at apex, persisting more or less intact at upper nodes, drying brown into brittle fibers at lower nodes; Leaves with **petioles** 3.5–18 cm long, spreading-pendent, sheathed to between 1/2 and 3/4 their length; geniculum upturned, thicker and drying darker than petiole; **blades** oblong-narrow elliptic, (6.2)16–20 cm long, 4–8 times longer than petiole, 30–60 cm long, 2–4.5 cm wide, broadest at 2/3 to 3/4 the length from base, moderately coriaceous, narrowly acuminate with acumen 2–4 cm, attenuate at base, both surfaces matte, upper surface dark green, drying grayish, lower surface much paler, drying more brownish; **midrib** convexly raised above, much larger below; **primary lateral veins** 12–18 per side, departing midrib at 35° angle, raised slightly more below than above; interprimary veins only slightly less prominent than primary veins; collective veins arising from the base, with same prominence as primary lateral veins, 2–5 mm from margin. Inflorescence spreading, shorter than leaves; **peduncle** 16–25 cm long, 3 mm diam., pale green, quadrangular, the margins winged; **spathe** spreading, subcoriaceous, yellowish green (B & K yellow green 8/10), linear or narrowly lanceolate, 6–10 cm long, 1–1.5 cm wide, broadest near base, inserted at a 60° angle on petiole, the apex acuminate with acumen inrolled, 5 mm long, the base margins meeting acutely at 50° angle, stipe 12–20 mm long in back; **spadix** olive-green (B&K yellow 5/5) at anthesis, paler (B&K yellow 7/7.5) prior to anthesis, long ellipsoid, scarcely, bluntly tapered at apex, curved upwards away from spathe, 6–13 cm long, 4 mm diam. at base and at middle, 3 mm diam. at apex, turning reddish, producing white berries; flowers slightly rhombic, 2.8 mm long, 2.2–2.4 mm wide, 5 in principal spiral, 3 in alternate spiral, the sides nearly straight to slightly sigmoid; tepals matte pre-anthesis, 1.2 mm wide, inner margins rounded, outer margins 2-sided, **pistils** raised before stamens emerge, green, stigma slitlike, raised, droplets appearing several days before anthesis, 0.5 mm long, slightly papillate; stamens emerge in unusual manner, the alternates preceeding laterals by 2 spirals, barely emerging above tepal level, closely circling pistil but not obscuring pistil; anthers white; 0.6–0.7 mm long, 0.4 mm wide; thecae 0.2–0.3 mm wide; pollen white.

Anthurium ceronii ranges from southern Colombia to Ecuador and northern Peru, and ranges throughout the eastern foothills of the Andes Mountains in Tropical wet forest (T-

wf), Premontane wet forest (P-wf), and Premontane rain forest (P-rf) life zones at 450–1600 m. This epiphyte is recognized by its pendent habit, conspicuously sheathed petioles, long, narrow leaf blades, quadrangular peduncles, spreading spathe, stipitate spadix with flower tepals turning red and fruits maturing white.

The species is most easily confused with *A. longispadiceum* K. Krause a species with which it sometimes occurs.

Anthurium ceronii is named in honor of Ecuadorian botanist and teacher Sr. Carlos Cerón an intrepid collector of Araceae who collected much of the better material of the species.

The first collection of *A. ceronii* was made by Luis Sodiro in December, 1904 from along the Río Pastaza on the slopes of Volcán Tungurahua in what may have been an area of *Lower Montane wet forest* (LM-wf). Sodiro named the plant *A. cultrifolium*, but because this name was a homonym to the earlier named *A. cultrifolium* Schott, Sodiro's plant necessarily must have a new name.

Paratypes: COLOMBIA. PUTUMAYO: Macoa, Corregimiento de San Antonio, Vereda Alto Campucuna, Finca Mariposa, 1°12'N, 76°38'W, 1350 m, *Franco et al. 5365* (COL), *Franco et al. 5404* (COL); trail between Finca La Mariposa and Alto La Sierra, 1°12'N, 76°38'W, 1500–1670 m, *Betancur et al. 5445* (COL). ECUADOR. MORONA-SANTIAGO: Cordillera del Cóndor, W slope above Valle del Río Quimi, 3°30'38"S, 78°24'55"W, 1600 m, 11 Dec. 2000, *Freire et al. 4317* (MO, QCNE); 1300 m, 11 Dec. 2000, *Pabón et al. 313* (MO, QCNE); Indanza, 3°05'S, 78°25'W, 1300–1600 m, 23 Mar. 1974, *Harling & Andersson 12793* (GB, MO); Cordillera Cutucú, Río Itzintza, 2°40'S, 78°00'W, 1500–1833 m, *Camp 1316* (MO, NY); 1600–1930 m, *Camp 1355* (NY); 15 km N of Macas, on rd. to Río Upano, 2°07'S, 78°08'W, 1250 m, *Bohlin et al. 1486* (GB). Napo: Cantón Archidona, Hollín-Loreto, km 25, slopes of Volcán Sumaco, 0°43'S, 77°36'W, 17 Dec. 1988, *Hurtado 1208* (MO, QCNA); along Río Itzintza, ca. 2°40'S, 78°00'W, 1500 m, *Camp 1355* (NY); Estación Biológica Jatun Sacha, 1.5 km S of Río Napo, 8 km E of Río Puerto Misahuallí, 1°04'S, 77°36'W, 450 m, 17 Jan. 1987–6 Feb. 1987, *Cerón 593* (MO); 24 Apr. 1987–55 May 1987, *Cerón 1336* (MO); 21–25 May 1987, *Cerón 1398* (MO); 4 Sep. 1987, *Cerón 1998* (MO); 20 Jan. 1990, *Cerón et al. 8367* (QCNE); 16 Feb. 1990, *Cerón et al. 8727* (MO), *Miller & Wilbert 2333* (MO); 6 Dec. 1988, *Palacios 3282* (MO); 17–28 May 1989, *Palacios 4309* (MO); 25 May 1991, *Palacios & Rubio 7338* (MO); 18 May 1985, *Palacios et al. 401* (MO, NY, QAME, QCNE); 6 km from Misahuallí on Río Napo, 0°03'S, 77°35'W, 500 m, 18 Dec. 1986, *Hammel 15988* (MO); Shushifindi, Coca-Lago Agrio, ca. 50 km NE of Coca, 0°15'S, 76°20'W, 400 m, 16 Feb. 1974, *Harling & Andersson 12012*; Hollín-Loreto, Río Huataraco, 2 hrs. on foot from Aldea Guagua Sumaco, 0°43'S, 77°32'W', *Cerón & Factos 7457* (QCNE); Tena, 1°00'S, 77°45'W, 500 m, 20–23 Dec. 1958, *Harling 3663* (S); Cantón Loreto, Parrochia San Vincente de Huaticocha, Comunidad Santa Rosa de Arapino, Bloque #19 Triton, Pozo Santa Rosa, *Freire et al. 2423* (QCNE); ca. 5.7 km W of Tena, Río Tena, 0°01'S, 77°51'W, 500 m, 1 May 1984, *Croat 58849* (AAU, MO, NY, QCA, US); Cantón Tena, Cabañas Chuva Urcu, 1°08'32"S, 77°35'29"W, 15–17 Apr. 1993, *Delinks et al. 289* (MO, QCNE); Estación Científica Yasuní, Pozo petrolero Daimi 2, 0°55'S, 76°11'W, 26 May 1988–8 June 1988, *Cerón & Hurtado 4150* (QCNE); Estación Científica Yasuní, Río Tiputini, NE of confluence of Río Tivacuno, 6 km E of km 44 on rd. to Maxus, 0°38'S, 76°30'W; 200–300 m, 17 Nov. 1995, *Romoleroux & Foster 2006* (MO), 14 Apr. 1996, *Romoleroux & Foster 2193* (MO); Maxus oil rd., km 27, 0°35'S, 76°28'W, 8–15 July 1993, *Dik 42* (QCNE). PASTAZA: 8 km from Puyo, 1°30'S, 78°00'W, 1000 m, 21 July 1980,

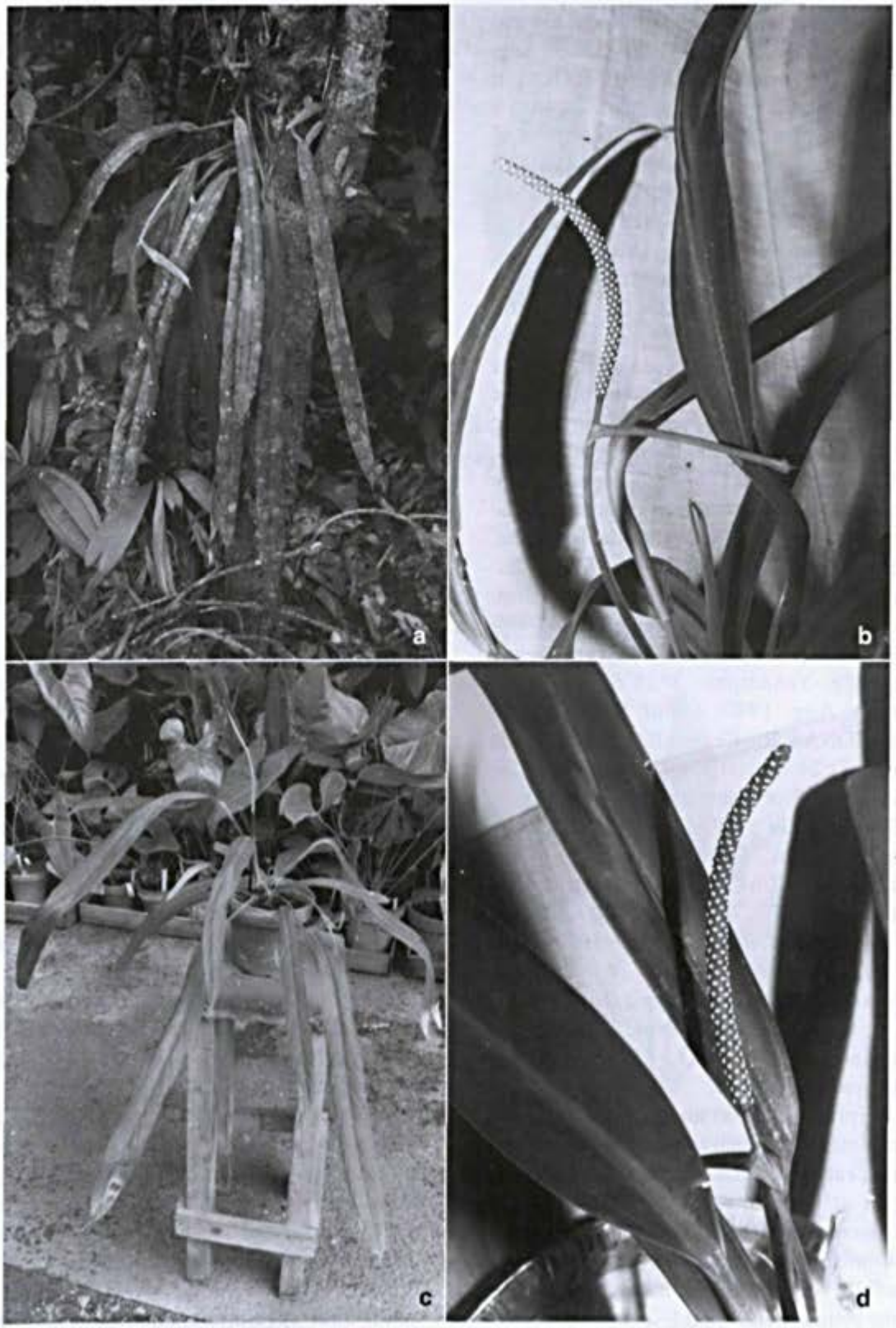


Figure 1 - *Anthurium ceronii* Croat: a. habit, in fruit; b. inflorescence at anthesis; c. habit in cultivation; d. inflorescence at anthesis, base of the leaf and spathe. Cultivated at Missouri Botanical Garden. (*Croat 58849*)

Shemluck 305 (ECON); Puyo-Macas, 31 km from Puyo, 1°37'S, 77°50'W, 1100 m, 31 Aug. 1976, *Øllgaard & Balslev 9058* (AAU); Puyo-Macas, ca. 33 km S of Puyo, 24.9 km S of Veracruz, ca. 1°38'S, 77°52'W, 900 m, 3 May 1984, *Croat 58963* (MO, QCA); Pozo petolero Villano 2 de Arco, 1°25'S, 1–18 Dec. 1991, *Hurtado 2875* (QCNE); 4–19 Aug. 1993, *Tirado et al. 50* (MO, QCNE). Sucumbios: Reserva Faunística Cuyabeno, N of Laguna Grande, 0°01'N, 76°11'W, 265 m, 19 Mar. 1989, *Balslev et al. 84463* (AAU); Cuyabeno Reserve, N of Laguna Grande, 0°0'S, 76°12'N, *Nielson 76014* (AAU); 9 Nov. 1988, *Paz et al. 66* (QCA); Río Aguarico, San Pablo de Secoyas, 0°17'S, 76°26'W, 235 m, 13 Feb. 1980, *Holm-Nielsen et al. 21040* (MO); Gonzalo Pizarro, Bosque Protectora Los Cedros, Cuenca del Río Tigre, 0°05'S, 77°25'W, 17 Mar. 1992, *Tipaz et al. 771* (QCNE). TUNGURAHUA: Río Pastaza, slopes of Volcán Tungurahua, Dec. 1904, *Sodiro s.n* (B). PERU. LORETO: Mayna Province, Yanamono, 3°25'S, 72°50'W, 150 m, Aug. 1980, *Croat 50124* (MO). AMAZONAS: Río Cenepa Region, Quebrada Aintami, 24 Nov. 1972, *Berlin 351* (US, USM); trail E of Hampami to Shaim, 1 Aug. 1974, *Berlin 1903* (USM); Prov. Condorcanqui, Cordillera del Condor, headwaters of Río Comainas, tributary of Río Cenepa, 3°54.1'S, 78°25.6'W, 1300–1500 m, 16 July 1994, *Beltrán & Foster 850* (MO).

Anthurium decurrens Poeppig, Nov. Gen. & Sp. 3: 83, t. 293, 1845. **Type**: Peru. Loreto, Maynas, Yurimaguas, *Poeppig* (W, destroyed). Fig. 2 a-d.

Epiphyte; **internodes** usually short, sometimes to as much as 1 cm long, 5–10 mm diam.; **cataphylls** 3.5–7.5 cm long, persisting intact at uppermost nodes, then cleanly deciduous; **petioles** (1.5) 6–22 cm long, drying 2–4 mm diam., subterete, weakly sulcate adaxially, sheathed 1–1.5 cm, only near the base of the petiole; geniculum 1–2 cm long; **blades** linear-lanceolate to oblanceolate-elliptic, 16–36.5 cm long, 3.7–12 cm wide, 2.9–4.0(5.3) times longer than broad, 1.6–1.8 times longer than petioles, narrowly oblanceolate to nearly obovate, broadest usually above the middle, gradually to abruptly long-acuminate at apex; drying matte on both surfaces, dark brown to dark gray-brown above, slightly paler and grayish to yellow-brown below; **midrib** drying convex on both surfaces, sometimes with an acute rib on the upper surface; **primary lateral veins** 12–15 per side, moderately obscure, drying scarcely more prominent than the interprimary veins, arising at a steep angle then spreading at 25°–45°; all major veins scarcely raised on either surface; collective veins arising from one of the lower primary lateral veins, usually from the lowermost, sometimes from very near the base, 1–4 mm from the margin, not at all loop-connected. Inflorescence subpendent; **peduncle** 26.5 cm long, usually 3–4-winged, rarely terete; **spathe** green, erect-spreading; **spadix** 6–11 cm long, drying 2–5 mm diam., prominently stipitate to 2–2.3 cm long (stipe drying 1–1.5 mm diam.), green to beige, becoming purple in fruit; flowers 3 per spiral, 2.5–2.7 mm long, almost as wide as long; tepals broadly rounded on inner margin, 2-sided on outside margin; stamens closely aggregated around the stigma; anthers 0.4 mm wide, 0.3 mm long, yellowish, drying tan, thecae scarcely divaricate. Infructescence 25–38 cm long; **berries** prominently early-emergent and green, narrowly ovate to obovate, deep purple to red at maturity 0.6–1.5 cm long.

Anthurium decurrens ranges from southern Colombia to Ecuador (Napo, Pastaza), Brazil (Acre), and Peru (Amazonas, Loreto) in the Amazon basin at 225–300 (440) m.

This species has been confused with a series of other species, especially with what has now been determined to be a new species, *A. whitmorei*, described in this paper. See the key to the species in this complex for key characters for the separation of *A. whitmorei*, and other species, from *A. decurrens*.

Additional specimens examined: PERU. AMAZONAS: Cunup, 800–850 m, *Kayap*

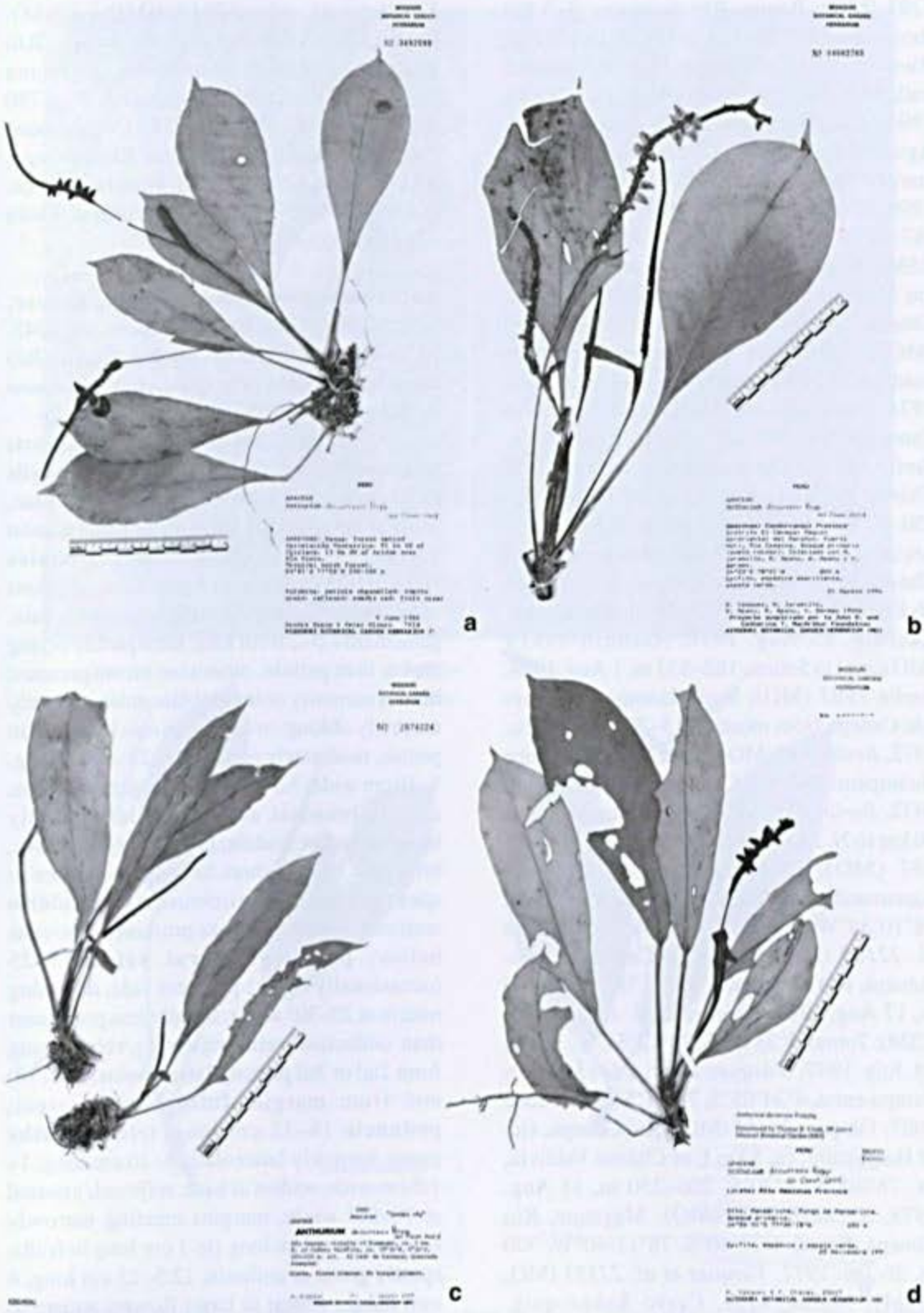


Figure 2 - *Anthurium decurrens* Poeppig. Herbarium specimens with inflorescences and infructescences. a. *Knapp & Alcorn 7614* (MO); b. *Vásquez et al. 19006* (MO); c. *Kujikat 383* (MO); d. *Vásquez & Chávez 25017* (MO).

1293 (MO); Bagua, Río Santiago, 3–5 km above mouth, 250–300 m, 8–13 Oct. 1962, *Wurdack 2163* (US); Imaza, Putuim-Shimutaz trail, 5°03'20"S, 78°20'23"W, 480 m, 19 June 1994, *Vásquez et al. 21261* (MO, USM); Aguaruna de Kusú-Listra, Cerro Apág, margen derecha Kusú, 600–700 m, 15 Sep. 1996, *Diaz et al. 8152* (MO); Río Cenepa, 167 m, 24 Nov. 1972, *Berlin 351* (MO, US, USM); Kayamas, flowing into Río Cenepa, 5 km N of confluence of Huampami and Río Cenepa, 213–243 m, 4 Dec. 1972, *Berlin 459* (MO); trail N of Río Cenepa towards headwaters of Kayamas, 182–243 m, 18 July 1974, *Berlin 1726* (MO); trail N of Río Cenepa to Tuhushiku, 213–243 m, 30 July 1974, *Berlin 1881* (MO); Huampami, ca. 5 km E of Chávez Valdivia, ca. 4°30'S, 78°30'W, 200–250 m, trail to Chigkan entsa, 8 Jan. 1978, *Ancuash 1230* (MO); 5 min. downriver from Chávez Valdivia, above Tuhusik, 213–243 m, 16 Dec. 1972, *Berlin 575* (MO); Huampami, Kachaig, 15 Aug. 1978, *Ancuash 1491A* (MO); trail to Sahim, 182–533 m, 1 Aug. 1974, *Berlin 1903* (MO); S of Huampami, across Río Cenepa from mouth, 213–274 m, 27 Dec. 1972, *Berlin 733* (MO); 5 km N of confluence Huampami and Río Cenepa, 256 m, 11 Oct. 1972, *Berlin 231* (MO); above Huampami to 10 km to N, 243–274 m, 22 Dec. 1972, *Berlin 687* (MO); Condorcanqui, El Cenepa, Aguaruan agki-Suwa, Río Cenepa, 4°31'35"S, 78°10'34"W, 289 m, 21 Jan. 1997, *Vásquez et al. 22108* (MO, USM); El Cenepa, Kusu-kubaim, Río Comina; 4°25'S, 78°16'W, 700 m, 17 Aug. 1994, *Vásquez et al. 18886* (MO, USM); Tutino, 4°33'05"S, 78°12'54"W, 340 m, 28 July 1997, *Vásquez et al. 24493* (MO); Pumpu-entsa, 4°34'05"S, 78°11'53"W, 26 June 1997, *Vásquez 24185* (MO); Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdivia, ca. 78°30'W, 4°30'S, 200–250 m, 11 Aug. 1978, *Ancuash 1404* (MO); Mayaque, Río Cenepa, Saasa, 4°31'40'S, 78°11'40"W, 300 m, 26 Jan. 1977, *Vásquez et al. 22353* (MO, USM); Mamayaque, Cerro Sakee-gaig, 4°34'62"S, 78°14'01"W, 500 m, 17 Feb. 1997, *Vásquez et al. 22613* (MO, USM). LORETO: Alto Amazonas Prov., Río Marañon, Pongo de Manseriche, *Tessmann 3901* (G, NY); Cerro Campanquiz, 550–750 m, 22 Oct. 1962, *Wurdack 2392* (NY); Above Pongo de Manseriche, mouth of Río Santiago, 200 m, *Mexia 6234* (US); Yurimaguas, ca. 135 m, 23 Aug.-7 Sep. 1929, *Killip & Smith 27675* (US).

Anthurium longispadiceum K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 10: 1045. 1930. **Type**: Colombia. Caquetá, Hetuhi, Río Orteguera, Laguna Cocha Quecachiara, *Woronow & Juzepczuk 6196* (US). Fig. 3 a-b.

Appressed epiphyte; stems short; **internodes** short, ca. 1 cm diam.; **cataphylls** to 10 cm long, 1.5 cm wide, broadest at base, acute at apex, drying brown and papery, soon deciduous. LEAVES spreading; **petioles** erect, 10–25 cm long, to 5 mm diam., thickest near base, terete; sheath inconspicuous; geniculum 1.5–2.0 cm long, infrequently drying darker than petiole, otherwise inconspicuous; **blades** narrowly oblong-oblanceolate or rarely narrowly oblong-ovate, 1–3 times longer than petiole, moderately coriaceous, 23–36 cm long, 4–10 cm wide, 3.5–8.5 times longer than wide, usually broadest above middle, or rarely broadest below middle, drying grayish above, brownish below, short to long-acuminate at apex (acumen 1–3 cm), obtuse at base; **midrib** convexly raised, nearly as prominent above as below; **primary lateral veins** 17–25 (occasionally fewer) pairs per side, departing midrib at 20–30° angle, slightly less prominent than collective vein; collective vein arising from 2nd or 3rd primary lateral veins, 2–5 (10) mm from margin. Inflorescence erect; **peduncle** 16–32 cm long, terete; **spathe** green, narrowly lanceolate, 8–10 cm long, 1–1.5 cm wide, widest at base, reflexed, inserted at 70–80° angle, margins meeting narrowly acute, stipe 5 mm long (to 1 cm long in fruit); **spadix** green at anthesis, 12.5–25 cm long, 4 mm diam., widest at base; flowers square to narrowly rhombic, 4 in principal spiral, 2.5 mm

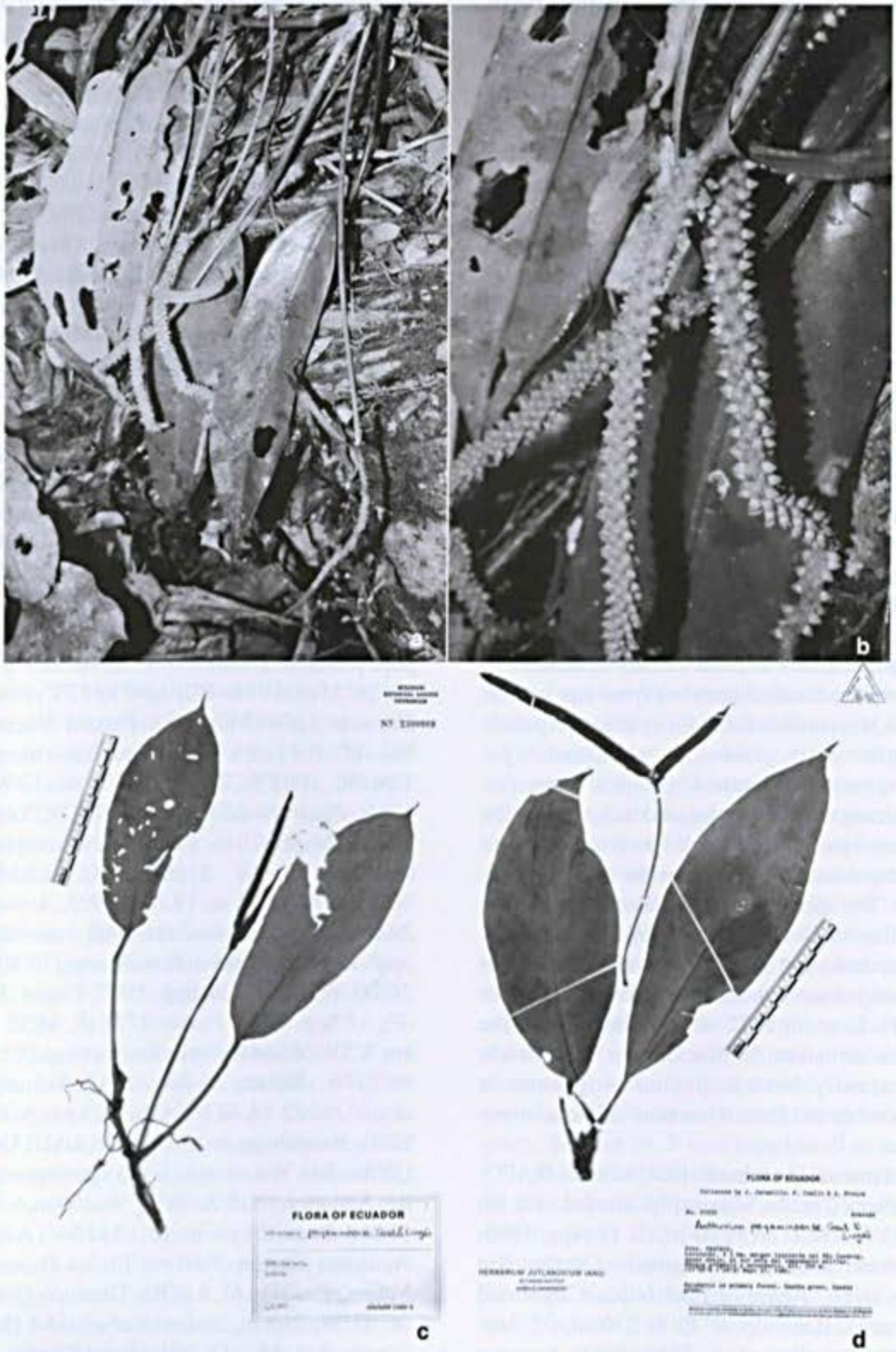


Figure 3 - a-b. *Anthurium longispadiceum* K. Krause: a. habit, in fruit; b. infructescences, note the berries promptly protruding. (*Croat 72550*); c-d. *Anthurium payaminoense* Croat & Lingán: c. type specimen (*Lugo 3164*); d. herbarium specimen (*Jaramillo 3133*).

long, 1.5–2.0 mm wide, sides straight; tepals 1.5 mm long, 0.5–0.8 mm wide, inner margins rounded, outer margins 2 sided. Infructescence to 40 cm long, 2.5 cm diam., ± pendent; **berries** ± tapered and pointed as they emerge, maturing red.

Anthurium longispadiceum is known from southern Colombia, eastern Ecuador and northern Peru, occurring in lowland Tropical moist forest (T-mf) and in a small region of Tropical wet forest (T-wf) centered at 1°04'S, 77°30'W, at 200–575 m. The species is distinguished by its erect habit with slender blades about twice as long as petioles, the weakly sheathed petioles, the very long greenish spadix and red berries.

Is a member of sect. *Decurrentia* and is distinguished from *A. decurrens* by its much narrower blades which are less conspicuously broadened toward the apex and by its proportionately longer spadices which are proportionately less stipitate. *Anthurium longispadiceum* is most closely related to *A. ceronii*, and is distinguished from that species by its less pendent habit, lower blade-to-petiole length ratio, weakly sheathed (vs. conspicuously sheathed) petioles, terete (vs. quadrangular) peduncles, and its long, slender, green spadices with red berries (vs. red spadices with white berries for *A. ceronii*).

The species was first collected in the type locality in Colombia by G. Woronow and S. Juzepczuk, but has not been collected in that country since. It was first collected in Ecuador by H. Lugo in 1972 while collecting for the Rijks herbarium in Stockholm. While it has apparently been collected only once in Colombia and Peru, it has been collected many times in Ecuador.

Specimens examined: ECUADOR. NAPO: Orellana Cantón, Maxus Pipeline Rd., km 19, 0°33'S, 76°31'W, 230 m, 1–17 Apr. 1993, *Hurtado 3068* (MO); Aguarico Cantón, Río Aguarico, Reserva Faunística Cuyabeno Reserve, Zancudo, 0°29'S, 230 m, 25 Sep. 1991, *Palacios et al. 7585* (MO); Reserva del Batallón de Selva, 0°05'S, 75°52'W, 200 m, Aug. 1980, *Andrade 33087* (AAU, QCA, QNA); 20 km W of Loreto, 0°45'S, 77°28'W, 575 m, 10 Jan. 1989, *Hurtado et al. 1391* (MO); Estación Biológica Jatun Sacha, 8 km E of Misahuallí, along Río Napo, 1°04'S, 77°36'W, 450 m, 17 Jan. 1987–6 Feb. 1987, *Cerón 865* (MO); 21–25 May 1987, *Cerón 1475* (MO), 8 Nov. 1987, *Cerón 2645* (MO); 6 Aug. 1989, *Cerón 7236* (MO); 23 May 1992, *Gudiño & Zuleta 1668* (QCNE); 1°08'S, 77°30'W, 450 m, *Palacios 2645* (MO), 24–27 Aug. 1988, *Palacios 2764* (MO), 24–27 Aug. 1988, *Palacios 4326* (MO); canopy walkway, 13 Jan. 1999, *Delinks & Suárez 176* (MO, QCNE). Orellana Cantón, Río Yasuní, Nacional Yasuní, km 3 of NPF-Puerto Maxus branch, 0°41'S, 76°25'W, 250 m, 15 June 1994, *Pitman 283* (MO, QCNE); Maxus pipeline rd., km 27, 0°35'S, 76°30'W, 250 m, 4–27 July 1993, *Aulestia 17* (MO), 4–27 July 1993, *Aulestia 55* (MO); km 45, 0°45'S, 76°28'W, 230 m, 8–15 Aug. 1993, *Dik 73* (MO, QCNE); pozo petrolero Diami 2, 0°55'S, 76°11'W, 200 m, 26 May 1988–8 June 1988, *Cerón & Hurtado 4179* (MO, US); Parque Nacional Yasuní, Estación Cientifica Yasuní, vic. Tipuanti, 0°38'S, 76°30'W, 200 m, 10 Mar. 1996, *Kjaer-Pedersen 2051* (MO); Yasuní Forest Reserve, vic. Pontificia Universidad Católica Field Station, 0°40.853'S, 76°23.697'W, 225 m, 19 June 1995, *Acevedo-Rodrigues & Cedeño 7411* (MO); ca. 80 km upriver from Nuevo Rocafuerte, 0°30' S, 76°00' W, 225 m, 16 Sep. 1977, *Foster 3691* (F), 17 Sep. 1977, *Foster 3718* (F, MO); 2–5 km WSW of San Pablo de los Secoyas, 0°15'S, 76°21'W, 300 m, 29 Aug. 1981, *Brandbyge et al. 36242* (AAU, QCA, QNA); 6 Aug. 1980, *Brandbyge et al. 32519* (AAU, QCA, QNA); Río Wai si ayá, 1 km upstream from Río Aguarico, 0°15'S, 76°21'W, 300 m, 6 Aug. 1981, *Brandbyge et al. 33206* (AAU); Aguarico Cantón, Reserva Etnica Huaorani, Maxus oil rd., km 61, S of Río Tivacuno, 0°48'S, 76°23'W, 250 m, *Aulestia et al. 984* (MO), *Pitman 249* (MO, QCNE); Santa Cecilia, Río Aguarico, 0°04'N, 76°58'W, 220 m, *Sparre*

13052 (S); 4–5 km N of Santa Rosa, on Río Bueno, 0°55'S, 77°28'W, ca. 400 m, *Lugo 2153* (MO); Tena region, *Asplund 9217* (S); Orellana Cantón, Yuca-Taracoa de Esperanza, 22.5 km E of jct. with main Coca-Río Tigüino Rd., 0°34'N, 6°42'W, 350 m, *Croat 72550* (MO); Coca-Loreto-Hollín, Sitio Huaticocha, 0°45'S, 77°29'W, 500 m, *Palacios et al. 3545* (MO), *Palacios et al. 3566* (MO). PASTAZA: Río Curaray, near Laguna Patoamo, 1°30'S, 76°30'W, 230 m, *Neill & Palacios 6817* (MO); Ceilán, path Ceilán-Río Cononaco, S of Río Curaray, 1°36'S, 75°40'W, 200 m, *Brandbyge & Asanza 31778* (AAU), *31759* (AAU), *31779* (AAU); E of Río Añango, 400–500 m, 1°30'S, 77°15'W, 9 Aug. 1980, *Jaramillo & Coello 3312* (QCA); Puyo; Pambayucua, Rio Lligino, 77°22'W, 0°29'S, 420 m, *Palacios 10164* (MO, QCNE); Centro-Oriente, Población Waorani (Aucas), 400–500 m, *Jaramillo & Coello 3313* (QCA). SUCUMBIOS: Lago Agrio Cantón, Lago Agrio-Baeza, km 46, 9.3 km E of Lumbaquí, 0°6'N, 77°16'W, 375 m, *Croat 58701*; Reserva Faunística Cuyabeno, between Pacuyacu & Juanillas, 0°33'S, 75°30'W, 230 m, *Palacios et al. 7893* (MO). PERU. AMAZONAS: 5 km E of Chávez Valdivia, Río Cenepa, 200–250 m, 4°30'S, 78°30'W, *Ancuash 1230* (MO).

Anthurium payaminoense Croat & Lingán, sp. nov. **Type**: Ecuador. Lago Agrio, 4 Nov. 1973, *Lugo 3164* (holotype, MO; isotype, GB). Fig. 3 c-d.

Epiphytica; internodia 0.5–3.2 cm longa, 0.4–0.7 cm diam.; petiolus 3.9–13.6 cm longus; lamina 16.5–30.8 cm longa, 5.5–11 cm lata, oblongo-elliptica vel oblanceolata; nervis primariis lateralibus (5)7–9 utroque; pedunculus 10.9–32.1 cm longus, 3–4-latus; spatha viridis, (3.4) 6.5–13 cm longa, 0.5–1.6 cm lata, anguste oblonga; spadix (0.2) 3.7–14.4 cm longus, 0.2–0.6 mm diam. viridis, stipitatus (0.4) 0.6–1.4 (3.2) cm.; bacca 3 mm longa.

Description based on dried material. Epiphyte; roots 1 mm diam., whitish to pale brown; stem terete; **internodes** 0.5–3.2 cm long, 0.4–0.7 cm diam; **cataphylls** 0.7–4 (9) cm long, lanceolate, membranaceous, persisting reddish brown to dark brown. Leaves erect to spreading; **petioles** 3.9–13.6 cm long, 0.2–0.3 cm diam., U-shaped, shallowly and acutely sulcate above, 0–2-ribbed below, green; sheath 1.4–3.2 (5.1) cm long; geniculum 1.2–2.7 cm long; **blades** papiraceous, 16.5–30.8 cm long, 5.5–11 cm wide, oblong-elliptic to oblanceolate, abruptly acuminate at apex, drying dark olive green above, blackish below; **midrib** conspicuously raised in both surfaces, more conspicuously above; **primary lateral veins** (5)7–9 per side, conspicuously raised below, straight, departing at 30–45° (50°) from the midrib; collective veins arising from the base, (0.2) 0.7–1.5 cm from the margin. Inflorescence erect to spreading; **peduncle** 10.9–32.1 cm long, 0.1–0.3 cm diam., markedly 3–4-sided, green, 2.3–2.8 times longer than the petiole; **spathe** papiraceous, green, persistent, erect to spreading, (3.4) 6.5–13 cm long, 0.5–1.6 cm wide, narrowly oblong, conspicuously acuminate at apex, the margins joining at ca. 90° angle; **spadix** slightly tapered at apex, (0.2) 3.7–14.4 cm long, 0.2–0.4 cm wide near to apex, 0.2–0.6 mm wide near to base, green; stipe greenish, (0.4) 0.6–1.4 (3.2) cm long; flowers square, margins slightly sigmoid, 2 × 2 mm; 3–4 flowers visible in the principal spiral, 5–6 flowers visible in the alternate spiral; tepals with the inner margins straight to convex; **pistils** with stigmas elliptic, not protruding; stamens ca. 1 mm long, flattened; thecae not divaricated. Infructescence erect to spreading, green; **berries** ca. 3 mm long.

Anthurium payaminoense is known from the Provinces of Napo and Pastaza (Ecuador), ranging from 200–500 m in elevation and seems to be endemic. There is a voucher from Río Moa, Acre in Brazil *(Jangoux et al. 85–101)*, which looks very similar to *A. payaminoense*, but the cataphylls are totally deciduous.

Anthurium payaminoense is a member of sect. *Decurrentia* and is distinguished by its oblong-elliptic to oblanceolate leaves drying blackish with the collective veins not close to the margins, cataphylls persisting brown and a stipitate green spadix. It can be confused with *A. whitmorei*, which has fibrous cataphylls, longer peduncles and its blades drying greenish.

This species is named after the village of Payamino, where it is a common species.

Paratypes: ECUADOR. PASTAZA: Lorocachi, 3 km left bank of Río Curacay, SE of military camp, 1°38'S, 75°58'W, 200 m, 27 May 1980, *Jaramillo et al. 31332* (AAU); Pastaza Cantón, Parroquia Curacay, Pozo Petrolero Villano 2 de ARCO, between Iquino and Villano, 1°29'S, 77°27'W, 350 m, 10 Aug. 1993, *Tirado et al. 130* (CAS, CM, ENCB, MO, QCNE). NAPO: Project of Payamino, Ministerio de Agricultura y Ganadería, near roadside, 0°26'S, 77°01'W, 200 m, 25 Feb. 1980, *Brandbyge & Asanza 30027* (AAU); Reserva El Chuncho rd. Payamino-Loreto, 0°10'S, 77°03'W, 13 Apr. 1988, *Arguello 828* (QCA); Reserva Biológica Jatun Sacha, 8 km from Puerto Misahuallí, right bank of Río Napo, 1°04'S, 77°36'W, 450 m, 4 Sep. 1987, *Cerón et al. 2001* (MO).

Anthurium sydneyi Croat & Lingán, sp. nov. **Type**: Peru. Loreto, campamento petrolero, Río Pastaza, N de Iquitos, 2°55'S, 76°25'W, 210 m, 21 Nov. 1980, *R. Vásquez & Jaramillo 852* (holotype, MO-3032816; isotype USM). Fig. 4 a-b.

Epiphytica; internodia 0.2–0.6 cm longa, 0.4–0.7 cm diam.; petiolus 2.3–9.2(12.6) cm longus; lamina 8.1–23 cm longa, 2.1–6 cm lata; nervis primariis lateralibus (5)7–10 utroque; pedunculus inferme costatus, 4–20 cm longus, 0.1 cm diam.; spatha viridis, 1.9–6.6 cm longa, 0.6–1.3 cm lata, ovato-lanceolata; spadix, 3.6–7.2 cm longus, 0.2–0.3 cm diam.

Description based on dried material; epiphytic; roots 1–2 mm diam., grayish to pale brown; stem terete; **internodes** 0.2–0.6 cm long, 0.4–0.7 cm diam.; **cataphylls** 2–6.2 cm long, 1-ribbed, oblong-lanceolate, membranaceous, brown to greenish brown, the uppermost persisting, then deciduous. Leaves erect to spreading; **petioles** 2.3–9.2 (12.6) cm long, 0.1–0.2 diam., U-shaped, shallowly and acutely sulcate, green; sheath 0.2–1.7 cm long; geniculum 0.2–0.5 cm long, inconspicuous; **blades** subcoriaceous, 8.1–23 cm long, 2.1–6 cm wide, wider at the upper third, oblanceolate to elliptic, attenuate at base, abruptly acuminate to acute at apex, semiglossy above, glossy below; **midrib** inconspicuously raised on both surfaces; **primary lateral veins** (5)7–10 per side, almost inconspicuous, straight, departing at 40°–50° angle from the midrib; interprimary veins slightly raised in both surfaces; collective veins arising from one of the 1st or 2nd primary lateral veins, 0.2–0.8 cm from the margins. Inflorescence erect; **peduncle** weakly ribbed, 4–20 cm long, 0.1 cm diam., greenish, 1.7–2.2 times longer than the petiole; **spathe** green, membranaceous, 1.9–6.6 cm long, 0.6–1.3 cm wide, ovate-lanceolate, abruptly acuminate at apex, acute at base; the margins forming ca. 50° angle on peduncle; **spadix** cylindric to slightly long-tapered, green, 3.6–7.2 cm long, 0.2–0.3 cm diam.; flowers rhombic, margins straight, 4 × 2 mm; 3–4 flowers visible in both spirals; **pistils** 2 mm long; stigmas oblong; stamens ca. 2 mm long, filaments flattened; thecae slightly divaricate. Infructescence erect to spreading; **spadix** (3) 7.4–10.6 cm long, 0.7–2.3 cm wide; **berries** green to red, early emergent, ovate with the apex conical, stigmas protruding.

Anthurium sydneyi is known only from Ecuador (Pastaza Province) and Peru (Department of Loreto) in areas of Tropical moist forest (T-mf) at 180–200 m.

The species is a member of sect. *Decurrentia* and is distinguished by its epiphytic habit, oblanceolate leaf blades conspicuously acuminate at apex, peduncle weakly ribbed, spathe and spadix green and principally by its berries promptly emerging even before reaching maturity. This species

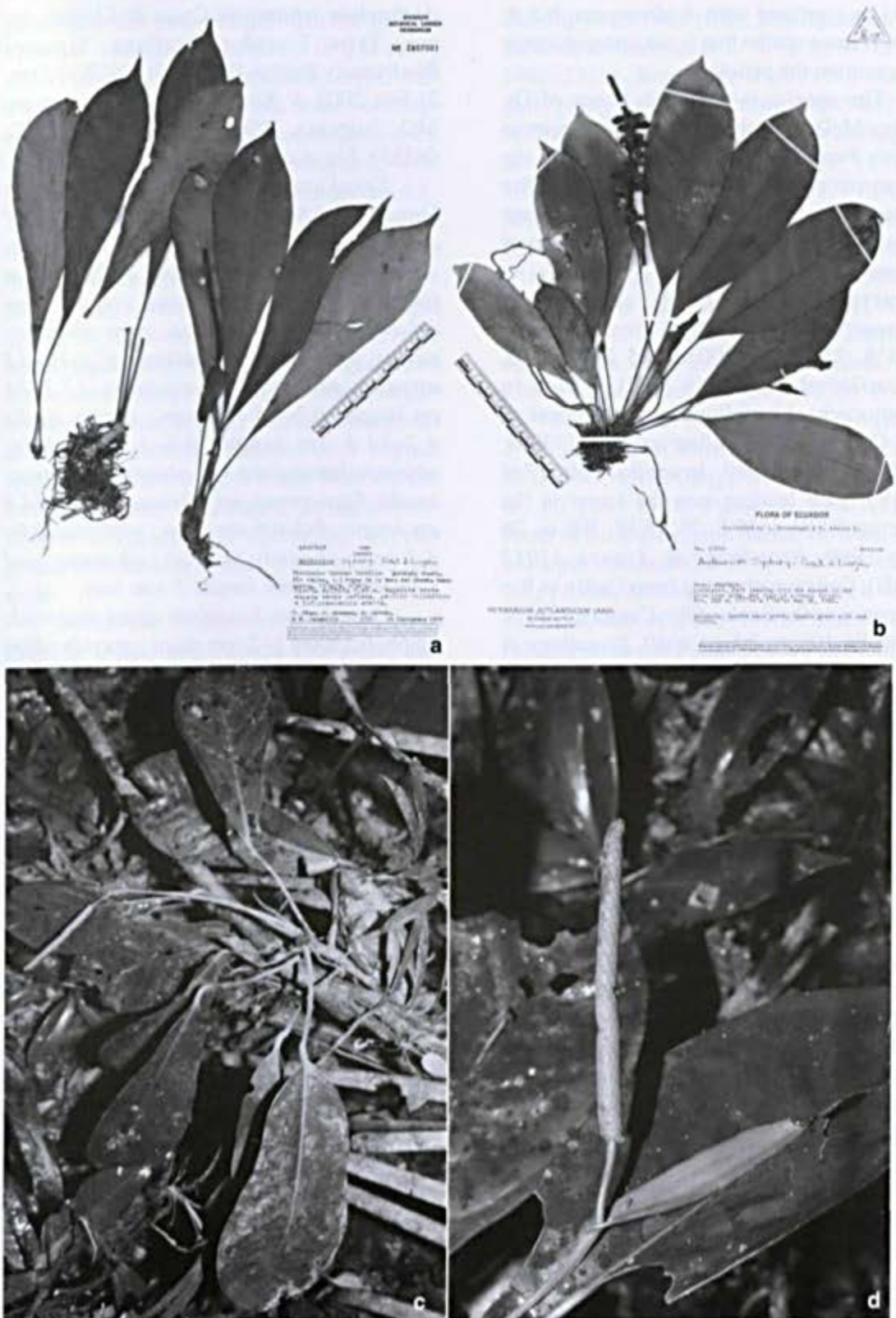


Figure 4 - a-b. *Anthurium sydneyi* Croat & Lingán. Herbarium specimens at MO. a. *Díaz 835*; b. *Brandbyge 31012*; c-d. *Anthurium whitmorei* Croat & Lingán. c. habit; d. inflorescence, post-anthesis. (*Croat 72524*)

could be confused with *A. decurrens*, but *A. sydneyi* has a spathe that is not conspicuously decurrent on the petiole.

The species is named in honor of Dr. Sidney McDaniel who collected the species in Loreto, Peru. Sidney McDaniel is one of the foremost experts on the plants of the Department of Loreto in Peru where he spent years collecting in preparation for the Flora of Loreto.

Paratypes: ECUADOR. PASTAZA: Lorocachi, on the path to Lagartococha, 1°38'S, 75°58'W, 200 m, 25 May 1980, *Jaramillo et al. 30969* (AUU); Pica to Lagartococha, 1 hr. following the right bank of Río Curaray, S of military camp, 1°39'S, 75°59'W, 1 June 1980, *Jaramillo et al. 31749* (AAU); path leading into the forest in the direction SSW, 1°38'S, 75°58'W, 200 m, 26 May 1980, *Brandbyge & Asanza 31012* (AAU); Ceilán, path going from Ceilán to Río Cononaco on the S side of Río Curaray, 1°36'S, 75°40'W, 200 m, 7 June 1980, *Brandbyge & Asanza 31793* (AAU); 6 June 1980, *Brandbyge & Asanza 31760* (AAU). PERU. LORETO: Alto Amazonas, Andoas, 2°55'S, 76°25'W, 180 m, 3 Nov. 1983, *Vásquez & Jaramillo 4564* (MO); Coronel Portillo, Quebrada Shesha, Río Abujao, 1.3 hrs. from the mouth of Shesha, 8°20'S, 73°45'W, 14 Dec. 1978, *Díaz et al. 835* (MO); Valseca-Rudolpho, Río Corrientes, between Platanoyacu & mouth of Río Macusari, 17 Sep. 1968, *McDaniel & Marcos 11054* (MO); Loreto, Pampa Hermosa and vicinity, Río Corrientes, 1 km S of jct. with Río Macusari, 30°15'S, 75°50'W, 160 m, 7 June 1986, *Lewis et al. 10843* (MO); Río Macusari, *McDaniel & Marcos 11026* (IBE). HUÁNUCO: Pachitea, Codo de Pozuzo, trail W of settlement to lower mountains slopes, 75°28'W, 9°40'S, 500–1000 m, 17 Oct. 1982, *Foster 9244* (MO). SAN MARTÍN: Mariscal Cáceres, Madre Mía, 760–880 m, 16 Mar. 1977, *Boeke 1310* (MO).

Anthurium whitmorei Croat & Lingán, sp. nov. **Type**: Ecuador. Orellana, Tiputini Biodiversity Station, 0°38'S, 76°09'W, 200 m, 21 Feb. 2002, *N. Köster et al. 1018* (holotype, MO; isotypes, BONN, K, QCA, QCNE, QUSF). Fig. 4 c-d.

Epiphytica; internodia 0.3–2.1 cm longa, 0.2–0.8 cm diam.; petiolus 2.7–12.7 cm longus, 0.2–0.5 diam., D-formatus, vaginatus 1.9–4.2 cm; lamina 14.2–34.9 cm longa, 3.1–10 (12.6) cm lata, oblanceolata vel oblongo-oblanceolata, raro obovate; nervis primariis lateralibus (7) 10–13 utroque; pedunculus 4-costatus, 13.2–31 cm longus, 0.2–0.5 cm diam.; spatha viridis 4.2–13.3 cm longa, 0.6–1.2 cm lata, oblongo-lanceolata vel oblongo-elliptica; spadix flavo-virens vel olivaceous, 4.5–14.8 cm longus, 0.2–0.6 cm diam., stipitatus 0.9–4.1 cm; bacca viridis, obovata vel sphaericus, 3 mm longa, 2 mm lata.

Description based on dried material; epiphytic; roots 1–2 mm diam., grayish white to brownish; **internodes** 0.3–2.1 cm long, grayish to brown, 0.2–0.8 cm diam.; **cataphylls** 2–6.2 cm long, un-ribbed, lanceolate, subcoriaceous, grayish to dark brown, weathering in to brown fibers, then deciduous. Leaves erect to spreading; **petioles** 2.7–12.7 cm long, 0.2–0.5 mm diam., D-shaped with erect margins above, frequently bluntly ribbed below, greenish; sheath 1.9–4.2 cm long; geniculum 0.7–2.3 cm long; **blades** subcoriaceous, 14.2–34.9 cm long, 3.1–10 (12.6) cm wide, oblanceolate to oblong-oblanceolate, rarely obovate, abruptly acuminate at apex, acute to obtuse at base, semiglossy above, glossy below; margins slightly concave below the middle; **midrib** convex above, prominently raised below; **primary lateral veins** (7) 10–13 per side, slightly curved, ascending, departing midrib at 50–60°; collective veins arising from the base, 0.4–1.7 cm from the margins. Inflorescence erect to spreading; **peduncle** markedly 4-ribbed, 13.2–31 cm long, 0.2–0.5 cm diam.,

green, 2.4–4.8 times longer than the petiole; **spathe** membranaceous to weakly subcoriaceous, green, persistent, erect, 4.2–13.3 cm long, 0.6–1.2 cm wide, oblong-lanceolate to oblong-elliptic, acuminate at apex, acute at base, the margins joining at 25–40°; **spadix** yellowish green to olive-green, 4.5–14.8 cm long, 0.2–0.6 cm diam.; stipe greenish, 0.9–4.1 cm long in front, 0.3–3.1 cm long in back; flowers rhombic 1.5–1.7 mm long, 1.7–2 mm wide; 3–4 flowers visible on the principal spiral, 3–7 flowers visible on the alternate spiral; tepals grayish to brownish, rugulose on drying, outer margins 2–3 sided, inner margins convex; stigmas elliptic; stamens contiguous at anthesis, closely clustered over stigma; anthers 0.35 mm long, 0.5 mm wide; thecae ovoid, markedly divaricated, drying yellow-brown. Infructescence spreading; **berries** green, obovate to spherical, 3 mm long, 2 mm wide.

Anthurium whitmorei is known from Ecuador (Napo and Pastaza Provinces) and Peru (Loreto Department), ranging from 140 to 700 m elevation in Tropical moist forest (T-mf).

Anthurium whitmorei is a member of sect. *Decurrentia* and is characterized by its cataphylls weathering into fibers, oblanceolate leaves with margins slightly concave as well as by the conspicuously 4-sided, markedly 4-ribbed peduncle and a prominently decurrent spathe and the green, stipitate spadix.

There are collections that share geographical distribution and morphological features (shape of leaves, peduncle 4-ribbed, spadix stipitate), but they are greenish on drying with lanceolate spathe and slender spadix; probably they are the same species or a hybrid.

Anthurium whitmorei is named in honor of Timothy Charles Whitmore who first collected this species in Tiputini Biodiversity Station, Orellana (Ecuador).

Paratypes: ECUADOR. NAPO: Limoncocha, near NW corner of lake, Oct. 1969, *Mowbray 69018* (MO); Lower Río Aguarico (above puesto military Puerto Loja), 7 Mar. 1968, *Harling et al. 7401* (GB); Río Aguarico, San Pablo de los Secoyas, 0°17'S, 76°26'W, 13 Feb. 1980, 235 m, *Brandbyge et al. 21040* (AAU); path going in the direction WSW, 0°15'S, 76°21'W, 8 Aug. 1981, 300 m, *Brandbyge et al. 33324* (AAU); *33334* (MO); 11 Aug. 1980, 300 m, *Brandbyge et al. 32791* (AAU, MO); Río Way si ayá, a northern tributary to Río Aguarico, ca. 6 km upriver from San Pablo, 0°15'S, 76°21'W, 10 Aug. 1980, 300 m, *Brandbyge & Asanza 32751* (AAU); *32698* (AAU, MO); Tena Cantón, Reserva Biológica Jatun Sacha, ca. 8 km E of Misahuallí, near Chinguipino, Parcel 3, 1°04'S, 77°36'W, 400 m, 16 Feb. 1990, *Cerón et al. 8751* (MO); 1°04'S, 77°36'W, 450 m, 24 Aug. 1988, *Cerón 4653* (MO, AAU, GB); 1°04'S, 77°37'W, 450 m, 10 Sep. 1988, *Palacios 2981* (MO); Reserva Biológica Jatun Sacha, ca. 8 km ESE of Puerto Misahuallí, 1°04'S, 77°37'W, 450 m, 3 July 1986, *Miller et al. 2332* (MO); 1°04'S, 77°36'W, 400 m, 8 Jan. 1990, *Palacios 4794* (MO); Permanent Parcel 5, 1°04'S, 77°36'W, 400 m, 6 Aug. 1989, *Cerón 7269* (MO, QCA); Misahuallí, 1°04' S, 77°37'W, 450 m, 10 Sep. 1988, *Palacios 3018* (F, MO, NY); 1°04'S, 77°36'W, 450 m, 4 Sep. 1987, *Cerón 2013* (MO); 1°04'S, 77°36'W, 450 m, 14 Apr. 1990, *Alvarez 27* (MO); *Palacios et al. 359* (MO); Parroquia Puerto Misahuallí, near Río Puni near Capirona village, 1°06'S, 77°39.5'W, 395 m, 12 Aug. 1993, *Webster 29756* (MO); Coca, 260 m, 27 Oct. 1960, *Whitmore 874* (K); right bank of Río Napo, 8 km of Misahuallí, 1°04'S, 77°37'W, 450 m, 10 Sep. 1988, *Palacios 2941* (MO); Cerro Antisana, Shinguipino forest between Ríos Napo and Tena, 8 km SE of Tena, 0°30'S, 78°W, 440 m, 13 Aug. 1960, *Grubb et al. 1574* (NY); 4 km S of Puerto Napo in Río Napo 500 m, 4 Aug. 1984, *Dodson et al. 14951* (MO); Villano near Rucu Llacta, 0°54'S, 77°45'W, 2 Aug. 1990, *Bennett et al. 4387* (MO); 5 km N of Coca off rd. Coca-Payamino, Finca Tipan, 0°25'S, 77°W, 250 m, 22 Oct. 1988, *Palacios 3187* (MO, US); new rd. on right bank of Río Napo, 14 km E of Puerto Napo, 9 km E of Atahualpa, 1°02'S,

77°40'W, 12 Feb 1987, 500 m, *Palacios & Neill 1550* (MO); Yasuní National Park, Estación Biológica Yasuní, at Tiputini and surroundings, 0°38'S, 76°30'W, 26 Mar. 1996, 200 m, *Kjaer-Pedersen 2052* (MO); Río Yasuní, 80 km upriver from Nuevo Rocafuerte, 225 m, 17 Sep. 1977, *Foster 3703A* (F); Reserva de Producción Faunística Cuyabeno, N of Laguna Grande, Plot 1, 0°S, 76°12'W, 11 Apr. 1988, 265 m, *Nielsen 76340* (AAU); Lago Agrio, Parroquia Dureno, Reserva Indígena Cofán-Dureno, 0°02'S, 76°42'W, 1 Jan. 1988, 350 m, *Cerón 3135* (MO, B). PASTAZA: Lorocachi, on the right bank of Río Curaray, 3 km from the military camp, 1°38'S, 75°58'W, 200 m, 30 May 1980, *Jaramillo et al. 31527* (AAU); Ceilán, Pica from Ceilán to Río Cononaco on the N side of Río Curaray, 1°36'S, 75°40'W, 6 June 1980, *Brandbyge et al. 31624* (AAU); Parroquia Curaray, Pozo Petrolero Villano 2 de ARCO, 1°25'S, 77°20'W, 400 m, 15 Dec. 1991, *Hurtado 2889* (MO, QCNE, VDB); between Iquino and Villano, 1°29'S, 77°27'W, 350 m, 15 Aug. 1993, *Tirado et al. 136* (MO, QCNE); Río Curaray, mouth of Río Namoyacu, 1°24'S, 76°45'W, 275 m, 10 Aug. 1985, *Neill & Palacios 6615* (MO, NY, QAME); Río Papayacu at Río Curaray, 1°29'S, 76°42'W, 235 m, 23 Mar. 1980, *Holm-Nielsen et al. 22651* (AAU, NY, QAME); *Holm-Nielsen et al. 22633* (AAU); Río Namoyacu at Río Curaray, 1°27'S, 76°45'W, 230 m, 21 Mar. 1980, *Holm-Nielsen et al. 22320* (AAU); Centro Oriente, Toñampari-Población Waorani (Aucas) Pica, 400–500, 14 Aug. 1980, *Jaramillo & Coello 3521* (AAU). ORELLANA: Montalvo, Río Bobonaza, 300 m, 26 Dec. 1976, *McElroy 200* (QCA). SUCUMBIOS: Reserva Cuyabeno, orilla del Río Aguarico, comunidad indigena Cofán de Zábalo, 75°45'W, 0°22'S, 230 m, 21 Nov. 1991, *Palacios et al. 9449* (MEXU, MO, US); Lago Agrio Cantón, rd. Lago Agrio (Nueva Loja) and Coca (Pto. Francisco de Orellana), 26 km S de Lago Agrio, 4.6 km S of El Emo, then 2.8 km W of main Lago Agrio-Coca rd., along farm rd., 0°05'S, 76°54'W, 355 m, 29 Feb. 1992, *Croat 72524* (KYO, MO). PERU. AMAZONAS: Condorcanqui, Río Cenepa, 04°25'S, 78°16'W, 700 m, 17 Aug. 1994, *Vásquez et al. 18845* (CM, MO, US). LORETO: Loreto, Campamento Forestal, 14 Apr. 1979, *Aronson & Rios del Aguila 936* (K, MO); Altura Tuta Pishco on Río Napo, *Croat 20301* (F, MO); Alto Amazonas, Andoas, Río Pastaza near Ecuador border, 230 m, 16 Nov. 1979, *Gentry & Díaz 28138* (MO); Maynas, Amazonas Explore Napo Camp (Río Sucusari), 3°15'S, 72°54'W, 29 July 1991, *Vásquez & Grández 17536* (MO); Amazonas Allpahuayo, Estación Experimental del Instituto de Investigaciones de la Amazonía Peruana (IIAP), 4°10'S, 73°30'W, 150–180 m, 4 Dec. 1990, *Vásquez & Jaramillo 15215* (MO, CAS); 4 Nov. 1990, *Vásquez & Jaramillo 14571* (F, MO).

Literature cited

Croat, T. 1983. A revision of the genus *Anthurium* (Araceae) of Mexico and Central America. Part 1: Mexico and Middle America. Annals of the Missouri Botanical Garden 70: 211-417.

_____. 1986. A revision of the genus *Anthurium* (Araceae) of Mexico and Central America. Part 2: Panama. Monographs of Systematic Botany Missouri Botanical Garden 14: 1-204.

_____. 1991. A revision of *Anthurium* section *Pachyneurium* (Araceae). Annals of the Missouri Botanical Garden 78: 539-855.

Engler, A. 1905. Araceae-Pothoideae. pp. 1-330. *In:* A. Engler (ed.), Das Pflanzenreich IV 23B (Heft 21). W. Engelmann, Leipzig and Berlin.

Schott, H. W. 1860. Prodromus Systematis Aroidearum. Mechitarists's Press, Vienna.

NOMENCLATURE AND TAXONOMY OF *PHILODENDRON HASTATUM* K. KOCH & SELLO

Cássia M. Sakuragui[1] & *Simon J. Mayo*[2]

ABSTRACT

(Nomenclature and taxonomy of *Philodendron hastatum* K. Koch & Sello) The paper discusses the taxonomy and nomenclature of *Philodendron hastatum* and aims to clarify the status of some other names often used to name specimens with similar leaf blade shape. A description of the species is provided based on the study of herbarium material.

Key-words: Araceae, *Philodendron hastatum*, nomenclature, typification.

RESUMO

(Nomenclatura e taxonomia de *Philodendron hastatum* K. Koch & Sello) O trabalho discute a taxonomia e nomenclatura de *Philodendron hastatum* e objetivou esclarecer o status de outros nomes freqüentemente utilizados para nomear espécies com morfologia foliar similar. São fornecidas descrição morfológica e figura da espécie baseadas no estudo de materiais de herbário.

Palavras-chave: Araceae, *Philodendron hastatum*, nomenclatura, tipificação.

INTRODUCTION

Philodendron hastatum, like many other *Philodendron* species, typically has great vegetative morphological variation, particularly in leaf shape. This species, however, shows two remarkable characteristics in the leaf blade leaf: the lobes of the posterior division are extrorse an arcuate sinus, and the anterior region is very elongated, at least three times longer than the length of the posterior lobes. It occurs in south-eastern Brazil (Rio de Janeiro and Minas Gerais states), growing in humid forests as a hemiepiphyte.

The morphological variation of the leaves, from juvenile to adult stages, makes specimens identification difficult, especially sterile ones. The major problem, however, seems to be the confusion among the different names that may appear on the labels indiscriminately, such P. *hastifolium* (of various authors) and *P. elongatum* Engler.

The present paper aims to clarify some of the problems linked to the name *P. hastatum* C. Koch & Sello and to suggest a specimen for the neotypification of this name.

RESULTS AND DISCUSSION

Philodendron hastatum K. Koch & Sello *in* Index sem. hort. berol. 1854. Appendix: 7 (1854/1855). Neotype here designated: "Hort. Schoenb. Hb. Schott 1859", specimen of a cultivated plant named as "*Philodendron hastatum* C. Koch" (*in* H. W. Schott's handwriting) with an additional label by N. E. Brown 1878: "*Philodendron hastatum* C. Koch. Compared with type in C. Koch's herbarium by N.E. Brown 1878" (K!).

Philodendron elongatum Engl. *In*: Martius, Flora brasiliensis 3(2): 160. 1878. **Neotype**: as for *P. hastatum* K. Koch & Sello

Philodendron hastifolium sensu Engl. *In*: Martius, Flora brasiliensis 3(2): 162. 1878 & *in* A. & C. de Candolle, Monogr. Phanerog. 2: 414. 1879, non Regel (1857).

Philodendron hastifolium Regel ("hastaefolium"). *In* Gartenflora 5: 131, t. 159 (1857). **Type**: "Ex horto bot. Petropolitano. 60.90 Philodendron hastifolia Regel vo [illegible] Rgl." (LE!)

Fig. 1.

Artigo recebido em 09/2004. Aceito para publicação em 02/2005.

[1]Universidade de Maringá. Depto. Biologia - CCB. Av. Colombo 5790, 87020-900 Brasil. e-mail: cmsakura@uem.br
[2]Royal Botanic Gardens, Kew - Herbarium. Richmond, Surrey TW9 3AE. United Kingdom.

Hemiepiphyte. Stem: internodes 1.5–8 cm long. Leaf: **prophyll** 18–25.5 cm long, pale green, glossy; **petiole** 13.5-46 cm long; **blade** 20–45 × 7–15 cm, narrowly ovate to triangular ovate, chartaceous, dark green on the adaxial surface, pale green on the abaxial surface, semiglossy to glossy, rounded to subacute at apex, sagittate at base; anterior lobe 25.5–32 × 7–15 cm; posterior lobes 5–11 × 6–10 cm; sinus arcuate; basal veins 3 per side, with 1 free to the base, 2 coalesced for 6–8 mm; posterior rib naked for 3–4 cm; primary lateral veins 6–7 per side; minor veins inconspicuous. Inflorescence: one per axil, peduncle 5.5–4.5 cm long; **spathe** 8.5–12.5 cm long, ovate, white externally, greenish cream internally; **spadix** 7.5–12 cm long, staminate zone 3–6 cm long, cream, sterile zone 0.5–1 cm long, white, pistillate zone 3.5–4.5 cm long, greenish. Flower: stamen 1–1.2 × 0.8–1 mm; staminode 2–4 × 1–2 mm; gynoecium 1–1.5 × 0.8–1 mm, ovate, ovary 5–6 locular, 2–5 ovules per locule, placentation subbasal. **Berry** (young): 1.5–2.5 × 1–1.5 mm, pale green, pear shaped; seed 0.8–1 mm long, ellipsoid.

Specimens examined: BRAZIL. MINAS GERAIS: Juiz de Fora, 16.IX.1972, *Kreiger & Urbano 11796* (CESJ, SPF); *l.c.* 14.VIII.1970, *Krieger 9179* (CESJ, SPF); RIO DE JANEIRO: Corcovado, Meso do Inperador, 10.IX.1958, *Pereira et al. 4296* (RB); Guanabara, 1.XII.1971, Sucre 8024 (RB); *l.c.* 22 .X.1969, *Sucre 6118* (RB); Floresta da Tijuca, 31.VIII.1958, *Pabst 4541* (B); Nova Iguaçú, Distrito de Tinguá, 25.XI.1992, *Nadruz et al. 819* (RB).

Cultivated material: BRAZIL. RIO DE JANEIRO: Jardim Botânico do Rio de Janeiro, RB 94024; *l.c.* RB 94831; *l.c.* RB 95730.

The date of publication of the original description of *P. hastatum* K.Koch & Sello is not completely clear. Some species described in the same work have comments on flowering times being in November, suggesting that publication could have occurred at the end of 1854 or beginning of 1855. Schott (1856) cited "1854/1855" but in later work, e.g. (Schott 1860), he cited just "1854".

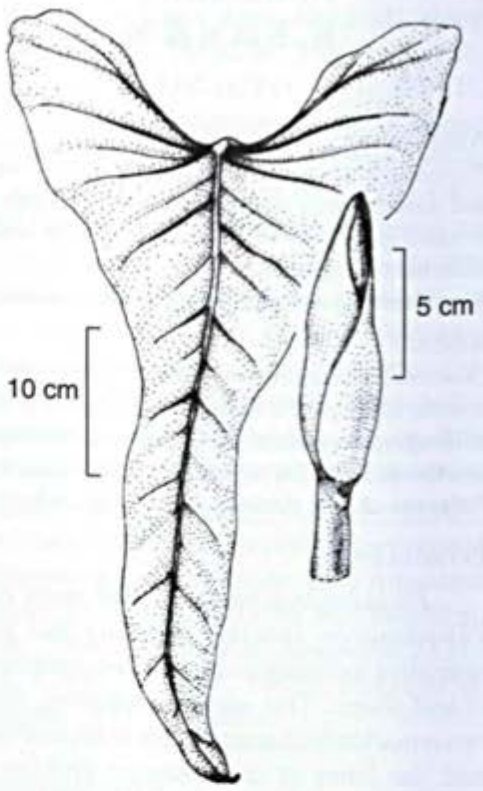


Figure 1 - *Philodendron hastatum*: leaf lamina and inflorescence (drawing from dried material *Krieger 9179*)

The type material must have been a cultivated plant at the Berlin Botanical Garden since the species was described in the Appendix of the Garden's annual seed catalogue. What is the evidence for the existence of a type specimen? Among the photographs of the Chicago Field Museum collection, "Types of the Berlin Herbarium", number 12228 could represent type material. This specimen, no longer to be found at Berlin (B), was probably destroyed during the Second World War. There were two labels: on one was written "*Philodendron simsii* hort. Berol 53" in unknown handwriting. Koch added "Hort." after the name "*Philodendron simsii*" and separately wrote "*Philodendron hastifolium* C. Koch et Sello". The other label was printed: "Museum botanicum Berolinense." and included in Engler's hand:- "*Philodendron hastifolium* C. Koch et Sello Engler".

However, on this last label, the epithet is corrected (a line through it) and a replacement epithet "*hastatum*" added above also in Engler's hand. It should be noted that Koch's original description mentioned "*Ph. simsii hortor.*" as a "synonym" of *P. hastatum*. Therefore it is very likely that this material was used for the original description. A problem with this specimen is that Koch's own annotation gives the name *P. hastifolium* whereas the name he published was *P. hastatum*. What probably occurred was that Koch named the specimen "*P. hastifolium*" while examining the material but decided to use the epithet "*hastatum*" in the publication later on and never went back to correct the name on the specimen label. If this doubtful point is ignored, it is reasonable to accept the photograph as a representative part of the protologue of *P. hastatum* K.Koch & Sello; there is little doubt that it is of an authentic Koch specimen, no longer in existence. As shown below, it seems clear that the specimen represents a juvenile plant and that Koch's complete type material included other mature specimens of which not even photographs survive.

Another specimen that can be connected to the protologue exists at the Kew Herbarium (K), consisting of juvenile leaves from a plant grown at Kew. One leaf has the following annotation by N. E. Brown (a nineteenth century Kew botanist and aroid specialist who personally studied K.Koch's herbarium collection): "*Philodendron hastatum* C. Koch! Compared with type in C. Koch's Herbarium by N. E. Brown 1878..." It is quite likely that this plant was sent to Kew by from Berlin by Koch, which would explain why Brown took the trouble to compare it with Koch's own herbarium material. Brown comments further on this sheet that the leaf of the Kew plant is a juvenile, matching juvenile leaves in Koch's herbarium. But he also comments that the leaves of Koch's flowering stage specimens are distinctly sagittate-hastate. At this point we may introduce a third specimen, the Kew sheet we have selected as neotype for *P. hastatum*. This fertile specimen has a fully sagittate-hastate leaf and is from a plant grown by Schott at the Schoenbrunn Palace Gardens near Vienna and identified by him as *P. hastatum* K.,Koch & Sello; this identification alone is enough to suggest the plant may have been grown on from a cutting of Koch's original plant sent from Berlin to Schott. In any case, we know that N. E. Brown compared it with Koch's type material and confirmed the determination as *P. hastatum* K., Koch & Sello. Based on Brown's testimony we can therefore conclude that Koch's mature specimens of *P. hastatum*, of which none survive, correspond to the Schott specimen at Kew.

Engler (1878, 1879) took up the name "*P. hastifolium* K. Koch & Sello" in error for *P. hastatum* K. Koch & Sello, and included *P. hastaefolium* Regel as a synonym. At the same time he excluded Schott's concept of *P. hastatum*, using the latter as the basis for the name *P. elongatum* Engl., of which more below. Our interpretation is that, for whatever reason, Engler separated the juvenile and mature forms of *P. hastatum* K.Koch & Sello into one species with weakly sagittate-hastate leaves (*P. hastifolium*) and another with strongly sagittate-hastate leaves (*P. elongatum*).

Later publications further confused matters. Engler (1899) resurrected the names *P. hastatum* K. Koch & Sello and *P. hastaefolium* Regel as separate species. He then described a completely different Ecuadorian species with the name *P. hastatum* Engl., later renamed by Krause (1913) as *P.subhastatum* Engl. *ex* K. Krause.

A key point in deciding that Engler made a mistake in describing *P. elongatum* concerns the issue of whether Schott's and Koch's concepts of *P. hastatum* were or were not the same. Engler, right from his first publication on the subject (Engler 1878), separated the two. In his original description of *P. elongatum*, he cites: "*Philodendron hastatum* Schott Syn.Ar.

101, Prodr. 279, non C. Koch. ... Habitat in Brasilia, loco accuratius non cognito: Schott". Engler evidently considered that Schott's and Koch's concepts of *P. hastatum* were different. There is an impressive contrast between the specimen pictured in Field Museum photo no. 12228 (Engler's *P. hastatum*; our *P. hastatum* with juvenile leaves) and the Schott specimen at Kew (Engler's *P. elongatum*, our *P. hastatum* with mature leaves). However an important corroboration that C. Koch's and Schott's concepts of *P. hastatum* were the same is given by comparing Koch's original description of the species and Schott's drawings of *P. hastatum* (Icones Aroideae numbers 2572, 2573, 2574, 2690, 2691, 2692, Schott, 1984), which match very well.

In conclusion, we disagree with Engler that Koch's and Schott's concepts of *P. hastatum* were different. We follow N. E. Brown in proposing that Koch's mature specimens of *P. hastatum*, of which none survive nor of which we have any illustrations, corresponded to the Schott specimen of *P. hastatum* at Kew. In the absence of any authentic specimens of Koch, we therefore propose to resolve this question by neotypifying the names *P. hastatum* K.Koch & Sello and *P. elongatum* Engl. on this same Schott specimen, at the same time sinking *P. hastifolium* Regel ("hastaefolium") once again, since it represents no more than a juvenile form.

Literature Cited

Engler, A. 1878. Araceae. *In* Martius, C. P. F. von, Flora brasiliensis 3(2): 160-163.

_____. 1879. Araceae. *In* De Candolle, A. C., Monographiae Phanerogamarum 2: 414-415.

_____. (1899). Beiträge zur Kenntnis der Araceae IX. Bot. Jahrb. 26: 538.

Krause, K. 1913. Araceae-Philodendroideae-Philodendreae-Philodendrinae. *In* A. Engler (ed.), Das Pflanzenreich 60 (IV.23Db): 86.

Regel, E. 1857 ("1856"). Index seminum quae hortus botanicus Imperialis Petropolitanus pro mutua commutatione offert. Accedunt animadversiones botanicae nonnullae. 8. Linnaea 28: 376.

Schott, H. W. 1856. Synopsis Aroidearum, p. 101. Typis congregationis mechitharisticae, Vienna.

_____. 1860. Prodromus systematis Aroidearum, p. 279. Typis congregationis mechitharisticae, Vienna.

_____. 1984. Icones Aroideae et Reliquiae. Microfiche edition, Index ed. D. H. Nicolson, 29p. IDC AG, Zug.

Duas espécies novas de *Anthurium* Schott (Araceae) para o Brasil

Marcus A. Nadruz Coelho[1] & *Eduardo Luís Martins Catharino*[2]

Resumo

(Duas espécies novas de *Anthurium* Schott (Araceae) para o Brasil) Duas espécies novas do gênero *Anthurium* são descritas para a Serra da Bocaina, estado de São Paulo, ambas até o momento endêmicas dessa localidade. *Anthurium bocainensis* pertence à seção *Urospadix*, subseção *Flavescentiviridia* e *A. ameliae* pertence à seção *Urospadix* subseção *Obscureviridia*, e ocorrem no bioma floresta atlântica. São fornecidas diagnoses, ilustrações e comentários à cerca da distribuição geográfica, ecologia, registro de floração, frutificação e conservação para cada espécie.

Palavras-chave: Araceae, *Anthurium*, taxonomia, Brasil.

Abstract

(Two new species of *Anthurium* Schott (Araceae) from Brazil) Two new species of the genus *Anthurium* are described from the Serra da Bocaina, São Paulo state, Brazil. Both currently endemic to this area and thus considered part of the Atlantic Forest biome. *Anthurium bocainensis* belongs to sect. *Urospadix*, subsect. *Flavescentiviridia*, and *A. ameliae* belongs to sect. *Urospadix* subsect. *Obscureviridia*. Diagnoses, descriptions, illustrations and commentary on geographical distribution, ecology, flowering and fruiting times and conservation status are provided for each species.

Key-words: Araceae, *Anthurium*, taxonomy, Brazil.

Introdução

A Serra da Bocaina está localizada entre os estados do Rio de Janeiro e São Paulo e pertence ao complexo da Serra do Mar, possuindo porções elevadas em altiplanos com altitudes superiores a 2.000 m a.n.m. onde as florestas tropicais de encosta diluem-se em florestas temperadas com araucárias e *Podocarpus*, formações herbáceo-arbustivas e campos de altitude (IBAMA 2004). Espécies do gênero *Anthurium* ocorrem tanto nas florestas contínuas às da encosta como nas formações florestais "insulares" nas porções mais elevadas, bem como no interior de densas formações arbustivas de altitude. As duas espécies aqui descritas pertencem às formações florestais das porções elevadas da serra. *A. bocainensis* ocorre preferencialmente nas formações arbóreas baixas das porções em geral acima de 1.500 m de altitude, sobre a serrapilheira, enquanto o *A. ameliae* ocorre nas florestas ripárias, normalmente sobre solos litólicos próximos a cursos d´água que correm para o mar, despencando nas escarpas litorâneas.

O gênero neotropical *Anthurium* Schott situa-se na subfamília Pothoideae, tribo Potheae, com aproximadamente 1.000 espécies (Keating 2002), distribuídas do norte do México e das Grandes Antilhas ao sul do Brasil e norte da Argentina e Uruguai, nas baixas e médias elevações, com alcance de maior diversidade no Panamá, Colômbia e Equador (Mayo *et al.* 1997, Carroll 2003). No Brasil ocorre em todas as regiões, com cerca de 120 espécies de acordo com o *checklist* de Mayo *et al.* (1996).

Atualmente o gênero *Anthurium* está subdividido em 19 seções (Croat 1983, Keating 2002). As subseções *Flavescentiviridia* e *Obscureviridia* pertencem a seção *Urospadix*, que foi descrita por Engler (1878). As espécies desta seção estão concentradas no Brasil leste e sudeste (Coelho 2004).

Artigo recebido em 06/2005. Aceito para publicação em 09/2005.

[1]Pesquisador Titular III, Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rua Pacheco Leão 915, 22460-030, Jardim Botânico, Rio de Janeiro, RJ, Brasil. mnadruz@jbrj.gov.br

[2]Pesquisador Científico IV, Instituto de Botânica de São Paulo, Av. Miguel Stefano, São Paulo, SP, Brasil. mcatarin@uol.com.br

Anthurium bocainensis Catharino & Nadruz sp. nov. **Tipo**: Brasil. São Paulo. São José do Barreiro, Serra da Bocaina, Parque Nacional da Bocaina. Mata de altitude no divisor de águas do Rio Mambucaba e Rio dos Veados. 20.VII.1994, fl., *L. Rossi & E. L. M. Catharino 1603* (Holótipo - SP, Isótipo - RB). Fig. 1 a-h

Anthurium bocainensis, *sp. nov.*, Anthurium lhotzkyano *Schott affine, sed foliorum lamina lanceolato-ovata, in pagina abaxiali leviter pruinosa, spatha naviculari, spadicis stipite 1.2cm longo (in* Anthurium lhotzkyano*: foliorum lamina ovata, non pruinosa, spatha plana, patens, spadicis stipes brevissimus).*

Terrestre, caule ereto; entrenós 0,4–1cm compr.; mesófilos silépticos inteiros a decompostos no ápice, decompostos e caducos para a base do caule, 1,9–3,2 cm compr.; profilos silépticos inteiros a decompostos no ápice, decompostos e caducos para a base do caule; bainha peciolar vinácea em pecíolo jovem, tornando-se esverdeada com margens amarelo-vináceas a cor de palha, 2–2,7 cm compr.; pecíolo foliar esverdeado, arredondado abaxialmente, achatado a levemente sulcado com margens obtusas adaxialmente, 20,2–52 cm compr.; genículo esverdeado-amarelado e mais grosso que o pecíolo, levemente sulcado adaxialmente, 0,5–3 cm compr.; lâmina foliar perpendicular, cartácea em material vivo, membranácea em material seco, esverdeada, levemente discolor, levemente pruinosa abaxialmente, oval-lanceolada, base cordada, lobos arredondados e sino triangular, ápice rostrado, curtamente apiculado, 14,3–33 × 3,7–14,5 cm na região mediana; nervura central arredondada abaxialmente, aguda adaxialmente; nervuras basais 3 em ambos os lados, fortemente impressas adaxialmente, a mais externa unindo-se a margem ainda no lobo posterior, a mediana juntando-se a margem no terço inferior e a mais interna unindo-se no terço superior; nervuras laterais primárias 4–10 em ambos os lados, sendo visíveis do meio para o ápice; nervuras laterais secundárias da metade inferior, unindo-se em tênue nervura coletora entre as nervuras central e coletora; nervura coletora saindo em ângulo agudo em relação a nervura central, tornando-se elíptica até o ápice da lâmina foliar, 0,7–2,4 cm afastada da margem na região mediana, unindo-se a margem a cerca de 1,5 cm do ápice; pedúnculo vináceo-acastanhado, esverdeado no ápice, roliço, 14–50 cm compr.; espata membranácea, esverdeada, esverdeado-vinácea com as margens levemente acastanhadas a vináceas, perpendicular em relação ao pedúnculo, linear-lanceolada, navicular, formando ângulo agudo com o pedúnculo, 2,5–7,2 × 0,5–1,1 cm, decorrência 0,2 cm compr.; espádice estipitado, acastanhado, cilíndrico, 2,5–8,8 cm compr., 0,3 cm grossura, estípite vináceo, 1–1,8 cm compr., quatro flores na espiral principal e seis na espiral secundária, tépalas amarronzadas com margens apicais rosadas, cuculadas, levemente rugosas, dorsalmente agudas e levemente convexas internamente nas tépalas laterais, fortemente convexas nas tépalas anteriores/posteriores ventralmente, 0,1–0,15 × 0,09–0,1 cm, androceu com estames opostos as tépalas anteriores/posteriores com filetes engrossados, convexos dorsalmente, estames opostos as tépalas laterais delgados, filetes com margens paralelas, anteras dorsifixas, 0,15–0,18 × 0,06–0,07 cm, gineceu de estigma vináceo, globoso, ovário oblongo a levemente globoso, séssil, bilocular, 1 óvulo por lóculo envolto em mucilagem hialina pegajosa, placentação subapical, 0,11–0,15 × 0,1–0,11 cm; bagas imaturas esverdeadas.

Parátipo: BRASIL. SÃO PAULO: Bananal, 5.III.1977, *G. Martinelli 1106* (RB). São José do Barreiro, 17.VII.1994, *E. L. M. Catharino & L. Rossi 1952* (SP); IV.2003, *E. L. M. Catharino & L. Rossi 2775* (SP).

Anthurium bocainensis é muito próximo de *A. lhotzkyanum* Schott, possuindo nervuras central e laterais primárias mais evidentes em ambas as faces e coloração verde mais clara – pálida – na face abaxial da lâmina foliar, caracterizando a subseção *Flavescentiviridia*.

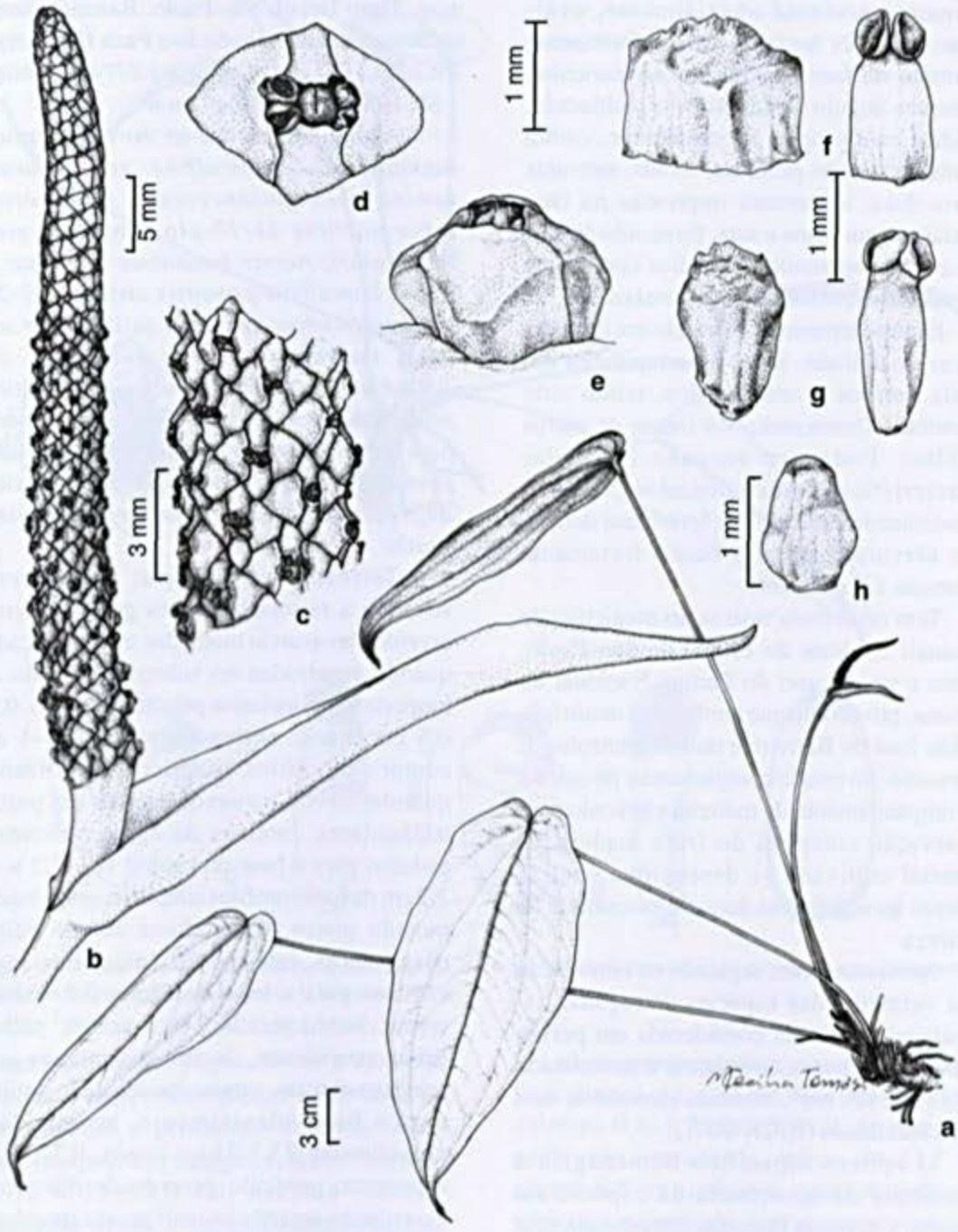


Figura 1 – *Anthurium bocainense* Catharino & Nadruz: a-hábito; b-espádice; c-detalhe do espádice; d-flor em vista frontal; e-flor em vista lateral; f-tépala e estame externos; g-tépala e estame internos; h-ovário (*Catharino & Rossi 2775*).

Difere ainda por apresentar lâmina foliar levemente pruinosa abaxialmente, oval-lanceolada, três nervuras basais fortemente impressas na face adaxial, espata navicular, formando ângulo agudo com o pedúnculo, espádice com estípite 1,2 cm compr., contra lâmina foliar não pruinosa, ovada, nervuras basais duas, levemente impressas na face adaxial, espata plana e reta, formando ângulo reto com o pedúnculo e espádice curtamente estipitado (subséssil) em *A. lhotzkyanum*.

Espécie terrestre, ocorrendo em florestas baixas de altitude, sobre a serrapilheira em locais úmidos e ensolarados, tendo sido encontrado florescendo nos meses de março e julho. Pode ser reconhecida pelas características mencionadas acima, acrescentando lâmina foliar levemente deflexa com nervuras central e basais fortemente impressas adaxialmente.

Tem ocorrência restrita ao município de Bananal, nordeste do estado de São Paulo, dentro e no entorno do Parque Nacional da Bocaina, provavelmente também no município de São José do Barreiro e outros limítrofes. É necessário um estudo complementar de coletas e acompanhamento de material cultivado para observação completa do fruto maduro. O material cultivado se desenvolve com as mesmas características daquele encontrado na natureza.

Até o momento, seguindo os critérios da lista vermelha das espécies ameaçadas, *A. bocainensis* pode ser considerada **em perigo critico** (CR), por ocorrer numa área estimada menor que 100 km² conhecida somente de uma única localidade (IUCN 2001).

O epíteto específico homenageia a localidade de ocorrência da espécie em questão, a Serra da Bocaina, considerada uma área de riqueza singular em relação a espécies de Araceae e outras regiões da fachada atlântica brasileira.

Anthurium ameliae Nadruz & Catharino sp. nov. **Tipo**: Brasil. São Paulo. Bananal, Serra da Bocaina, alto vale do Rio Paca (Bracuhy), IV.2003, *E. L. M. Catharino 2774* (Holótipo - SP, Isótipo - RB). Fig. 2 a-e

Anthurium ameliae *sp. nov.*, Anthurium maximiliani *Schott affine, sed foliorum lamina oblongo-lanceolata, lobo antico lobis posticis 11-17-plo longiore, sinu triangulari, nervis basalibus utrinque 2, nervis lateralibus primariis utrinque 12-25, in superficiebus ambabus folii leviter aut haud impressis, spatha recurvata (in* Anthurium maximiliani*: lobus anticus lobis posticis 5-plo longior, sinus obovatus, nervi basilares utrinque 3-4, nervi lateralis primarii utrinque 13-15, pagina adaxiali impressi, pagina abaxiali prominentes, spatha reflexa), differt.*

Terrestre ou rupícola; caule ereto, subereto a rastejante; raízes grossas, ocres, esverdeadas quando molhadas, esbranquiçadas quando enterradas no substrato, saindo ao longo do caule, inclusive próximo às folhas, 0,5–0,8 cm diâm.; entrenós curtos, 0,4–1 cm compr.; mesófilos silépticos esverdeados quando novos tornando-se cor de palha, triangulares, inteiros no ápice, inteiros a caducos para a base do caule, 10–17,3 × 5–3,2 cm na base; prófilos silépticos esverdeados quando novos, tornando-se cor de palha, triangulares, inteiros no ápice, inteiros a caducos para a base do caule, 5,2–6,4 cm compr.; bainha peciolar 7–8 cm compr.; pecíolo foliar esverdeado, levemente sulcado com margens obtusas, raramente achatado a roliço para a base adaxialmente, arredondado abaxialmente, 33,3–55 cm compr., 0,7–0,8 cm espessura; genículo esverdeado discolor a esverdeado-amarelado, mais grosso em relação ao pecíolo, levemente canaliculado, 3–4 cm compr., 0,8–1 cm diâm.; lâmina foliar levemente cartácea em material vivo, membranácea em material seco, esverdeada,

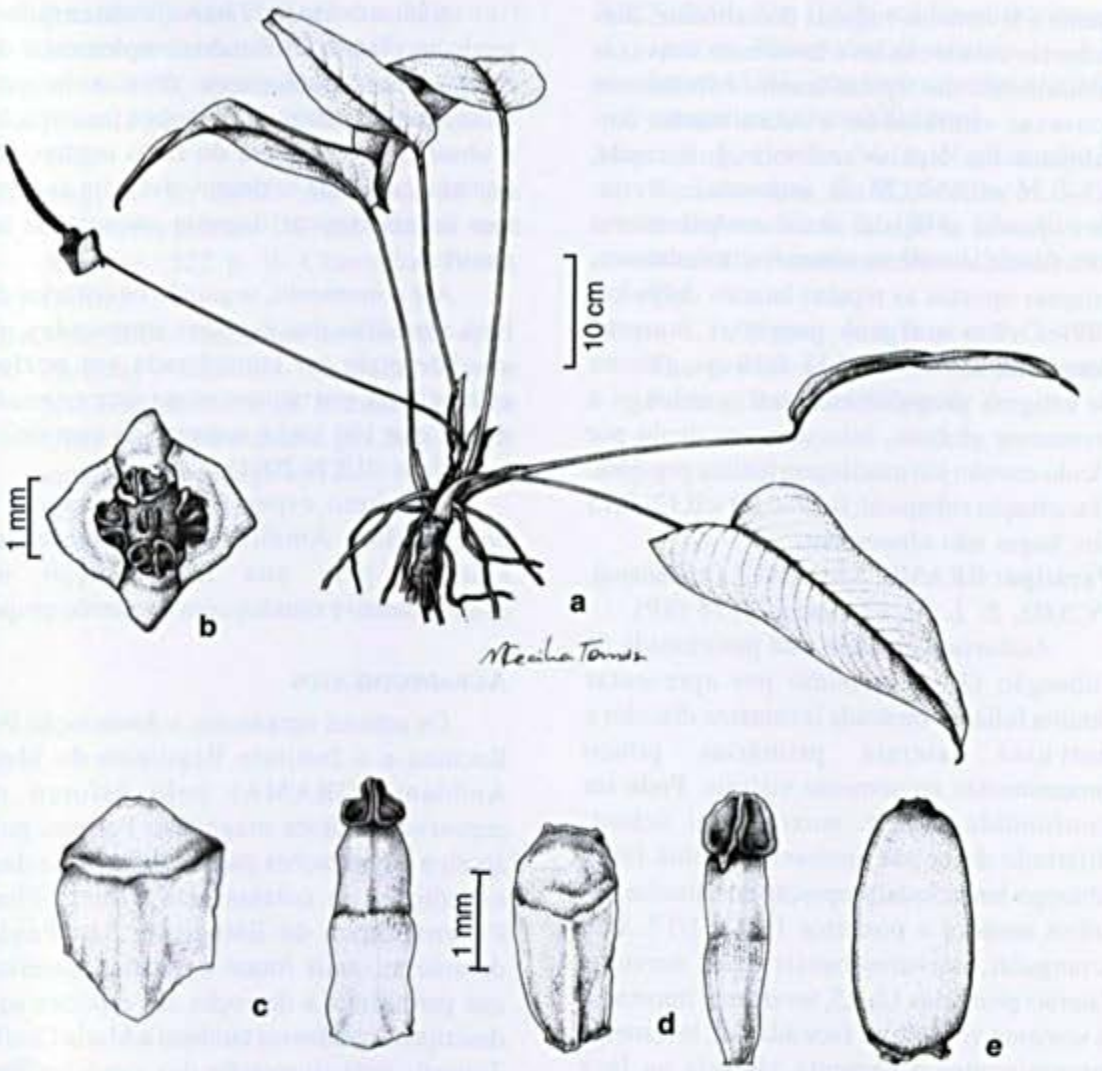


Figura 2 – *Anthurium ameliae* Nadruz & Catharino: a. hábito; b. flor em vista frontal; c. tépala e estame externos; d. tépala e estame internos; e- ovário (*Catharino 2776*).

levemente discolor, perpendicular a sub-ereta em relação ao pecíolo, oblongo-lanceolada, de base truncada a geralmente cordada, lobos arredondados, sino triangular, ápice rostrado, 32–52 × 15–19,9 cm; nervura central, geralmente aguda a subaguda adaxialmente, arredondada abaxialmente; nervuras basais duas levemente impressas a somente visíveis na face adaxial, a mais externa terminando na margem da base dos lobos, a mais interna terminando na margem no quarto inferior; nervuras laterais primárias levemente impressas a somente visíveis na face adaxial, levemente proeminentes a somente visíveis na face abaxial, 12 a 25 de cada lado; nervura coletora 0,8–1,7 cm afastada da margem; pedúnculo esverdeado, roliço, 44–51,7 cm compr., 0,5 cm espessura; espata esverdeado-vinácea a esverdeada com margens vináceas, membranácea, lanceolada, plana, curvada para trás, formando ângulo agudo com o pedúnculo, 9,5–11 × 1–4 cm, decorrência 1,3 cm compr.; espádice séssil, cilíndrico, amarronzado, 8,5–9,1 cm compr., seis a sete flores na espiral primária, nove flores na espiral secundária; flores com tépalas cuculadas, lisas ventral-

mente e levemente rugosas dorsalmente, dorsalmente subcarenadas e levemente convexas ventralmente nas tépalas laterais e fortemente convexas ventralmente e subcarenadas dorsalmente nas tépalas anteriores/posteriores, 0,3–0,36 × 0,25–0,27 cm, androceu com estames opostos as tépalas anteriores/posteriores com filetes levemente côncavos dorsalmente, estames opostos as tépalas laterais delgados, filetes com margens paralelas, anteras dorsifixas, 0,3–0,38 × 0,17–0,19 cm, gineceu de estigma proeminente, ovário oblongo a levemente globoso, bilocular, um óvulo por lóculo envolto em mucilagem hialina pegajosa, placentação subapical, 0,27–0,39 × 0,12–0,15 cm; bagas não observadas.

Parátipo: BRASIL. SÃO PAULO: Bananal, IV.2003, *E. L. M. Catharino 2776* (SP).

Anthurium ameliae está posicionada na subseção *Obscureviridia* por apresentar lâmina foliar esverdeada levemente discolor e nervuras laterais primárias pouco proeminentes ou somente visíveis. Pode ser confundida com *A. maximiliani* Schott, diferindo desta por apresentar lâmina foliar oblongo-lanceolada, proporção do tamanho dos lobos anterior e posterior 1/11 a 1/17, sino triangular, nervuras basais duas, nervuras laterais primárias 12–25, levemente impressas a somente visíveis na face adaxial, levemente proeminentes a somente visíveis na face abaxial, espata curvada para trás, contra proporção do tamanho dos lobos anterior e posterior 1/5, sino obovado, nervuras basais 3–4, nervuras laterais primárias 13–15, impressas adaxialmente e proeminentes abaxialmente, espata reflexa em *A. maximiliani*.

Espécie terrestre, até o momento encontrada somente na serra da Bocaina, em uma única localidade no município de Bananal, São Paulo, em floresta de altitude voltada para a face atlântica, no vale do rio Bracuhy. É uma planta robusta para as congêneres, distinguida pela forma alongada e deflexa da lâmina foliar, pelas nervuras laterais primárias pouco visíveis e pela espata curvada para trás.

A única coleta fértil foi realizada em julho, sendo necessário um estudo complementar de coletas e acompanhamento de material cultivado para registros de floração e frutificação e observação completa do fruto maduro. O material cultivado se desenvolve com as mesmas características daquele encontrado na natureza.

Até o momento, seguindo os critérios da lista vermelha das espécies ameaçadas, *A. ameliae* pode ser considerada **em perigo critico** (CR), por ocorrer numa área estimada menor que 100 km^2 e somente de uma única localidade (IUCN 2001).

O epíteto específico homenageia a pesquisadora Amélia Olaio, amante das aráceas, pela sua contribuição no conhecimento e estudos com o referido grupo.

Agradecimentos

Os autores agradecem a Associação Pró Bocaina e o Instituto Brasileiro do Meio Ambiente (IBAMA) pelo esforço na conservação deste magnífico Parque, pelo apoio e autorizações para realização de duas expedições de coletas pelo Projeto Flora Fanerogâmica do Estado de São Paulo, durante as quais foram coletados materiais que permitiram a detecção das espécies aqui descritas. Agradecemos também a Maria Cecília Tomasi, pela ilustração das espécies aqui descritas.

Referências bibliográficas

Carroll, N. 2003. The *Anthurium* primer. Internet URL: http://www.aroid.org/TAP/TAPstructure.html.

Coelho, M. A. N.; Waechter, J. L. & Mayo, S. J. 2004. Taxonomia das espécies de *Anthurium* (Araceae) seção *Urospadix* subseção *Flavescentiviridia*. Tese de doutorado. Universidade Federal do Rio Grande do Sul, RS.

Croat, T. B. 1983. A revision of the genus *Anthurium* (Araceae) of Mexico and Central America. Part 1: Mexico and Central

America. Annals of the Missouri Botanical Garden 70: 211-417.

Engler, A. 1878. Araceae. *In* Martius, C. F. P. von, Flora brasiliensis 3(2): 56-88, t. 11-102.

Keating, R. C. 2002. Anatomy of the monocotyledons IX. Acoraceae and Araceae. 322 p. il. Clarendon Press. Oxford.

IBAMA. 2004. Unidades de Conservação. Parques Nacionais. Unidade: Parque Nacional da Serra da Bocaina. Internet URL: http://www.ibama.gov.br/siucweb/mostraUc.php?seqUc=43.

IUCN. 2001. The IUCN red list of threatened species. Categories & criteria (v. 3.1) Internet URL: http://www.redlist.org/info/categories_criteria2001.html.

Mayo, S. J.; Coelho, M. A. N.; Ramalho,F. C.; Sakuragui, C. M.; Soares, M. L. C. & Barros, C. S. S. 1996. *Checklist* da família de Araceae no Brasil. Manuscrito. 92p.

Mayo, S. J.; Bogner, J. & Boyce, P. C. 1997. The genera of Araceae. Continental Printing, Belgium. 370pp. il.

NEW SPECIES OF *ANTHURIUM* (ARACEAE) FROM THE PERUVIAN ANDES

Jorge Lingán[1] & *Thomas B. Croat*[2]

ABSTRACT

(New species of *Anthurium* (Araceae) from the Peruvian Andes) Five new species of *Anthurium* are described from Peru: *Anthurium chinchipense* Croat & Lingán, *A. hamiltonii* Croat & Lingán, *A. magdae* Croat & Lingán, *A. mariae* Croat & Lingán, and *A. piurensis* Croat & Lingán.

Key-words: new species, *Anthurium*, Peru, Andes.

RESUMO

(Novas espécies de *Anthurium* (Araceae) nos Andes peruanos) Neste trabalho são descritas cinco novas espécies para o Peru: *Anthurium chinchipense* Croat & Lingán, *A. hamiltonii* Croat & Lingán, *A. magdae* Croat & Lingán, *A. mariae* Croat & Lingán e *A. piurensis* Croat & Lingán.

Palavras-chave: novas espécies, *Anthurium*, Peru, Andes.

INTRODUCTION

This is one of several anticipated papers dealing with Peruvian Araceae. The authors have embarked on the preparation of an updated checklist of the Peruvian Araceae since the checklist published in 1993 by Lois Brako and Jim Zarucchi (Croat 1993) is already out of date and many more new species are yet to be described. Among the areas yet to be reported on is Oxapampa which is currently the focus of investigations by Rodolfo Vásquez (Missouri Botanical Garden) and his Peruvian colleagues. The senior author has made a thorough revision of the Araceae of the Oxapampa region and has discovered a number of new species of Araceae. During a recent two month long research trip to the Missouri Botanical Garden we were able to separate and determine many previously undetermined plants and some of these proved to be undescribed, including those reported in this manuscript.

Anthurium chinchipense Croat & Lingán, sp. nov. **Type**: Peru. Cajamarca, Huarango, San Martín del Chinchipe, 5°19'17"S, 78°41'05"W, 900 m, 14 Sep. 1999, *Campos et al. 6200* (holotype, MO; isotypes, B, K, NY, US, USM). Fig. 1a.

Planta terrestris; internodia usque ad 2 cm longa, 0.9–2 cm diam.; petiolus 23.2–70.2 cm longus, 0.4–0.6 cm diam.; lamina 24–52 cm longa, 14.4–37.4 cm lata, cordato-sagitata; lobulas posterioribus (6.4) 7.8–15 cm longus; nervis primariis lateralibus 6–8 utroque; pedunculus 10.3–22.7 cm longus, 0.3–0.4 cm diam.; spatha viride, 7.3 cm longa, 1.1 cm lata; spadix cinereo-viride, 8.3–10 cm longus, 1.1–7 cm diam.

Description based on dried material. Terrestrial; roots 1–4 mm diam., white to gray, short pubescent; stems short; **internodes** up to 2 cm long, 0.9–2 cm diam., terete; **cataphylls** 7.2–9.9 cm long, subcoriaceous, triangular-lanceolate, brown to reddish brown, promptly withering into a mass of pale brown to reddish brown fibers. Leaves erect; **petioles** 23.2–70.2 cm long, 0.4–0.6 cm diam., (0.9) 1.2–1.5 times longer than the blade, U-shaped narrowly and acutely sulcate with acute margins, sometimes 2-ribbed abaxially; sheath up to 3.1 cm long; geniculum 1.3–2.7 cm long; **blades** drying subcoriaceous, 24–52 cm long, 14.4–37.4 cm wide, 1.1–1.3(1.6) times longer than wide, wider at the base, cordate-sagitate, acute to acuminate at apex, bicolorous, olive-green above, brown to reddish brown below; margins straight to slightly convex; posterior lobes elliptic, markedly convergent, directed toward the base, (6.4) 7.8–15 cm long; sinus widely hippocrepiform;

Artigo recebido em 09/2004. Aceito para publicação em 06/2005.

[1]Museo Historia Natural, UNMSM, Lima, Peru.

[2]Missouri Botanical Garden. P.O. Box 299. St. Loius, MO 63166-0299, USA. e-mail: Thomas.Croat@mobot.org

midrib convex in both surfaces, sometimes conspicuously and narrowly acute below; **primary lateral veins** 6–8 per side, straight to arched-ascending, departing midrib at (30) 50–70° angle; **basal veins** 5–10 pairs, fused all to the basal ribs; posterior ribs 3.5–11.1 cm long, recurved toward the base, naked 2.9–9.2 cm along the sinus; **collective veins** arising usually from the uppermost lateral veins, rarely from the 1st pair of basal veins, 1–6 mm from the margins. Inflorescence erect; **peduncle** 10.3–22.7 cm long, 0.3–0.4 cm diam., green, 0.3–0.4 times longer than the petiole; **spathe** coriaceous, green, generally deciduous at fruiting, reflexed, 7.3 cm long, 1.1 cm wide, lanceolate to oblong-lanceolate, attenuate at apex, cordate at base; **spadix** grayish green, cylindric, 8.3–10 cm long, 1.1–7 cm diam. at base, 0.4 cm diam. at apex, sessile; flowers 4-lobed, margins sigmoid, 3 × 3 mm; 7–9 flowers visible on the principal spiral, 6–7 flowers visible in the alternate spiral; tepals with the inner margins broadly convex, outer margins 2-sided; **pistils** elliptic-obovate, 2.5 mm long; stigmas rounded; stamens not seen. Infructescence not seen.

Anthurium chinchipense is known only from San Ignacio Province, and is endemic to the locality of San Martín del Chinchipe (thus the name "chinchipense"), at about 900 m elevation in Tropical lower montane rain forest (TLM-rf) and the Tropical lower montane wet forest (TLM-wf).

The species is a member of *Anthurium* section *Belolonchium* and is distinguished by its petioles with acute margins, broadly ovate leaves, as well as by the short peduncle and generally deciduous spathe. There is a collection from the same general area (*Rodríguez 1240*) which represents a species that appears to be close to *A. chinchipense*, but it has a brown spadix (versus green in *A. chinchipense*), collective veins arising from the 6th basal veins (instead of the 4th primary lateral vein in *A. chinchipense*), and occurs up to 1240 m in elevation.

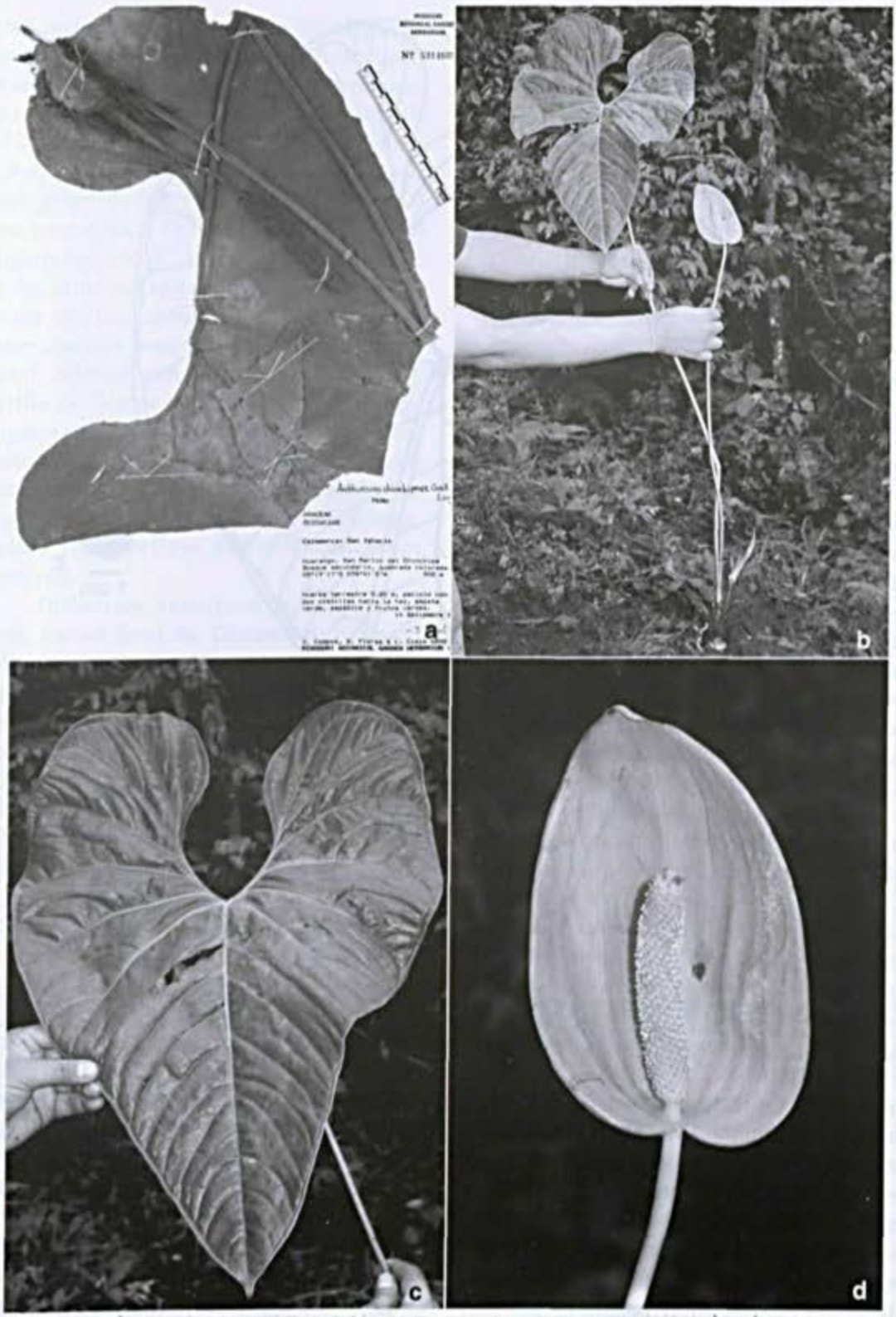
Anthurium chinchipense is similar to *A. macleanii* Schott (which is one of two species it keys out with in the treatment of the Araceae for Peru (MacBryde 1936), but *A. macleanii* has the blade margin much more concave on the anterior lobe and has a longer, more tapered spadix. The other species *A. chinchipense* keys out to in the Flora of Peru is *A. monzonense* Engl., which differs in having longer blades (65 cm) that are narrowly ovate with a more or less spathulate sinus (versus triangular-sagittate with a broadly hippocrepiform sinus for *A. chinchipense*).

Paratypes: PERU. CAJAMARCA: Huarango, San Martín del Chinchipe, 5°19'17"S, 78°41'05"W, 900 m, 14 Sep. 1999, *Campos et al. 6208* (CAS, F, G, MO, USM).

Anthurium hamiltonii Croat & Lingán, sp. nov. **Type**: Peru. Pasco, Oxapampa Province, Parque Nacional Yanachaga-Chemillén, Sector San Alberto, Refugio El Cedro, 10°33'46"S, 75°22'93"W, 2450 m, 13 Mar. 2003, *J. Lingán et al. 342* (holotype, MO; isotype, HOXA). Figs. 1 (b–d), 2.

Planta terrestris vel hemiepiphytica; internodia 7–20 mm longa, 1.9–2.1 cm diam.; cataphylla 11.6–15.7 cm longa; petiolus 73.5–93.2 cm longus, 0.6–0.9 cm diam.; lamina ovata, 50–52.2 cm longa, 29.8–34.9 cm lata, cordata ad basim; nervis primariis lateralibus 6–8 utroque; pedunculus 59.5–69.7 cm longus, 0.5–0.7 cm diam.; spatha ovata vel lanceolata, 12.5–16.5 cm longa, 6.4–7.2 cm lata, viride; spadix 6.4–7.8 cm longus, 0.9–1.1 cm diam., flavo-virescens vel virellus.

Description based on dried material. Terrestrial to hemiepiphytic; roots 2–3 mm diam., whitish to grayish brown; stem terete, 1.9–2.1 cm diam.; **internodes** 7–20 mm long; **cataphylls** 11.6–15.7 cm long, obtusely 1-ribbed, lanceolate, subcoriaceous, green to reddish, persistent as reddish brown to dark brown fibers. Leaves erect to spreading; **petioles** 73.5–93.2 cm long, 6–9 mm diam.,



Figures 1 - a. *Anthurium chinchipense* Croat & Lingán. Type specimen. (*Campos et al. 6200*); b-d. *Anthurium hamiltonii* Croat & Lingán; b. habit; c. leaf; d. inflorescence at anthesis, note the cylindric spadix subtended by the broad spathe. (*Lingán et al. 342*)

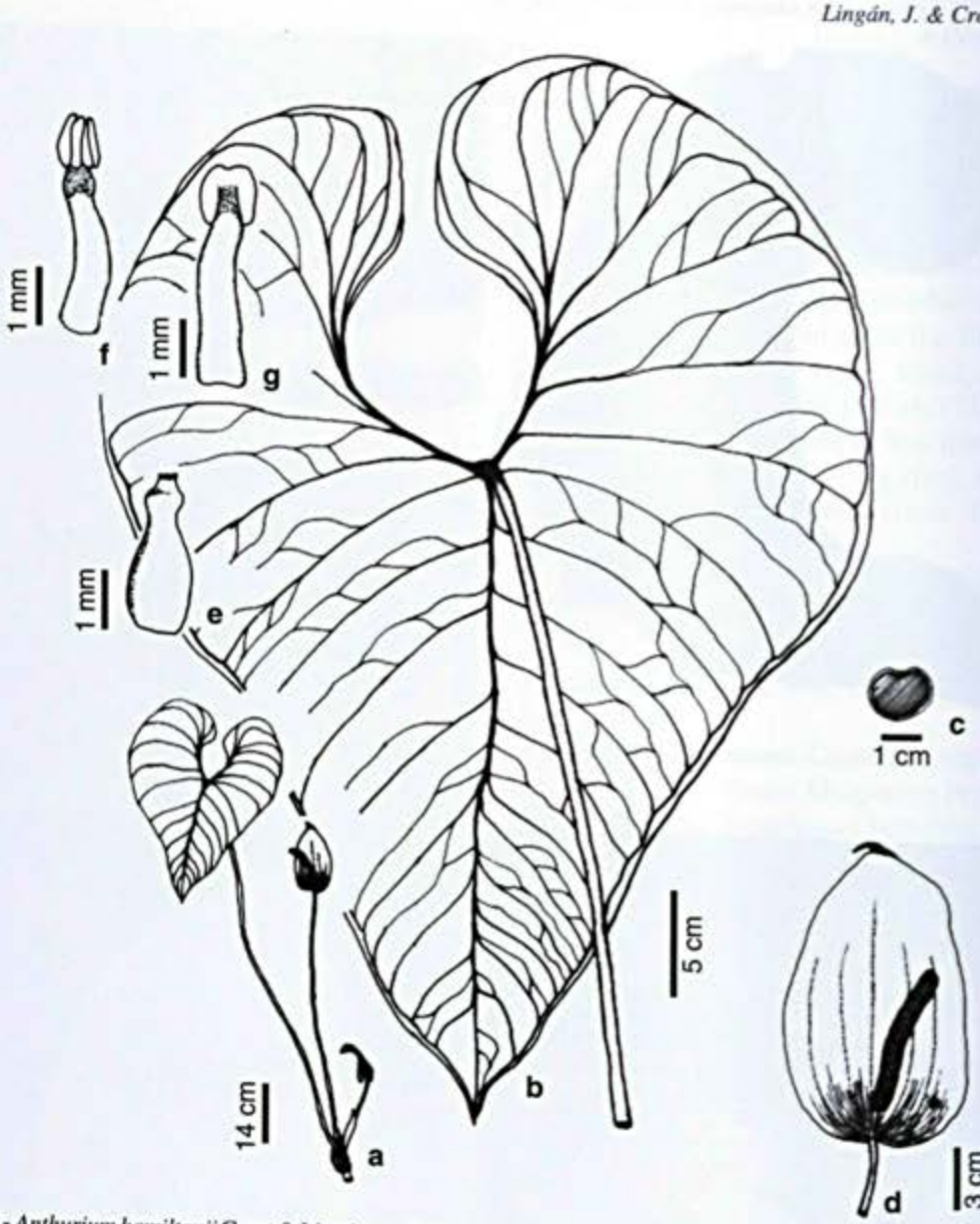


Figure 2 - *Anthurium hamiltonii* Croat & Lingán. a. Habit; b. leaf (abaxial view); c.petiole (cross section); d. inflorescence; e. pistil; f. stamen (anterior view); g. stamen (posterior view). Drawing by J. Lingán, based on several collections including *Soukup 2328* (GH), *C. Diaz et al. 3258* (MO) and *Monteagudo et al. 4507* (MO).

terete to slightly sulcate, green; sheath 3.9 cm long; geniculum 1.2–1.4 cm long; **blades** subcoriaceous, drying papiraceous, 50–52.2 cm long, 29.8–34.9 cm wide, ovate, acuminate to apex, deeply cordate at base, darker and semiglossy above, slightly paler and matte below; posterior lobes oblong, convergent, 16.9–19.1 cm long, sinus rhombic to spatulate; **midrib** convex on both surfaces; **primary lateral veins** 6–8 per side, more conspicuously convex below, arcuate-ascending, departing midrib at 30°–50°; **basal veins** 7–8 pairs, the 1st to 6th or 7th coalesced; posterior rib 8.3–8.7 cm long, curved, naked 6.3–6.7 cm along the sinus; collective veins arising from the 4th or 5th pair of basal veins, 1–6 mm from the margin. Inflorescence erect; **peduncle** 59.5–69.7 cm long, 0.5–0.7 cm diam., green, 0.7–0.8 times longer than the petiole; **spathe** subcoriaceous, green, persistent, erect, 12.5–

16.5 cm long, 6.4–7.2 cm wide, broadly ovate to oblong-lanceolate, hooding, abruptly acuminate to acute at apex, obtuse to rounded at base, the margins joining at approximately 170° angle; **spadix** cylindric, 6.4–7.8 cm long, 0.9–1.1 cm diam., yellowish green to greenish; stipe greenish, 0.6–1.9 cm long in front, 2–3 mm long in back; flowers square, the margins slightly sigmoid, 4 ´ 4 mm; 7–8 flowers visible in the principal spiral, 9–10 flowers visible in the alternate spiral; lateral tepals with the inner margins concave, the outer margin 3-sided, anterior and posterior tepals 5-sided; **pistils** ca. 3 mm long, largely obpyriform; stigmas oblong-linear; stamens ca. 3 mm long, protruding ca. 1 mm long at anthesis; filaments flattened; anthers not convergent above the stigmas at anthesis; thecae not divaricate; pollen light yellow. Infructescence not observed.

Anthurium hamiltonii is endemic to Peru, known from the Department of Pasco in the Parque Nacional Yanachaga-Chemillén, Sector San Alberto, as well as in the Department of Cajamarca in the Parque Nacional de Cutervo. This species prefers shady areas, but can also be found in exposed areas in Tropical Lower Montane wet forest (TLM-wf), ranging from 2400 to 2500 m elevation.

The species is a member of *Anthurium* section *Belolonchium* and is distinguished by its cordate long-petiolate leaves, cataphylls persistent as a dark brown mass of fibers, and broadly ovate spathe that is erect and held close to the spadix, as well as by the greenish to yellowish cylindric spadix. The species is probably closest to *A. macleanii* with which it shares cordate leaves and persistent fibrous cataphylls, but the latter has a stipitate and purplish spadix (versus yellowish green in *A. hamiltonii*). *Anthurium monzonense* differs in having proportionally broader and shorter lobes, a much longer petiole sheath and having a more tapered spadix.

The species is named in honor of Hamilton Beltrán at the Museo de Historia Natural (UNMSM), a prolific fieldworker and avid botanical collector of the Peruvian flora who has collected many Araceae.

Paratypes: PERU: CAJAMARCA: Cutervo Province, San Andres de Cutervo, Parque Nacional de Cutervo, 2400 m, 14 Mar. 1989, *Díaz et al. 3258* (MO). PASCO: Oxapampa Province, *Soukup 2328* (MO); Oxapampa District, near the Refugio El Cedro, 10°32'S, 75°22'W, 2200–2400 m, 6 Feb. 2003, *Monteagudo et al. 4507* (HOXA, MO).

Anthurium magdae Croat & Lingán, sp. nov. **Type**: Peru. Cajamarca, San Ignacio Prov., trail to limit of "La Unión", 2000 m, 1 Nov. 1995, *C. Diaz & A. Torres 7832* (holotype, MO-04920427; isotype, USM). Fig. 3a.

Terrestris vel hemiepiphytica; internodia 2–10 cm longa; cataphylla (9)12–18 cm longa, persistens intacta; petiolus 49–65 cm longus; lamina 23–42 cm longa, 16–25.4 cm lata, ovato-cordata; lobus posterioribus (7.5)10–13 cm longus, (7)8–11 cm lata; nervis primariis lateralibus 3–5 utroque; pedunculus 26–45 cm longus; spatha 10–15.5 cm longa, 2–3 cm wide, viridis; spadix luteus, cylindroideus, 8.5–11 cm longus, 0.7–1.2 cm diam.

Description based on dried material. Terrestrial to hemiepiphytic climber; roots not seen; stem to 2 m long, terete, 1.2–1.5(2.2) cm diam.; **internodes** 2.7–10.2 cm long, pale reddish brown, semiglossy, drying finely and densely ribbed; **cataphylls** (9)12–18 cm long, coriaceous, persisting reddish brown, intact, lanceolate. Leaves erect to spreading; **petioles** (33.7)41.8–79.2 cm long, drying 0.4–0.8 cm diam., reddish, terete, 1.2–1.7(2) times longer than blade, 1.2–2.3 times longer than peduncle, brittle, obtusely and broadly sulcate, sometimes bluntly ribbed abaxially at base, weakly glossy to matte; sheath 3.3–7 cm long; geniculum 1–3.2 cm long; **blades** 23–42 cm long, 16–25.4 cm wide, 1.4–1.6 times longer than wide, ovate-cordate to narrowly ovate-cordate, deeply lobed at base, acuminate at apex, drying moderately coriaceous, dark

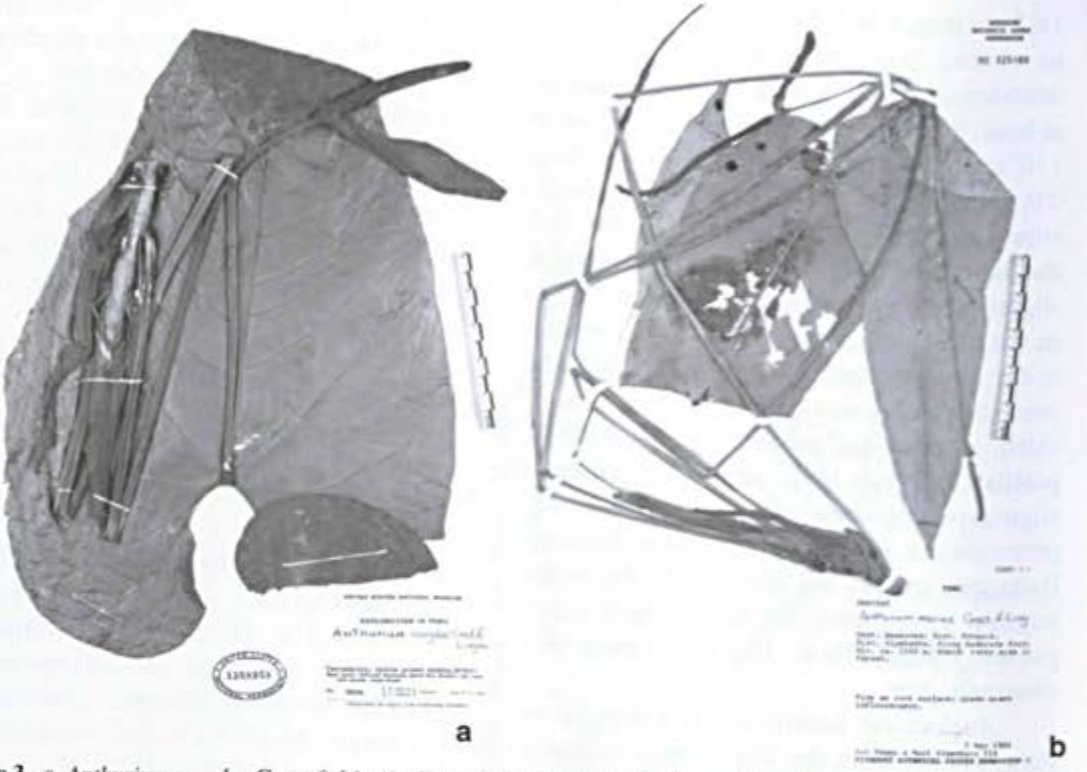


Figure 3 - a. *Anthurium magdae* Croat & Lingán. Type specimen. (*Díaz & Torres 7832*); b. *Anthurium mariae* Croat & Lingán. Type specimen. (*Young & Eisenberg 314*)

green and semiglossy above, moderately paler and glossy below, drying dark reddish brown and semiglossy above, somewhat paler and reddish brown below; anterior lobes 33 cm long, broadly rounded; posterior lobes (7.5)10–13 cm long, (7)8–11 cm wide; **midrib** and basal veins paler and convex above, paler and acutely raised below; **primary lateral veins** 3–5, arising at an acute angle then spreading at 55–70° angle, prominently arcuate to the margins; raised weakly in valleys above, those toward the apex sunken; tertiary veins darker than surface below, drying more or less prominulous below; lower surface epunctate, densely brownish speckled on drying; collective veins arising from the 1st or 4th pair of basal veins, extending to apex very near the margin, usually about 1 mm from margin but up to 4 mm in loop-connecting areas of primary lateral veins; **basal veins** 5–6 pairs, 1st and often 2nd, sometimes 3rd free to the base, (3rd)4th–5th fused (0.5)1–3 cm long; posterior rib naked 1.5–2.5 cm along the sinus, sometimes scarcely naked at all. Inflorescence erect; **peduncle** 26–45 cm long, drying 3–4 mm wide; **spathe** green, erect-spreading, 10–15.5 cm long, 2–3 cm wide, lanceolate to oblong-elliptic, subcoriaceous, drying reddish brown; **spadix** 8.5–11 cm long, 0.7–1.2 cm diam., white, broadly rounded at apex; flowers 10–11 per principal spiral, 14–15 per alternate spiral; flowers 1.7–2.0 mm wide and long; tepals broadly rounded on inner margin, 2-sided on outside; **stamens** in a tight cluster around the style; anthers 0.4 mm long, 0.6 mm wide, turning light brown; thecae moderately divaricate. Infructescence not seen.

Anthurium magdae is endemic to Peru, known from Amazonas, Cajamarca and Junín Provinces in Tropical moist forest transition to Premontane (T-mf/P), at 1500–2200 m elevation. The species is characterized by its somewhat scandent habit, persistent intact cataphylls, terete petioles, ovate-cordate, reddish brown-drying, epunctate, densely brownish speckled blades, green erect-

spreading spathe and white cylindroid spadix.

The species is close to *A. lutescens* Engl., but that species has much larger blades (to 55 cm long) and a distinct collective vein that does not merge with the margin (versus so close to the margin on *A. magdae* that it is difficult to discern). In addition, the lower blade surface of *A. lutescens* Engl. is dark-punctate whereas the lower surface of *A. magdae* is epunctate.

The species is named in honor of Magda Chanco, Curator of the USM Herbarium at the Universidad San Marcos in Lima, who has promoted and assisted the senior author in his work with Araceae.

Anthurium mariae Croat & Lingán, sp. nov. **Type**: Peru. Amazonas, Bongará Province, Sipabamba District, along Quebrada Fortuna, 1300 m, 5 May 1981, *Young & Eisenberg 314* (holotype, MO; isotypes, B, K). Fig. 3b.

Epiphytica; internodia 1.6 cm longa, 1–1.2 cm diam.; petiolus 46.6–75.4 cm longus; lamina 21.6–32.5 cm longa, 6.3–7.2 cm lata, anguste lanciolata, subcordata ad basim; nervis primariis lateralibus 7–12 utroque; pedunculus 41.1–64.2 cm longus, 0.1–0.4 cm diam.; spatha viridis, 2.6–5.9 cm longa, 0.6–0.8 cm lata; spadix (2) 3–10.6 cm long, 0.3–0.4 cm diam., viride.

Description based on dried material. Epiphyte; roots white, short pubescent, 2–3 mm wide; **internodes** up to 1.6 cm long, 1–1.2 cm diam.; **cataphylls** 3.3–11.2 cm long, lanceolate, subcoriaceous, persisting intact, drying brown to reddish brown. Leaves erect to spreading; **petioles** 46.6–75.4 cm long, 0.2–0.5 cm diam., terete, green; sheath up to 3.2 cm long; geniculum 1.1–1.8 cm long; **blades** drying subcoriaceous, 21.6–32.5 cm long, 6.3–7.2 cm wide, narrowly ovate-triangular, attenuate at apex, subcordate at base, drying yellowish brown; **midrib** raised in both surfaces; **primary lateral veins** 7–12 per side, not prominent above, conspicuously raised below, straight weakly curvated, departing at 50–65° from the midrib; collective veins arising from the 2nd primary lateral veins, (0.1) 0.3–1.1 cm from the margin. Inflorescence erect to spreading; **peduncle** 41.1–64.2 cm long, 0.1–0.4 cm diam., terete, green, 0.85–0.88 times longer than the petiole; **spathe** subcoriaceous, green, persistent, spreading, 2.6–5.9 cm long, 0.6–0.8 cm wide, linear oblong, conspicuously acute to obtuse at apex, acute at base, the margins joining at 25–55° angle; **spadix** long, slender and weakly tapered, (2) 3–10.6 cm long, 0.3–0.4 cm wide near to base, 0.2 mm wide near to apex, green; stipe green, 1.1–1.6 cm long in front, 0.3–0.6 cm long in back; flowers rhombic, margins straight, 3 × 1.5 mm; 2–3 flowers visible in the principal spiral, 4–6 flowers visible in the alternate spiral; tepals with the inner margins straight to weakly convex; **pistils** with stigmas rounded, not protruding; stamens with anthers protruding at anthesis; thecae divaricated. Infructescence not seen.

This species is only known from the Department of Amazonas (Province of Bongará). *Anthurium mariae* occurs ca. 1300 m in elevation, and grows near the banks of creeks in Tropical Lower Montane dry forest (TLM-df).

This species belongs to *Anthurium* section *Calomystrium* and is particularly characterized by its narrowly-lanceolate, weakly cordate leaves drying yellowish brown, cataphylls persisting entire, and slender, green spadix subtended by a subcoriaceous green spathe.

Anthurium mariae is atypical for *Anthurium* section *Calomystrium* in terms of blade shape, drying colors and type of inflorescence, but fits no other section and owing to its persistent, intact cataphylls it is best assigned to *Calomystrium*. It cannot be confused with another *Calomystrium* because other species in the section have ovate-cordate leaves and generally huge spadices (versus narrowly ovate-triangular with a long, slender spaidx for *A. mariae*).

This species is named after María Chávez, mother of the senior author.

Anthurium piurensis Croat & Lingán, sp. nov. **Type**: Ecuador. Loja: Along road between Loja and San Lucas, 32.4 km N. of Las Juntas, along Río Marañon, 3°59'15"S, 79°09'28"W, 1981 m, 1 June 2003, *T. B. Croat & M. Menke 89983* (holotype, MO; istotypes B, CAS, COL, F, GB, GH, K, NY, QCNE, US, USM). Fig. 4.

Terrestris; internodia brevia, 0.2–0.5 cm long, 1.3–2.3 cm diam.; cataphylla (6.2) 8.7–12.4 cm, persistens in fibras porphyreus; petiolis 42.4–58.8 cm longus, 0.4–0.9 diam., D-formatus; lamina 42.2–57.3 cm longa, 25.7–30.8 cm lata, ovata, profunde cordata ad basim; nervis primariis lateralibus 6–9 utroque; pedunculus 26.8–48.1 cm longus; spatha purpureus vel viride, 6.3–10.4 cm longa, 2.5–5.4 cm lata; spadix cylindricus, 3.7–12.3 cm longus, 0.5–1.2 cm diam., stipitus, purpureus.

Description based on dried material. Terrestrial; roots white, 0.2–0.5 cm diam.; stem terete, reddish brown; **internodes** short, 0.2–0.5 cm long, 1.3–2.3 cm diam.; **cataphylls** subcoriaceous, persisting as a pale brown to reddish brown mass of fibers, (6.2) 8.7–12.4 cm, unribbed, lanceolate, reddish brown, weathering to a reddish brown fibers with fragments of epidermis remaining. Leaves erect to weakly spreading; **petioles** 42.4–58.8 cm long, 0.4–0.9 diam., D-shaped, generally bluntly 3-ribbed abaxially; green; sheath 1.5–2.4 cm long; geniculum 1.6–2.4 cm long; **blades** subcoriaceous, 42.2–57.3 cm long, 25.7–30.8 cm wide, widest at the petiole insertion, ovate, semiglossy to matte on both surfaces, acuminate at apex, deeply cordate at base; margins straight to slightly convex on anterior lobe; posterior lobes oblong, convergent, 12.9–13.6 cm long; sinus rhombic; **midrib** acutely raised in both surfaces; **primary lateral veins** 6–9 per side, straight toward the base of the blade and curved toward the apex, acutely raised on both surfaces, departing margins at 40–70° angle; basal veins 8 pairs, 1st and sometimes 2nd free to the base; **posterior ribs** 3.5–6 cm long, strongly curved to the base, naked 2.1–5.5 cm along the margin; collective veins arising from 1st basal veins, 2–5 mm from the margins. Inflorescence erect; **peduncle** 26.8–48.1 cm long, 0.2–0.6 cm diam., green, 0.6–0.9 times longer than the petiole; **spathe** subcoriaceous, purple to green, persisting, erect, hooding spadix, 6.3–10.4 cm long, 2.5–5.4 cm wide, ovate-oblong to elliptic, acute or acuminate at apex, cordate at base; **spadix** cylindric, 3.7–12.3 cm long, 0.5–1.2 cm diam., stipitate, purple; flowers square, margins weakly to markedly sigmoid, 2 × 2 mm; 7–8 flowers visible on the principal spiral, 5–6 flowers visible in the alternate spiral; tepals straight to slightly concave on the inner margins; **pistils** with stigmas elliptic; stamens protruding at anthesis; anthers conspicuously extrorse, overlapping the stigmas at anthesis; thecae not divaricate. Infructescence spreading; spadix 24.1 cm long, 2.5 cm diam., reddish purple; **berries** 0.7 cm long, 0.4 cm wide, obovate, conical at apex.

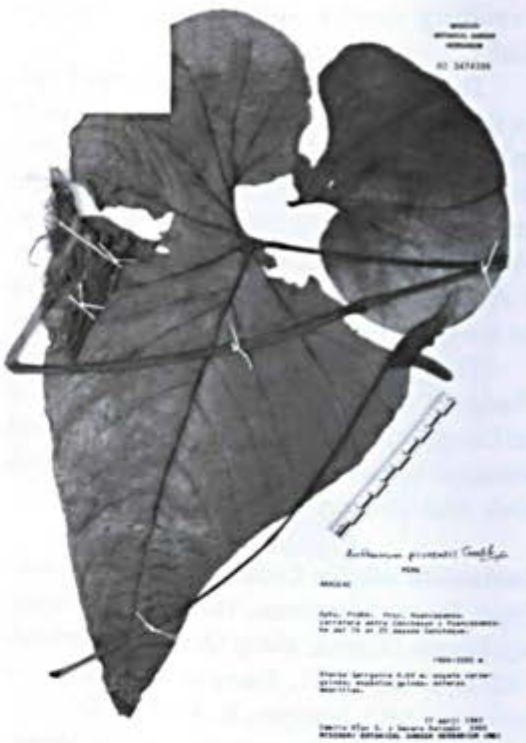


Figure 4 - *Anthurium piurensis* Croat & Lingán. (*Díaz & Baldeón 2405*). Paratypes specimen.

Anthurium piurensis is known from southern Ecuador (Loja Province) and Peru (Piura Dept.) ranging from 1500-2000 m in Tropical Lower Montane moist forest (TLM-mf).

The species is a member of *Anthurium* section *Belolonchium* and is characterized by ovate leaves with straight margins, cataphylls persisting as pale brown to reddish brown fibers, spathe hooding the spadix, and a stipitate, stubby green spadix.

The species could be confused with *A. hamiltonii*, which also has a cylindrical spadix but that species has a much longer, yellowish green spadix (versus stubby and purple in *A. piurensis*).

In the Canchaque-Huancabamba area Díaz collected a species that looks very similar to *A. piurensis*, (*Díaz et al. 2781)*, but the collective veins arise from the 4th basal veins and extend farther than the collective veins of *A. piurensis*.

Paratypes: PERU. PIURA: Huancabamba, Canchaque-Huancabamba, 1900–2200 m, 17 Apr. 1987, *Díaz & Baldeón 2405* (MO); Canchaque, 1500–1900 m, 18 Apr. 1987, *Díaz & Baldeón 2478* (MO); between km 15 and km 25 on rd. Canchaque-Huancabamba, 21 Mar. 1989, *Díaz & Beltrán 3372* (MO).

Literature cited:

Croat, T. 1993. Araceae. *In*: L. Brako & J. L. Zarucchi (eds.). Catalogue of the Flowering Plants and Gymnosperms of Peru. Monographs of Systematic Botany Missouri Botanical Garden 45: 71-82.

Macbride, J. F. 1936. Araceae. pp. 428-486. *In*: Flora of Peru. Publications of the Field Museum of Natural History, Botany Series 13.

A REVISION OF *SCAPHISPATHA* (ARACEAE – CALADIEAE) INCLUDING A NEW SPECIES

Eduardo Gomes Gonçalves[1]

ABSTRACT

(A revision of *Scaphispatha* (Araceae – Caladieae) including a new species) The formerly considered monospecific genus *Scaphispatha* (Araceae – Caladieae) is here revised. *Scaphispatha robusta* E.G.Gonç, a second species for the genus is newly described from the Cerrado Biome and the transition Cerrado-Amazonia. It differs from *S. gracilis* Brongn. *ex* Schott by the much more robust petioles and leaves, primary lateral veins drying clearer than the lamina, lateral secondary veins conspicously more prominent than tertiary veins and for the female spadix with 11-15 rows of flowers visible in side view. A key to separate both species is provided, as well as ink illustrations and general remarks on the genus.

Key-words: *Scaphispatha*, Cerrado, Caladieae, Araceae, geophyte.

RESUMO

(Revisão de *Scaphispatha* (Araceae – Caladieae), incluíndo a descrição de uma nova espécie para o gênero) O gênero *Scaphispatha* (Araceae – Caladieae), até então considerado monoespecífico, é aqui revisado. *Scaphispatha robusta* E.G.Gonç., uma segunda espécie para o gênero é descrita para o bioma Cerrado e a transição Cerrado-Amazonia. Difere de *S. gracilis* Brongn. *ex* Schott pelos pecíolos e folhas muito mais robustas, nervuras laterais mais claras que o limbo quando secas, nervuras laterais secundárias mais proeminentes que as terciárias e pela porção feminina do espádice com 11-15 espirais de flores visíveis em vista lateral. Uma chave para separar as espécies, assim como ilustrações em nanquim e aspectos gerais para o gênero são apresentados.

Palavras-chave: *Scaphispatha*, Cerrado, Caladieae, Araceae, geófita.

INTRODUCTION

The exclusively neotropical genus *Scaphispatha* was formerly considered monospecific. The type species – *Scaphispatha gracilis* – ranges from Brazil to Bolivia (Bogner 1980; Mayo *et al.* 1997), at the transitional areas between the phytogeographic provinces of the Cerrado, Caatinga and the Amazonia. Despite the wide occurrence, flowering seems to be an ephemeral event, so flowering specimens are very rarely collected. Until living collections were brought to cultivation by Josef Bogner in 1980, only three flowering collections (including the type specimen) were recognized in herbaria (Bogner 1980) and the leaves were unknown.

Recently, a second species of *Scaphispatha* was recognized when plants from Pará state (Northern Brazil) flowered in cultivation. Sterile specimens of this species has been collected and seen for years, but they were consistently considered as belonging to *Caladium* because of the large-sized peltate leaves, usually speckled in white.

In order to make easier the comparisons of the newly described species with the former one, both are fully described and illustrated and a taxonomic account for the genus is presented.

TAXONOMICAL TREATMENT

History of the genus

The genus *Scaphispatha* was originally described by Heinrich Wilhelm Schott (1860), based on a d´Orbigny specimen deposited

Artigo recebido em 05/2005. Aceito para publicação em 08/2005.

[1]Universidade Católica de Brasília. Curso de Ciências Biológicas. Prédio São Gaspar Bertoni - sala M-206, QS-7, Lote 1 - EPTC. CEP 72030-170, Taguatinga - DF - Brazil. Phone: 55 61 356-9300

Financial support: Instituto Plantarum de Estudos da Flora Ltda; Biodiversidade do Bioma Cerrado (EMBRAPA, UnB, ISPN, DFID); Fundação Botânica Margaret Mee.

the Herbarium of the Paris Museum. He used the name suggested by Adolphe Brongniart in the type sheet. It was placed in the tribe Caladieae, "Subtribus Problematicae". In his Das Pflanzenreich treatment, Engler placed *Scaphispatha* in the subfamily Aroideae, tribe Zomicarpeae, together with *Zomicarpa*, *Ulearum*, *Zomicarpella* and *Xenophia* (now *Alocasia*). The reason for this placement was the presence of a unilocular ovary with basal anatropous ovules.

The genus was reevaluated by Josef Bogner (1980) when new collections from Ceará State, Brazil, were brought into cultivation. These new collections were taken very far from the original locality but a third collection was localized from Pará state. Bogner transferred *Scaphispatha* to the Englerian subfamily Colocasiodieae, subtribe Caladiineae, based on chromosome numbers and pollen type. This was also the first description of its leaves, which has proven to be peltate. Mayo and collaborators (1997) summarized the current information of this genus in their "The Genera of Araceae", providing detailed illustrations and including it in the tribe Caladieae, with no subtribal recognition. Since then, almost nothing has been published about the genus, except a few ecological remarks (Gonçalves 2004).

Ecology

Both species of *Scaphispatha* are true geophytes, producing flowers and leaves during the rainy months and resting leafless during the drier or colder months. Both species occur in well drained soils, but *S. gracilis* seems to prefer drier areas, occuring in open woodland (Cerradão), usually in shaded portions near small ravines. *Scaphispatha robusta* seems to prefer heavier soils, usually occurring in forest edges or nearby clearings in the forest.

Flowering is usually a short event and fruiting has proven to be even quicker. Flowering and fruiting are said to occur in 10-14 days (Bogner 1980)! Inflorescences in *Scaphispatha* seem to appear in late October and infructescences are no longer to be found by mid November. Leaves persist a little longer, as long as late February.

Biogeography

Both species of *Scaphispatha* have more or less the same general occurrence, ranging across the transition between the Cerrado biome and the Amazonia, with one species in the transition between the Cerrado and the Caatinga biome (dry thorn forest). Both species can be considered sympatric to some extent, but the distributions present different patterns. *Scaphispatha gracilis* seems to present a wider distribution, ranging from Ceará State to Bolivia, also penetrating deeply in the Cerrado and reaching northern Goiás State. *Scaphispatha robusta* has a more or less similar distribution, but it seems to penetrate more deeply in the Amazonia, probably occurring in deciduous forms of Amazonian forest, common in Brazilian States of Acre and Rondônia.

Relationships

Scaphispatha belongs to the tribe Caladieae, together with the economically important genera *Xanthosoma*, *Caladium* and *Syngonium* (Bogner 1980; Mayo *et al.*, 1997). It is not supposed to be especially close to any other genus in the tribe, but *Scaphispatha* was not surveyed in the only cpDNA phylogenetic analysis of the entire family, performed by French *et al.* (1995).

Morphologically, *Scaphispatha* does not have any special aspect that would mark any obvious affinity on it. Vegetatively it looks like a *Caladium*, with peltate leaves that are sometimes white-speckled. The inflorescence is also of a general type, and the only remarkable aspect is the presence of a unilocular ovary with basal ovules in the female flowers. Other interesting aspect that could be considered is the presence of a short

but noticeable style. Both features are shared with most genera of the small neotropical tribe Zomicarpeae. In fact, the tribe Zomicarpeae was considered inseparable from Caladieae (French *et al.* 1995) and some classifications have both groups in an expanded Caladieae (see Keating 2004).

Anyhow, the inclusion of *Scaphispatha* in a phylogenetic analysis of the entire complex Caladieae-Zomicarpeae would help the clarify which genus or genera are closest to *Scaphispatha*. A DNA phylogeny of the complex (as well as chromosome counts) has been currently reconstructed by Gonçalves and collaborators and the results will be published further.

Scaphispatha Brongn. *ex* Schott, Prodr. Syst. Aroid. 214 (1860). **Type**: *S. gracilis* Brongn. *ex* Schott.

Tuberous herb, tuber globose or slightly depressed apically. Leaf usually solitary, occasionally 2–3. Petiole long, marbled, sheath short, inconspicuous. Blade always peltate, ovate-sagittate to ovate-hastate, primary lateral veins forming a conspicuous collective vein, minor venation reticulate. Inflorescences solitary, appearing much before the leaves or together with them; peduncle from shorter to longer than the petiole. Spathe usually decurrent at base, constriction weak to moderate, tube incompletely convolute. Spadix usually shorter than the spathe, not constricted, densely flowered, fertile male and female zones contiguous or separated by 1–3 rows of sterile male flowers. Flowers unisexual, perigone absent. Male flower 4-6 androus, stamens connate in synandria, with a lateral thecae opening by a slit or a "T" like opening; pollen grains solitary, inaperturate, exine verrucose to subarolate. Female flower with a ovoid to obovoid ovary, 1-locular, ovules 3–7, anatropous, basally attached by a short funicle; style well developed, connoid, much narrower than the ovary, stigma capitate, slightly broader than the apex of the style. Infrutescence with persistent spathe tube, berries subglobose, one seeded. Testa thin and smooth, endosperm abundant. Chromosomes: 2n=28 (only counted for *S. gracilis*).

Key to the species of *Scaphispatha*

Petioles slender, rarely reaching 28 cm long (usually up to 20 cm long) and always less than 4 mm in diameter at base; primary lateral veins drying darker than the lamina; lateral secondary and tertiary veins not significantly different from each other; female part of spadix with 6-9 rows of flowers visible in side view. ..... *S. gracilis*

Petioles robust, never shorter than 28 cm long in adult plants (usually up to 1 m long) and always more than 6 mm in diameter at base, usually more than 1 cm; primary lateral veins drying clearer than the lamina; lateral secondary veins conspicously more prominent than tertiary veins; female part of spadix with 11-15 rows of flowers visible in side view. ..... *S. robusta*

Scaphispatha gracilis Brongn. *ex* Schott, Prodr. Syst. Aroid. 214. 1860. **Type**: BOLÍVIA. CHIQUITOS. Camiño de San Rafael a Santa Ana, *d'Orbigny 1043* (holotype P!, isotype L!). Fig. 1.

Geophytic herb, usually growing in open woodlands (distrophic cerradão) or rocky outcrops, ocasionally in full sunlight. **Stem** tuberous, subglobose, 2 × 3 cm, flesh yellow. **Leaf** usually solitary, ocasionally 2–4, erect. **Petiole** smooth, 9–20(-28) × 0.3–0.4 cm, marbled. **Blade** peltate, cordate to sagittate or subhastate, ovate in outline, membranous, adaxial and abaxial surfaces matte green, somewhat silvery, 9–20 × 6–22 cm, anterior division 5–13 × 4–13 cm, primary lateral veins

1–3 per side, usually drying darker than the lamina, departing at an angle of 40–70°, slightly curved towards the apex, fusing into a collective nerve 6–9 mm from leaf margin, second collective nerve 1–2 mm far from leaf margin, a little less prominent than the main collective vein; posterior divisions 2–4 × 6–22 cm, posterior lobes rounded, sinus up to 75% the length of the posterior divisions, acroscopic nerves 0–2, basioscopic 2–3. **Peduncle** 20–40 cm long, 3–4 mm diam., marbled. **Spathe** withish green outside, white inside, only slightly constricted at middle, 3–5(-6) cm long, tube poorly differentiated, 1–1.5 cm long. **Spadix** unconstricted, 2–2.5 cm long, female portion 4–6 × 2–4 mm, cylindric, fertile male portion 1,2–1,4 cm, abruptely tappered to the apex, male flowers with 2–5-androus synandria, filaments connate, 4–5 mm tall, thecae square in outline, dehiscing by an apical slit (only seen in dry specimens); connectives inconspicuous; female flowers with ovoid ovary, c. 0.6–1 × 0.6–0.8 mm, 1-locular, ovules 3–5, attached at the base, style conical to cylindric, c. 0.2–0.4 × 0.1 mm, stigma capitate. **Berries** subglobose to obovoid, 3–4 mm long, about 3 mm in diam., whitish grey (*fide* J. Bogner); seeds solitary, subglobose, 2.5–3 mm diam..

Specimens examined: BRAZIL. CEARÁ: Crato, Serra do Araripe, near Crato, above the village of Granjeiro, 850 m, 15-17.XI.1976, *Bogner 1211* (K); Same locality, Taboleiros, 28.X.1934, *Luetzelburg 25984* (US); MARANHÃO: Carolina, Estrada Carolina-Estreito, 7°05′18″S – 47°25′41″W, 16.I.1998, *Gonçalves & Oliveira 156* (UB); São Raimundo das Mangabeiras, 6°57′29″S – 45°21′46″W, 18.I.1998, *Gonçalves & Oliveira 168* (UB). MATO GROSSO: Rosário Oeste, estrada Nova Brasilândia – Mazagão, ca. 65 km de Nova Brasilândia, 14°38′S-55°14′W, 9.X.1997, *Souza et al.20603* (ESA, UB). PIAUÍ: Floriano, proximidades de Floriano, Estrada para Canto do Buriti, 6°56′06″S-43°04′28″W, 20.I.1998, *Gonçalves & Oliveira 172* and *182* (UB); TOCANTINS: Arraias, área ao redor do trevo para Paranã e Conceição do Tocantins, 27.XII.2000, *Gonçalves 655* (UB); Arraias, estrada Arraias Paranã, 56 km do trevo para Conceição do Tocantins, 27.XII.2000, *Gonçalves 657* (UB); Arraias, Rio Arraias, 12 km depois do trevo da entrada da cidade em direção à Paranã, 27.XII.2000, *Gonçalves 646* (UB); Campos Belos, 8 km de Campos Belos em direção à Tabatinga, 8.X.1972, *Rizzo 8443* (UFG).

Scaphispatha gracilis can be recognized by its slender inflorescences, primary lateral veins drying darker than the lamina and for the presence of lateral secondary veins as prominent as tertiary veins. It was originally described from Bolivia, but all subsequent collections were made in Brazil. *Scaphispatha gracilis* occurs in open woodlands ("Cerradões") and is specially common in the transition between the biomes Cerrado and Caatinga. Despite its rarity in collections, it is a common plant and is the main understory herb in some forests in Piauí state.

Scaphispatha robusta E. G. Gonç. sp. nov. **Type**: BRAZIL. PARÁ: Canaã dos Carajás, Morro da Torre (Morro do Sossego), 6°27′36″S-50°04′28″W, 21.I.2003, *Gonçalves et al. 1128* (holotype UB). Fig. 2.

A Scaphispatha gracili *similis sed habitu robustiore, nervis lateralibus primariis in sicco quam lamina pallidioris, nervis lateralibus secundaris conspicue quam nervis lateralibus tertiaris prominentibus et feminea inflorescentia cum 11-15 seriebus florum manifestis lateraliter differt.*

Tuberous herb, usually growing near the margins of forests, ocasionally in full sunlight. **Stem** tuberous, subglobose, 4 × 3 cm, yellow fleshed, deeply buried in the substrate. **Leaf** usually solitary, ocasionally 2 or 3, erect. **Petiole** smooth, 29–82 × 0.4–1.2 cm, marbled. **Blade** peltate, cordate to satigittate, ovate in

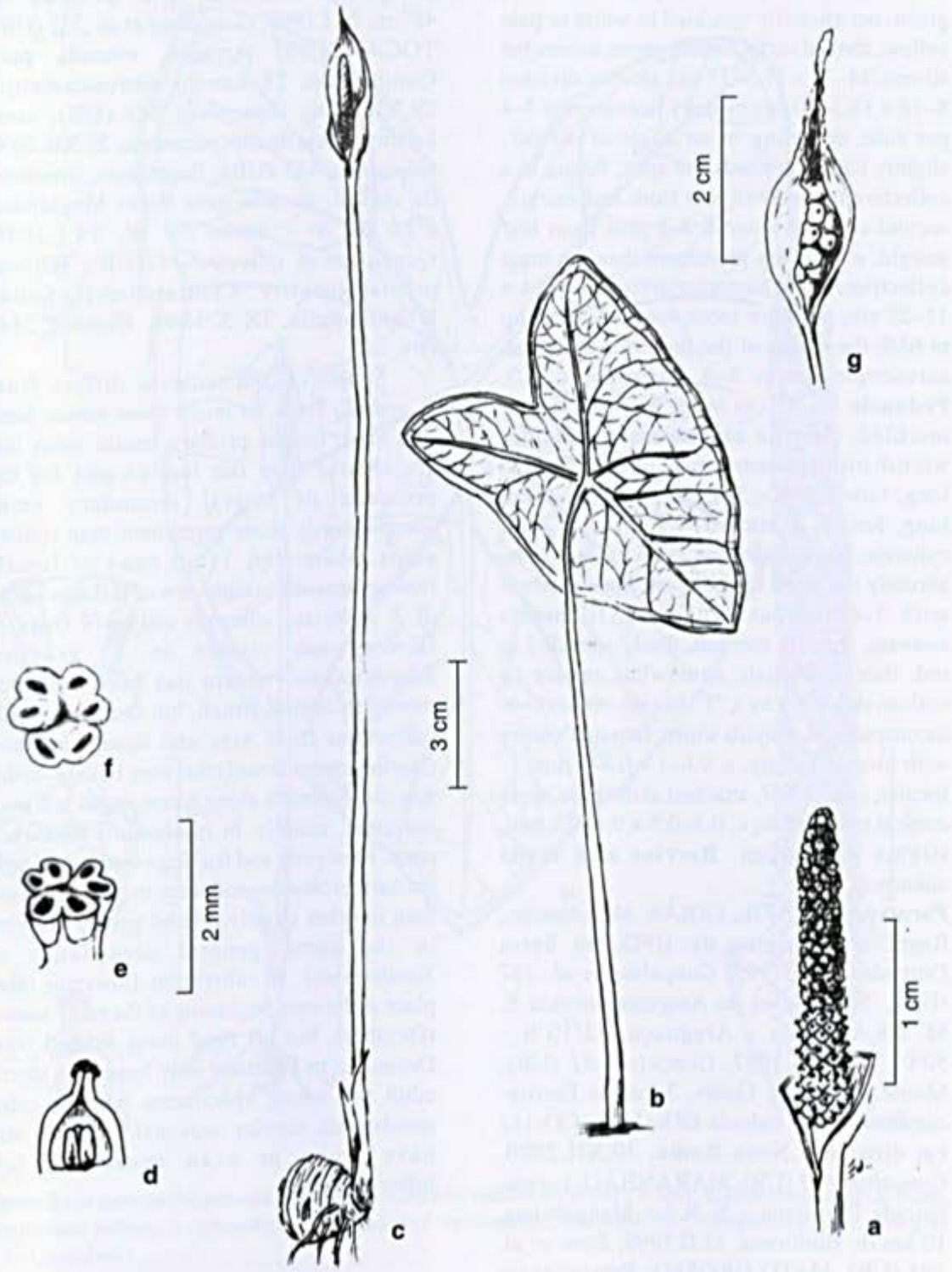


Figure 1 - *Scaphispatha gracilis* Brongn. *ex* Schott. a. Spadix (spathe removed); b. leaf; c. flowering tuber; d. ovary, longitudinal section; e. synandrium, side view; f. synandrium, upper view; g. infructescence. (a, c-f, *Souza 20603*; b, *Gonçalves* 646; g, *Bogner 1211* – drawn by E. G. Gonçalves)

outline, membranous, adaxial surface matte green, occasionally speckled in white or pale yellow, abaxial surface matte green, somewhat silvery, 14–33 × 11.5–27 cm, anterior division 8–19 × 18.3–40 cm, primary lateral veins 3–4 per side, departing in an angle of 40–60°, slightly curved towards the apex, fusing in a collective nerve 8–15 mm from leaf margin, second collective nerve 2–5 mm from leaf margin, a little less prominent than the main collective nerve; posterior divisions 6–14 × 11–27 cm, posterior lobes rounded, sinus up to 65% the length of the posterior divisions, acroscopic nerves 2–3, basioscopic 2–3. **Peduncle** 17–25 cm long, 3–5 mm diam., marbled. **Spathe** bright green outside, whitish inside, constricted at middle, 5–7 cm long, tube 1.5–2 × 3–4 cm. **Spadix** 3–5 cm long, female portion 1–1.5 × 0.5–0.7cm, cylindric, fertile male zone 2–3.5 × 0.4–0.7 cm, abrubtly tappered to the apex; male flowers with 3–6-androus synandria, filaments connate, up to 1 mm tall, finely speckled in red, thecae whitish, somewhat square in outline, dehiscing by a "T" like slit, connectives inconspicuous, grayish white; female flowers with obovoid ovary, c. 0.6–1 × 0.8–1 mm, 1-locular, ovules 5–7, attached at the base, style conical to cylindric, c. 0.3–0.5 × 0.1–0.2 mm, stigma pale green. **Berries and seeds** unknown.

Paratypes: BRAZIL. GOIÁS: Mossâmedes, Reserva Ecológica da UFG em Serra Dourada, 6.XII.1999, *Gonçalves et al. 367* (UB); São Miguel do Araguaia, estrada S. M. do Araguaia – Araguaçu, 13°10′S – 50°01′W, 14.II.1997, *Gonçalves 81* (UB); Monte Alegre de Goiás, 3 km do Entroncamento com a rodovia GO-118 na GO-112 em direção a Nova Roma, 30.XII.2000, *Gonçalves 693* (UB). MARANHÃO: Loreto, Estrada Buritirana – S. R.das Mangabeiras, 10 km de Buritirana, 11.II.1999, *Lima et al. 105* (UB). MATO GROSSO: Proximidades de Águas Quentes, 15°26′15′′S – 59°06′26′′W, 487 m, 22.I.1999, *Gonçalves et al. 272* (UB). TOCANTINS: Arraias, estrada para Combinado, 28 km do entroncamento, 29.XII.2000, *Gonçalves 681* (UB); same locality, 32 km do entroncamento, 29.XII.2000, *Gonçalves 685* (UB); Pequizeiro, arredores da cidade, estrada para Porto Magalhães, 8°26'20''S – 49°06'53''W, 14.I.1998, *Gonçalves & Oliveira 141*(UB). Without precise locality: Central Brésil, Sertão D´Amaroleite, IX-X.1844, *Weddell 2849* (P).

Scaphispatha robusta differs from *S. gracilis* from its much more robust habit (see key), for the primary lateral veins that are clearer than the lamina and for the presence of lateral secondary veins conspicuously more prominent than tertiary veins. Moreover, 11-15 rows of female flowers are seen in side view of inflorescences of *S. robusta*, whereas only 6-9 rows of flowers are visible in *S. gracilis*. *Scaphispatha robusta* has been collected mostly in central Brazil, but there are sterile collections from Acre and Rondonia states (Northwestern Brazil) that may belong to this species. It occurs along forest edges and rock outcrops, usually in moderately disturbed areas. Flowering and fruiting events in the wild are hard to observe and seem to be much faster than in other closely related genera growing in the same general area (such as *Xanthosoma*). In cultivation, flowering takes place at the very beginning of the rainy season (October), but all field areas visited from December to February only have both sterile adult and young specimens, whereas other aroids with similar seasonal behavior still have fruits or even occasional late inflorescences.

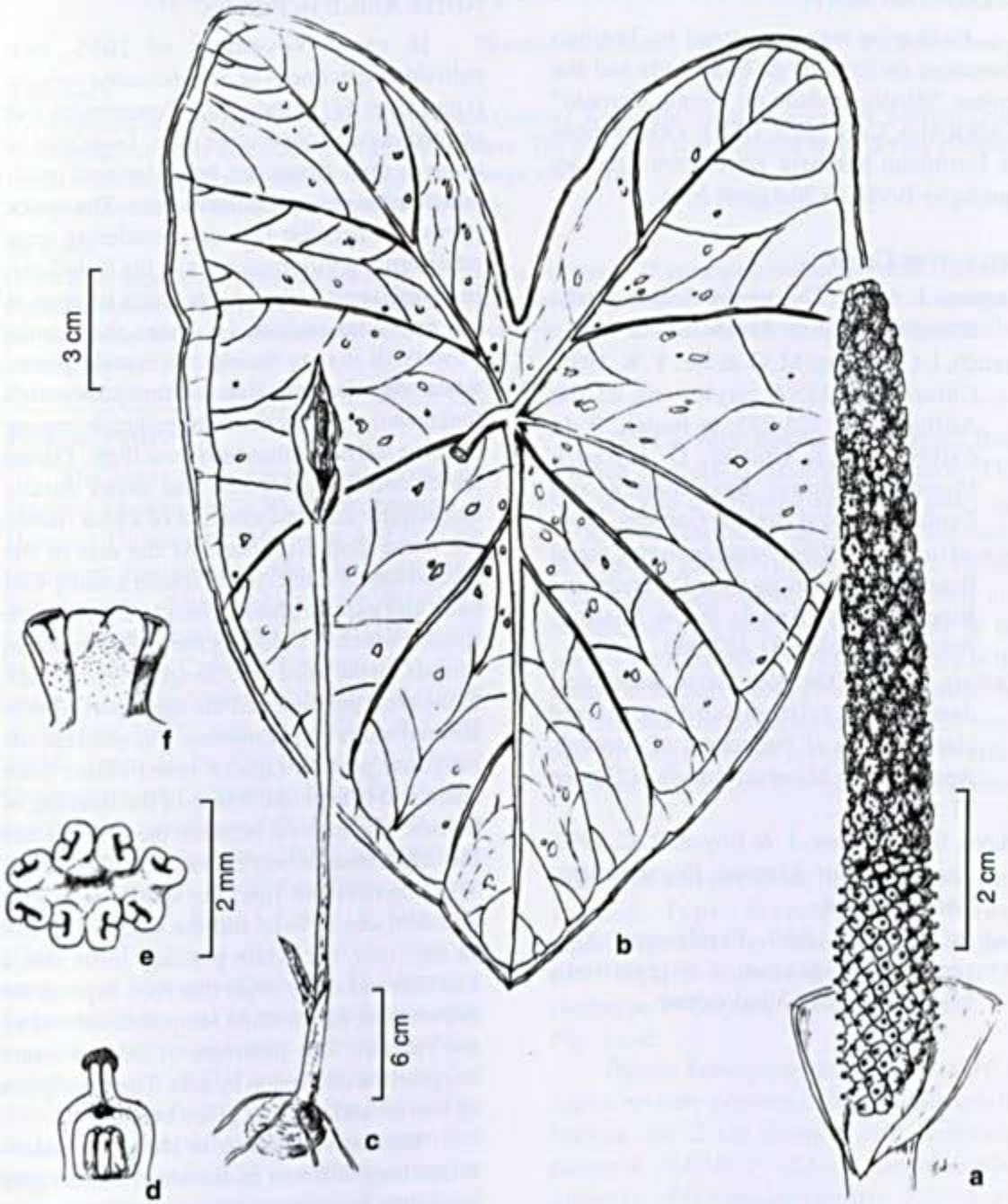


Figure 2 - *Scaphispatha robusta* E. G. Gonç. a. Spadix (spathe removed); b. leaf; c. flowering tuber; d. ovary, longitudinal section; e. synandrium, upper view; f. synandrium, side view. (a-f, *Gonçalves1128* – drawn by E. G. Gonçalves)

Acknowldegments

Field trips were sponsored by Instituto Plantarum de Estudos da Flora Ltda and the project "Biodiversidade do Bioma Cerrado" (EMBRAPA, UnB, ISPN, DFID). Observations on European herbaria were sponsored by Fundação Botânica Margaret Mee.

Literature Cited

Bogner, J. 1980. The genus *Scaphispatha* Brongn. *ex* Schott. Aroideana 3:4-12.

French, J. C.; Chung, M. G. & Jur, Y. K. 1995. Chloroplast DNA phylogeny of the Ariflorae. Pp. 225-275, *in* Rudall, P. J.; Cribb, P. J. & Cuttler, D. F. (ed.). Monocotyledons: Systematics and Evolution. Royal Botanic Gardens, Kew.

Gonçalves, E. G. 2004. Araceae from Central Brazil: Comments on their Diversity and Biogeography. Annals of the Missouri Botanical Garden 91:457-463.

Keating, R. C. 2004. Vegetative anatomical data and its relationship to a revised classification of the genera of Araceae. Annals of the Missouri Botanical Garden 91: 485-494.

Mayo, S. J.; Bogner, J. & Boyce, P. C. 1997. The Genera of Araceae. Royal Botanic Gardens, Kew.

Schott, H. W. 1860. Prodromus systematis aroidearum. Congretationis Mechitharisticae, Vindobonae.

Notes Added in Proofs

In early November of 2005, two cultivated specimens of *Scaphispatha robusta* (*Gonçalves 681*) produced inflorescences that opened in two consecutive days. I was able to observe their flowering behavior and hand-pollinate the younger inflorescence. The spathe opens in a peculiar fashion considering most tube-forming inflorescences in the Caladieae. In *Scaphispatha*, the spathe starts to open at the proximal region, i.e., near the female flowers. It occurs during the female phase, when stigmas are wet, so the pollinators (unknown) probably climb the peduncle coming from the soil rather than land from flight. During the second day the spathe also unfurl distally and acquire the conformation of a boat (hence the name *Scaphispatha*). At the end of the second day of anthesis the spathe usually fold back and expose almost completely the male spadix, which is shedding the pollen grains in threads. In the third day, the spathe come back to the erect position and the distal part (spathe lamina) starts to get marcescent, whereas the proximal portion (spathe tube) closes once again and is kept like this until the ripening of berries. The interval between the anthesis and the dehiscence of berries was exactly 40 days. When berries are ripe, the spathe tube split and dehisces at base and the berries fall off. In the floor, the white pericarp turns into a blackish and slimy cover that soon exposes the brown testa with a white strophiole formed by the funicle. The presence of this structure suggests the dispersion by ants. The description of berries and seeds is given below:

Berries subglobose to barrel-shaped, 4-6 mm long, 3-6 mm in diameter, whitish grey or slightly lavender, pericarp somewhat spongy; seeds solitary, rarely two, ovoid, 3-4 mm long, 4-5 mm in diam., testa thin and smooth, brown, funicle forming a white strophiole, endosperm copious, embryo small, straight, greenish.

New species of *Monstera* (Araceae) from French Guiana

Thomas B. Croat[1], *Joep Moonen*[2] & *Odile Poncy*[3]

Abstract

(New species of *Monstera* (Araceae) from French Guiana) A new species of *Monstera*, *M. barrieri* Croat, Moonen & Poncy, is described from French Guiana. The species is characterized by its deeply pinnately lobed, black-drying blades and the wine-red to orange spadix axis.

Key-words: French Guiana, *Monstera*, new species.

Resumo

(Uma nova espécie de *Monstera* (Araceae) da Guiana Francesa) O presente trabalho apresenta uma nova espécie de *Monstera* nativa da Guiana Francesa, *M. barrieri* Croat, Moonen & Poncy. A espécie é caracterizada por apresentar lâmina profundamente lobada, tornando-se negra quando seca e eixo da espádice vermelho-vináceo a alaranjado.

Palavras-chave: Guiana Francesa, *Monstera*, espécie nova.

Introduction

The genus *Monstera* was last revised by Michael Madison as a Ph.D. dissertation at Harvard University (Madison 1977). This treatment contained a total of 22 species. Subsequently, four species were described from Central America by Grayum (1997), one by Grayum (*in* Croat & Grayum, *loc. cit.*), one by Croat & Acebey from Bolivia (Croat & Acebey 2005), and one (Mora & Croat 2004) from Cabo Corrientes in Chocó Department of Colombia. In addition, one species, *M. standleyana* G. S. Bunting, was resurrected by Grayum (2003), and another was transferred from *Rhodospatha* (*M. costaricensis* (Engl.) Croat & Grayum (Grayum 1997)) to bring the number of recognized *Monstera* species to 31. *Monstera bolivana* Rusby and *M. expilata* Schott, both species synonymized with *M. obliqua* Miq. by Madison (1977), are now considered distinct species by the first author and will be formally resurrected as distinct species so that the total will be at least 33. In addition, a number of undescribed species remain in Central and especially South America so that in all probability the total number of species in the genus will approach 60 species.

Here a very distinctive species from French Guiana is described as new. This species was discovered about ten years ago by Joep Moonen who has had it in cultivation at Emerald Jungle Village in French Guiana and was independently rediscovered and recognized as a new species recently in the area of the type locality by Odile Poncy at the Paris Herbarium, Paris, France. However, the species was first collected more than 23 years ago by Serge Barrier and Christian Feuillet. The species is named in honor of Serge Barrier.

Monstera barrieri Croat, Moonen, & Poncy, sp. nov. **Type**: French Guiana. Fleuve Approuague, Rivier Arataye, Sauts Parare, Feb. 1981, *S. Barrier & C. Feuillet 2719* (holotype P; isotypes K, MO, NY, U).
Fig. 1 a-d.

Planta hemiepiphytica usque ad 10 m supra terram crescens. Internodia adulta brevia, ca. 2 cm diam. Folia juvenalia patentia, petiolo 2—2.5 cm longo, lamina anguste oblongo-lanceolata 5.5—8 cm longa. Folia adulta petiolo (13—)18—41 cm, lamina pinnatisecta, inaequilatera, 36—58 cm longa, 31—37 cm lata. Inflorescentia

Artigo recebido em 08/2004. Aceito para publicação em 12/2004.

[1]Missouri Botanical Garden. P.O. Box 299. St. Loius, MO 63166-0299, USA. e-mail: Thomas.Croat@mobot.org
[2]Emerald Jungle Village, 97356 Montsinéry, Guyane. e-mail: emeraldjunglevillage@wanadoo.fr
[3]Odile Poncy, Museum National d'Histoire Naturelle, Paris, France. e-mail: poncy@mnhn.fr

pedunculo (12—)16.5—19 cm longo, in vivo usque ad 1 cm (in sicco usque ad 6 mm) diam.; spatha cremea 15—23 cm longa, ca. 4.5 cm lata; spadice in vivo cremeo, in sicco nigrescente, in vivo 6—13 cm longo, ca. 2 cm diam., maturitate in sicco 9—12 cm longo, 1.8—2 cm diam.; axe in sectione tranversali vinoso vel aurantiaco, ca. 7 mm diam.

Hemiepiphyte to 10 m high in trees; **juvenile plants** with blades petiolate, not shingled; stem drying blackened, closely and acutely ridged; petioles 2–2.5 cm long, sheathed almost throughout, the margins turned inward, the sheath apex narrowly rounded at least on one side, the free portion sharply sulcate; blades subcoriaceous, narrowly oblong-lanceolate, 5.5– cm long, 5 times longer than wide, drying matte on both surfaces; pre-adult plants with petioles 6.5–9 cm long, narrowly sheathed almost to the apex; **preadult blades** narrowly ovate-lanceolate 17.5–18.5 cm long, 21–21 cm wide, deeply 4–6-lobed, 4.3–6 cm wide, 2.9–4.2 times longer than wide, pinnately lobed with 1–4 narrow lobes divided to or almost to the base; **adult plants** with stem assymetrical, to 2 cm diam.; internodes shorter than broad; **petioles** (13)18–41 cm long, sheathed to within 8 cm of base of blade; **blades** 36–58 cm long; 31–37 cm wide; pinnae 7–9 pairs, 17–26 cm long, 0.6–1.8 cm wide, 2–6 cm apart, most with a single medial rib, sometimes 2-ribbed, the upper edge ending abruptly on the midrib, the lower margin broadly confluent on the midrib and ending usually near the emergence of the next lower lobe; upper surface drying blackened and matte, minutely papillate; lower surface drying blackish yellow-brown, weakly glossy and only slightly paler; **midrib** obtusely sunken and concolorous above (drying deeply sunken), drying narrowly and obtusely raised and slightly brownish below; **primary lateral veins** 2–4 per side, arising at 15–20° angle, drying darker than surface, acute to bluntly raised, with numerous whitish linear cellular inclusions; sinus narrowly linear-lanceolate in outline; lateral lobes 2–12 mm wide, narrowly tapering to an acicular apex, sometimes still weakly connecting to the adjacent segment. Inflorescences 2 per axil; **peduncle** medium-dark green, (12)16.5–19 cm long, to 1 cm diam., to 6 mm diam. on drying, blackened; **spathe** creamy white, matte outside, only slightly paler inside, moderately coriaceous, markedly cucullate with the apical portion directed forward and hooding the opening, 15–23 cm long, 4.5 cm wide at anthesis (flattening to 11 cm wide), weakly convolute at the base for up to 2.5 cm with the lateral margins markedly folded and with the apical ½ protruding forward at almost a 90° to the axis of the spathe, acuminate at apex; **spadix** cylindroid, weakly tapered toward both ends, narrowly rounded at apex, 6–13 cm long, 2 cm diam., creamy white, deep wine-red to orange in cross-section, drying blackened, 9–12 cm long, 1.8–2 cm diam. at maturity, the axis ca. 7 mm wide; **pistils** ca. 7 mm long, creamy white; style about as broad as the pistil, tapered weakly to a nipple-like stigma; stamens white, held at about 2/3 the length of the pistils; anthers with thecae oblong, closely parallel, ca. 3 mm long; unripened. Infructescence pale green, sometimes with the old spathe persisting from base, the **berries** acute at apex.

Paratypes: FRENCH GUIANA. Réserve Naturelle des Nouragues Camp Arataye, a short distance from the mouth of the Arataye River at jct. of the Approuague River, 3°59'N, 52°35'W, *Poncy 1700* (CAY, P); grounds of the main camp and vic., 100 m, 11 Nov. 2003, *Mori et al. 25701* (CAY, MO); along Arataye River, Oct. 1996, *Moonen 139* (MO); *264* (MO); *291* (MO).

Monstera barrieri is known only from the type locality in French Guiana. It is characterized by its pinnately lobed, blackish-drying blades with slender pinnae that are narrowly long-tapered toward the apex and not at all constricted toward the base. Also characteristic is the cuculate spathe and the bright reddish color of the cross-section of both the spadix and the pistils.

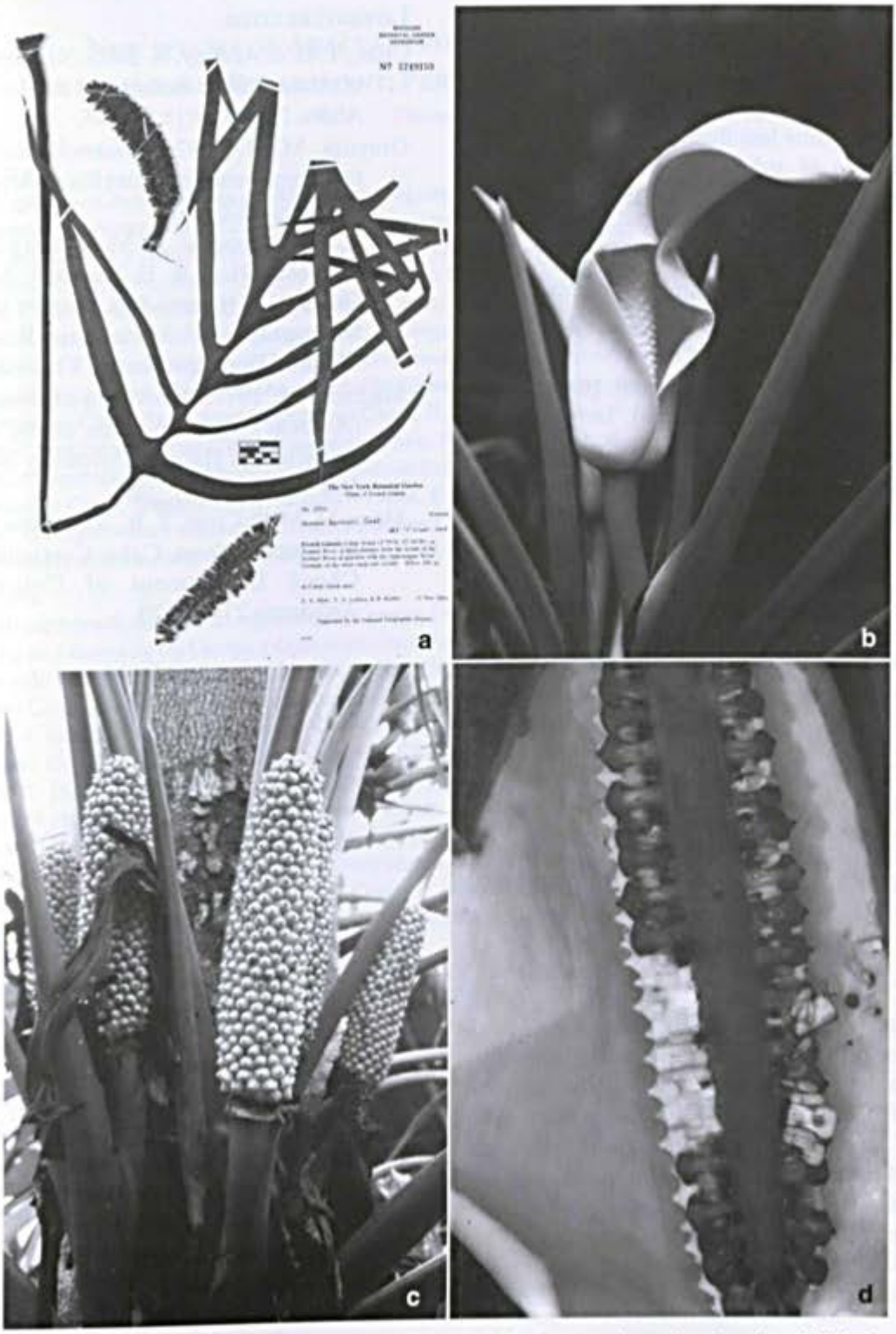


Figure 1 - a-d. *Monstera barrieri* Croat, Moonen & Poncy. a. Herbarium specimen showing pinnatifid blades and infructescences. (*Mori et al. 25701*); b. inflorescence showing cucullate spathe with apical portion directed forward hooding the opening; c. fruiting plant. d. spadix cross-section with spathe in background. (*Poncy 1700*) Photo by S. Mori.

The species is most similar to *M. expilata* Schott in its blackish coloration and texture of the leaves on drying, but that species has blades that are merely perforate, not pinnate and a straight spathe less than 8 cm long. It is also similar to *M. subpinnata* (Schott) Engler, a species that has pinnately lobed leaves that also dry black, but that species is restricted to the upper Amazon basin and has up to 12 lobes that are constricted toward the midrib.

Acknowledgements

The authors wish to thank Roy Gereau, Missouri Botanical Garden, for the Latin diagnosis and Emily Yates, Missouri Botanical Garden, for editing of the manuscript and preparation of the images and legend.

Literature cited

Croat, T. B. & Acebey, A. 2005. New species of Araceae from Bolivia and the Tropical Andes. Novon 15(1): 80-103.

Grayum, M. H. 1997. Nomenclatural and taxonomic notes on Costa Rican Araceae. Phytologia 82: 30-57.

_____. 2003. Araceae. *In*: Manual de plantas de Costa Rica, B. E. Hammel, M. H. Grayum, C. Herrera & N. Zamora (eds.). Monographs of Systematic Botany, Missouri Botanical Garden 92: 59-200.

Madison, M. 1977. A revision of *Monstera* (Araceae). Contributions of the Gray herbarium of Harvard University 207: 2-100.

Mora, M. M. & Croat, T. B. 2004. New Taxa of Araceae from Cabo Corrientes in Chocó Department of Colombia. Aroideana 27: 90-129.

New species of Araceae from the Río Cenepa region, Amazonas Department, Perú

Thomas B. Croat[1,2], *Anne Swart*[3] & *Emily D. Yates*[1]

Abstract

(New species of Araceae from the Río Cenepa region, Amazonas Department, Perú) New species from the Department of Amazonas in Peru are described as new in preparation for the treatment of the Araceae for the Flora del Cenepa y Areas Adyacentes Amazonas Peru. New species include: *Anthurium apanui* Croat, *A. atamainii* Croat, *A. baguense* Croat, *A. brent-berlinii* Croat, *A. ceronii* Croat, *A. chinimense* Croat, *A. diazii* Croat, *A. galileanum* Croat, *A. huampamiense* Croat, *A. huashikatii* Croat, *A. kayapii* Croat, *A. kugkumasii* Croat, *A. kusuense* Croat, *A. leveauii* Croat, *A. lingulare* Croat, *A. mostaceroi* Croat, *A. penae* Croat, *A. quipuscoae* Croat, *A. rojasiae* Croat, *A. shinumas* Croat, *A. tsamajainii* Croat, *A. tunquii* Croat, *A. yamayakatense* Croat, *Dieffenbachia wurdackii* Croat, *Monstera aureopinnata* Croat, *M. cenepensis* Croat, *M. vasquezii* Croat, *Philodendron ampamii* Croat, *P. ancuashii* Croat, *P. barbourii* Croat, *P. brent-berlinii* Croat, *P. condorcanquense* Croat, *P. avenium* Croat, *P. huashikatii* Croat, *P. palaciosii* Croat, *P. reticulatum* Croat, *P. swartiae* Croat, *Rhodospatha acosta-solisii* Croat, *R. brent-berlinii* Croat, *R. katipas* Croat, *R. piushaduka* Croat, *Spathiphyllum barbourii* Croat, *S. brent-berlinii* Croat, *S. buntingianum* Croat, *S. diazii* Croat, *Stenospermation ancuashii* Croat, *S. parvum* Croat & A. P. Gómez, *Xanthosoma baguense* Croat.

Key-words: Araceae, new species, Río Cenepa, Perú, Amazonas Department.

Resumo

(Novas espécies de Araceae da região do rio Cenepa, Departamento de Amazonas, Peru) Durante a elaboração da flora de Araceae do rio Cenepa e áreas adjacentes, Amazonas, Peru, várias novas espécies foram encontradas e são aqui descritas. São elas: *Anthurium apanui* Croat, *A. atamainii* Croat, *A. baguense* Croat, *A. brent-berlinii* Croat, *A. ceronii* Croat, *A. chinimense* Croat, *A. diazii* Croat, *A. galileanum* Croat, *A. huampamiense* Croat, *A. huashikatii* Croat, *A. kayapii* Croat, *A. kugkumasii* Croat, *A. kusuense* Croat, *A. leveauii* Croat, *A. lingulare Croat, A. mostaceroi* Croat, *A. penae* Croat, *A. quipuscoae* Croat, *A. rojasiae* Croat, *A. shinumas* Croat, *A. tsamajainii* Croat, *A. tunquii* Croat, *A. yamayakatense* Croat, *Dieffenbachia wurdackii* Croat, *Monstera aureopinnata* Croat, *M. cenepensis* Croat, *M. vasquezii* Croat, *Philodendron ampamii* Croat, *P. ancuashii* Croat, *P. barbourii* Croat, *P. brent-berlinii* Croat, *P. condorcanquense* Croat, *P. avenium* Croat, *P. huashikatii* Croat, *P. palaciosii* Croat, *P. reticulatum* Croat, *P. swartiae* Croat, *Rhodospatha acosta-solisii* Croat, *R. brent-berlinii* Croat, *R. katipas* Croat, *R. piushaduka* Croat, *Spathiphyllum barbourii* Croat, *S. brent-berlinii* Croat, *S. buntingianum* Croat, *S. diazii* Croat, *Stenospermation ancuashii* Croat, *S. parvum* Croat & A. P. Gómez, *Xanthosoma baguense* Croat.

Palavras-chave: Araceae, espécies novas, rio Cenepa, Peru, Amazonas.

Introduction

New species of Araceae, in the genera *Anthurium*, *Dieffenbachia*, *Monstera*, *Philodendron*, *Rhodospatha*, *Spathiphyllum*, *Stenospermation*, and *Xanthosoma*, are described as new from the area of the Río Cenepa and Río Santiago drainages in northwestern Peru. Included are 48 new species described in preparation for the treatment of the Araceae for the Flora del Cenepa y Areas Adyacentes Amazonas Peru (Croat *et al.*, in press). The Río Cenepa flora area lies between the Río Cenepa and the Río Santiago in Bagua or Condorcanqui provinces at ca. 4°00'S to 5°30'S and 77°30'W to 78°30'W at ca. 500–1500 m elevation. This area encompasses the following life zones based on the Holdridge Life Zone system (Holdridge 1971): Premontane rain forest (P-rf), Tropical wet forest (T-wf), and Premontane moist forest transitioning to Tropical moist forest (P-mf/T).

Artigo recebido em 11/2004. Aceito para publicação em 06/2005.

[1]Missouri Botanical Garden. P.O. Box 299. St. Loius, MO 63166-0299, USA.
[2]e-mail: Thomas.Croat@mobot.org
[3]Washington University, St. Louis, MO.

Anthurium apanui Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Marañon, Yamayakat, Kusu-Chapi, Río Marañon, permanent area 500 × 500 m, parcel "E," 4°55'S, 78°19'W, 550 m, Feb. 1995, *R. Vasquez, N. Jaramillo, R. Apanu & R. Kugkumas 20067* (holotype, MO-05002341). Fig. 1a.

Planta epiphytica; internodia brevia, 8 mm diam. in sicco; cataphylla 5.5 cm longa; petiolis 18–19 cm longus; laminae oblongae vel oblongato-ellipticae, 33.5–34.5 cm longae, 7.3–7.6 cm latae; nervis primariis lateralibus 5–6 utroque; pedunculus 22 cm longus, 1–2 mm diam. in sicco; spatha viridis; spadice viridis, cylindricus, 4 cm longus, ca. 4 mm diam. in sicco.

Epiphytic plant; **internodes** short, drying 8 mm diam.; **cataphylls** 5.5 cm long, drying tan, weathering to fine longitudinal fibers near apex, a reticulum near base at upper nodes, then deciduous. **Petioles** 18–19 cm long, drying 2–3 mm diam., dark yellowish brown; **blades** oblong to oblong-elliptic, narrowly acuminate at apex (acumen ca. 3.5 cm long), cuneate at base, 33.5–34.5 × 7.3–7.6 cm, 4.5–4.6 times longer than broad, green-tinged with brown or gray above, brown-tinged with yellow below; **midrib** convex, brown above, convex, concolorous below; **primary lateral veins** 5–6 per side, arising at a 42–50° angle from midrib; collective veins arising from margin near base, 4–5 mm from margin. Inflorescence with **peduncle** 22 cm long, drying 1–2 mm diam.; **spathe** green; **spadix** green, cylindrical, erect, 4 cm long, drying ca. 4 mm diam. Flowers 2.2–2.3 × 2.1–2.2 mm, 3 visible per spiral; lateral tepals 1 mm wide.

Anthurium apanui is endemic to the type locality in northern Perú at 550 m in Tropical wet forest (T-wf) or Premontane rain forest (P-rf) life zones (Holdridge 1971). It is a member of section *Porphyrochitonium* and is characterized by oblong-elliptic, bicolorous blades and a green spadix with only three flowers per spiral. *Anthurium apanui* is similar to *A. tunquii* Croat (also published in this manuscript), but the latter species has more, closer primary lateral veins, longer cataphylls, and a red spadix.

This species is named for one of the collectors of the type specimen, Ricardo Apanu Nampin, a chief at Yamayakat Aguruna community along the Marañon river. He was an assistant plant collector with Rodolfo Vasquez in northern Peru from 1995–1996.

Anthurium atamainii Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Aguaruna Putuim, anex Yamayakat, zone of high hills 24° SW of Putuim, 660–760 m, 21 Sep. 1994, *C. Díaz, A. Peña, P. Atamain 7179* (holotype, MO-05095096; isotypes, K, US, USM). Fig. 1b.

Planta terrestris; internodia brevia, 0.6–1 cm diam.; cataphylla 7–9.5 cm longa; petiolis 22.5–38.4 cm longi, 3–4 mm diam.; laminae ovatae vel ovatae-ellipticae, attenuatae ad basim, 27.5–36 cm longae, 7.5–10.8 cm latae; nervis primariis lateralibus 12–17 utroque; pedunculus 25–34 cm longus; spatha oblonga, 3.7–5.5 cm longa; spadice viridis, cylindroideus, 3.9–7 cm longus, 3–4 mm diam. in sicco.

Terrestrial; **internodes** short, drying 0.6–1 cm diam.; **cataphylls** 7–9.5 cm long, drying dark reddish brown, lanceolate, persisting at upper internodes, weathering to tan longitudinal fibers near apex, and a reticulum of fibers near base. **Petioles** 22.5–38.4 cm long, averaging 30.4 cm, drying 3–4 mm diam., sulcate adaxially, darkened or grayish brown, sometimes yellow-tinged; geniculum slightly thicker than petiole, sometimes blackened, 1–2 cm long, drying 2–4 mm wide; **blades** ovate to ovate-elliptic, rarely weakly falcate, sometimes markedly arched along midrib, sometimes inequilateral (one side up to 1 cm wider than the other), gradually long-acuminate at apex (acumen 2–4 cm long), base slightly attenuate, 27.5–36 cm long (averaging 31.2 cm), 7.5–10.8 cm wide, 3–4.4 times longer than wide, blade 0.8–1.1 times longer than petiole, revolute at margins, drying

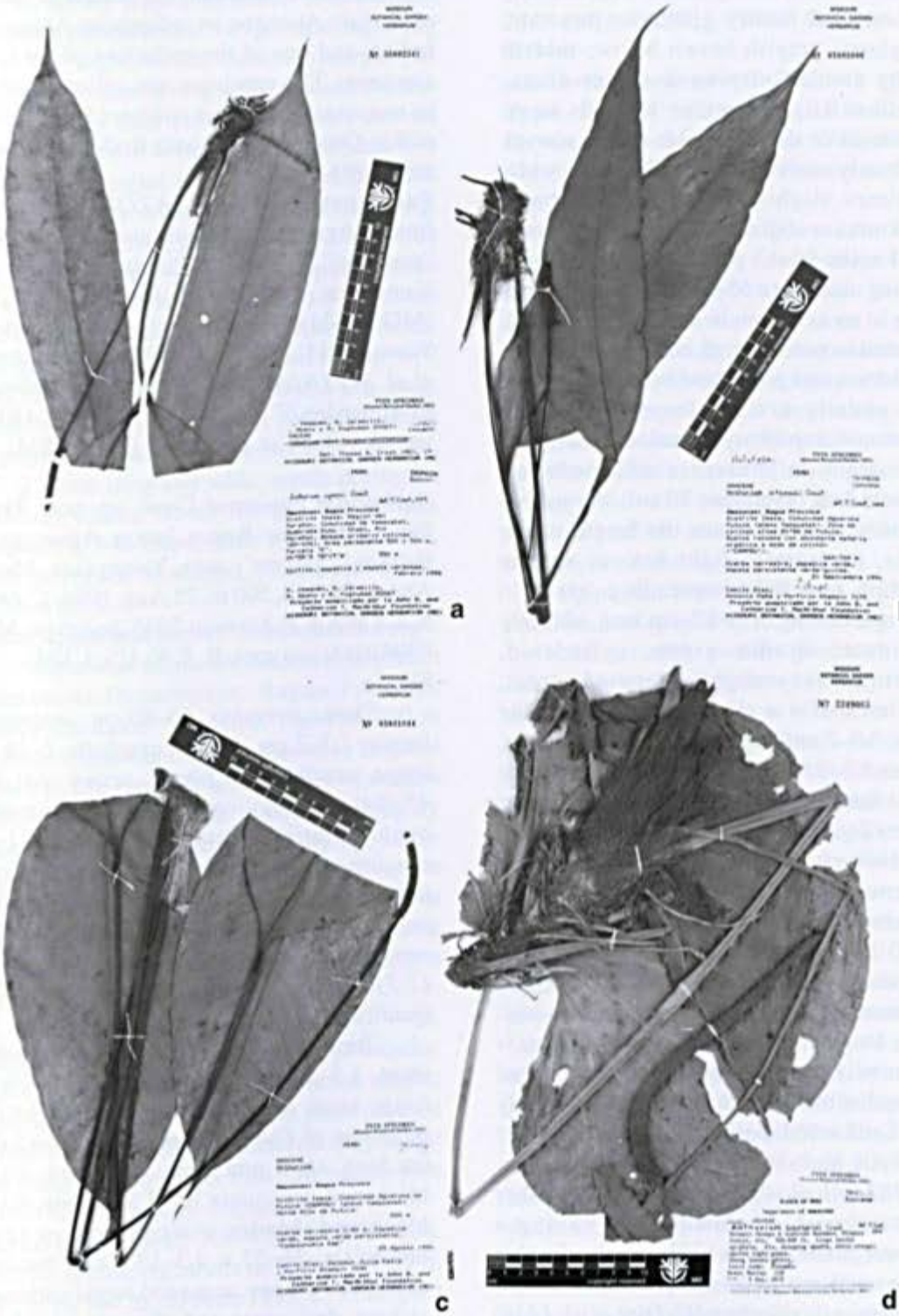


Figure 1 - a. *Anthurium apanui* Croat. Type specimen. (*Vásquez et al. 20067*); b. *Anthurium atamainii* Croat. Type specimen. (*Díaz et al. 7179*); c. *Anthurium baguense* Croat. Type specimen. (*Díaz et al. 7030*); d. *Anthurium brent-berlinii* Croat. Type specimen. (*Berlin 518*)

eglandular, brownish green above, densely but somewhat faintly glandular-punctate, semi-glossy, grayish brown below; **midrib** broadly convex, drying 2–4 mm diam., sometimes slightly wider towards base, concolorous or slightly darker above, convex to narrowly convex, drying 2–3 mm wide, sometimes slightly wider towards base, concolorous or slightly paler below; **primary lateral veins** 12–17 per side, 1–3 cm apart, departing midrib at a 55–65° angle, sometimes arising at an acute angle and then spreading, somewhat loop-connected, concolorous above, concolorous and prominent below; collective veins usually arising from base, more prominent than primary lateral veins, 2–7 mm from margin. Inflorescence with **peduncle** 25–34 cm long (averaging 30 cm), drying 2–3 mm diam., 0.8–1.1 times the length of the petiole, medium to light brown; **spathe** spreading to reflexed-spreading, green to green-red, oblong, 3.7–5.5 cm long, abruptly acuminate; **spadix** green, cylindroid, sometimes very slightly tapered, erect, sometimes with a slight curve toward the spathe, 3.9–7 cm long, drying 3–4 mm diam. Flowers 2.7–2.8 × 2.1–2.8 mm, 3–4 visible per spiral; lateral tepals 1.2 mm wide, outer margins 2-sided.

Anthurium atamainii is known from northern Perú at 430–800 m in Premontane wet forest (P-wf) and Tropical moist forest (T-mf) life zones (Holdridge 1971). It is a member of section *Porphyrochitonium* and is characterized by ovately shaped blades with a very long acumen. *Anthurium atamainii* is similar to *A. yamaykatense* Croat (published herein), but that species has very prominently loop-connected collective veins, longer cataphylls, and a more elliptic blade.

Díaz et al. 7725A differs from other collections of *A. atamainii* in having a narrower blade, yet is likely to also be this species and we have included it here. An undetermined collection (*C. Diaz et al. 1359*) from Loreto, Alto Amazonas, is similar to *A. atamainii*, however, it likely represents another new species.

Anthurium atamainii is named in honor of Porfirio Atamain, an indigenous Aguaruna Indian, and one of the collectors of the type specimen. This specimen was collected while he was an assistant plant collector for the Flora of Río Cenepa project with Rodolfo Vasquez from 1995–1997.

Paratypes: PERU. AMAZONAS: Bagua, Imaza, Aguaruna Putuim, anex Yamayakat, "campou," 24° SW of Putuim, 28.5°SW of Yamayakat, 700–750 m, *Díaz et al. 7725A* (MO, USM); Tayu Mujaji, Comunidad de Wawas, 5°15'25"S, 78°21'41"W, 800 m, *Rojas et al. 399* (AAU, MO, NY, USM); Quebrado El Almendro, 5°14'40"S, 78°21'24"W, 430 m, *van der Werff et al. 14568* (MO, USM).

Anthurium baguense Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Aguaruna de Putuim "campou", anex Yamayakat, Monte Alto de Putium, 500 m, 25 Aug. 1994, *C. Diaz, S. J. Katip & P. Atamain 7030* (holotype, MO-05081044; isotypes, B, F, K, US, USM). Fig. 1c.

Planta terrestris, 60–80 cm; internodia brevia, 1.5–2 cm diam.; cataphylla 7–10 cm longa, persistens in fibras; petioli (18) 34–45 (54) cm longi, ca. 5 mm diam.; laminae ovato-ellipticae, raro lanceolatae, 21–32 cm longae, 4.3–13.3 cm latae; nervis primariis lateralis 7–10 utroque; pedunculus (21)27–38(52) cm longus, 3–4 mm diam. in sicco; spatha viridis, lanceolata (1.7)3.5–5.3 cm longa, 3–7 mm lata; spadice viridis, 2–6.3 cm longus.

Terrestrial, 60–80 cm tall; **internodes** short, 1.5–2 cm diam., **cataphylls** 7–10 cm long, soon decomposing to pale brown reticulum of fibers. **Petioles** (18) 34–45 (54) cm long, ca. 5 mm diam., subterete, drying blackened, geniculum 1.5–2.5 cm long, drying blackened; **blades** ovate-elliptic or rarely lanceolate, 21–32 × 4.3–13.3 cm, narrowly acuminate at apex, acute and weakly attenuate at base, dark green and almost matte above, drying yellow-green to gray-green, slightly paler and semi-glossy below, drying dark gray-brown; **midrib** narrowly raised above, convex

below, drying somewhat darker than surface; **primary lateral veins** 7–10 per side, departing at 45–55° angle, weakly curved to margin, flat on upper surface, drying weakly raised and less conspicuous than collective veins, convex below; collective veins arising from base, 4–8 mm from margin; interprimary veins often present; tertiary veins weakly raised on drying. Inflorescence erect, **peduncle** (21) 27–38 (52) cm long, drying 3–4 mm diam., **spathe** green to reddish green, lanceolate (1.7) 3.5–5.3 cm × 3–7 mm, acuminate at apex, inserted at ca. 45° angle at base and decurrent for up to 7 mm on peduncle; **spadix** 2.0–6.3 cm long, weakly tapered toward apex, yellowish green to green. Flowers 4–5 visible per spiral, square, 1.7–2.3 mm long and wide, tepals drying 1–1.2 mm diam., outer margin 2-, or less frequently, 3–4-sided, inner margin concave, style drying button-shaped, 0.5–0.6 mm diam., 0.2 mm thick.

Local Aguaruna name: "campounumia eep".

Anthurium baguense is known only from Amazonas Department, Bagua Province (hence the name "baguense") at 450–700 m in Premontane wet forest transition to Tropical (P-wf/T) life zones. It is a member of section *Porphyrochitonium* and is characterized by short internodes, mostly pale-drying, semi-organized cataphyll fibers, narrowly ovate to ovate-lanceolate, black-drying leaf blades that are semiglossy on the lower surface and have prominent primary lateral veins and a prominently acuminate apex.

Anthurium baguense is similar to *A. penae* Croat, also occuring at the type locality, but *A. penae* differs in having thicker elliptic blades drying yellowish brown, more obscure primary lateral veins, and intact cataphylls that dry darker brown, rather than turning into pale brown fibers as in *A. baguense*.

Paratypes: PERU. AMAZONAS: Bagua, Distrito Imaza, Aguaruna de Putuim, 4°55'S, 78°19'W, 780 m, 13 June 1996, *E. Rodríguez et al. 1004* (MO, USM); anex Yamayakat, Monte Alto de Putium, 450 m, *Diaz et al. 7008* (COL, F); Communidad zona de Colinas altas, 24° SW of Patuim, 660–760 m, *Diaz et al. 7179* (MO, QCNE); *7196A* (MO).

Anthurium brent-berlinii Croat, sp. nov. **Type**: Perú. Condorcanqui, Río Cenepa-Kayamas, 213–244 m, 9 Dec. 1972, *B. Berlin 518* (holotype, MO-2249065, isotype, USM). Fig. 1d.

Planta epiphytica, internodia brevia, 2–3 cm diam. in sicco; cataphylla ad 14 cm longa; persistens in fibris; petioli 70–85 cm longi, 0.5–1.3 cm diam. in sicco; laminae plerumque cordatae, interdum subhastatae, obpyriformes, 63–67 cm longae, 48–56 cm latae; nervis primariis lateralibus 7–10 utroque; pedunculus 39–48 cm longus; spatha pallide viridis, lanceolata vel oblonga, 9.5–19.5 cm longa, 2–2.8 cm lata; spadice pallide aurantiacus, pendens, 23 cm longus, 8 cm diam. in sicco.

Epiphytic; **internodes** short, drying 2–3 cm diam.; **cataphylls** up to 14 cm long, at least 1-ribbed, possibly weakly 2-ribbed, drying reddish brown, lanceolate or oblong, persisting only at upper internodes as a large reticulum of coarse reddish brown fibers (with some longitudinal fibers), eventually deciduous, acute to weakly acuminate at apex. **Petioles** 70–85 cm long, drying 0.5–1.3 cm diam., prominently sulcate near base, drying pale grayish brown sometimes tinged with red; geniculum shaped like petiole, concolorous or slightly darker, 1.5–3 cm long, drying 5–6 mm diam.; **blades** usually cordate, sometimes weakly subhastate, obpyriform, somewhat abruptly acuminate (acumen 1.5–2 cm long), 63–67 × 48–56 cm, ca. 1.1–1.3 times longer than wide, drying gray-green above and gray-brown faintly tinged with red below; anterior lobe 48–50 × 20–22 cm at midpoint; posterior lobes 24.5–26.5 × 14.5–18 cm at midpoint; sinus parabolic, 15–20 cm deep, 9.5–11 cm wide at midpoint; **midrib** thicker than broad, concolorous to gray-brown above, narrowly rounded, sometimes drying with a rib, concolorous to slightly paler below; **primary lateral veins** 7–10 per side, 2.5–6.5 cm apart, departing midrib at a 55°–70° angle,

straight or slightly arching towards collective vein, concolorous, somewhat prominent; lesser veins usually faint to obscure; basal veins 6–8 per side, 1st and 2nd free to the base, 5th and 6th coalesced to 4.5–5.5 cm, concolorous or slightly paler than surface, raised; posterior rib naked for 5.5–6.5 cm along sinus; collective veins faint, arising from 1st basal vein, much less prominent than primary lateral veins, 3–11 mm from margin. Inflorescence with **peduncle** 39–48 cm long, drying 3–10 mm diam., drying grayish to reddish gray; **spathe** erect to erect-spreading, light green, lanceolate to oblong, 9.5–19.5 × 2–2.8 cm, acuminate at apex, **spadix** orange, slightly tapered to apex, slightly stipitate (stipe 4–10 mm long), pendent, 23 cm long, drying 8 cm diam. Flowers 2.8–3 × 2.6–2.8 mm, 7 to 8 visible per spiral; lateral tepals 1.5 mm wide, 2-sided. Infructescence to 56 cm long, drying to 1.4 cm diam.; **berries** white.

Local Aguaruna name: ináimas.

Anthurium brent-berlinii is known only from northern Perú (Amazonas) at 200–800 m in Tropical wet forest (T-wf) and Premontane wet forest transition to Tropical (P-wf/T) life zones. It is a member of section *Belolonchium* and is characterized by large, usually cordate, sometimes obpyriform blades; thick internodes, and large, dark cataphylls. It is most similar to *A. kugkumasii* Croat, which also has thick internodes, and similarly shaped blades, but *A. kugkumasii* has a smaller, purple spadix, and its blades are less constricted toward the apex and have a more convex margin.

The species is named in honor of Dr. Brent Berlin, anthropologist at the University of Georgia, previously at the University of California, Berkeley, who worked with the Aguaruna and Huambisa Indian tribes of the Amazonas Department, and who collected the type specimen. Berlin's anthropological studies along the Río Marañón enabled numerous new species in many plant families to be collected.

Paratypes: PERU. AMAZONAS: N of Quebrada Huampami, 244–260 m, 13 Dec. 1972, *Berlin 522* (MO); Río Santiago, 1 km behind Caterpiza, E of Quebrada Caterpiza, 200 m, 10 Sep. 1979, *Huashikat 503* (MO).

Anthurium ceronii Croat, sp. nov. **Type**: Ecuador. Napo, 5.7 km W of Tena at Río Tena, 0°01'S, 77°51'W, ca. 500 m, *T. B. Croat 58849* (holotype, MO-3154535; isotypes, AAU, NY, QCA, US).

Planta epiphytica; internodia brevia, usque ad 1 cm lata; cataphylla 5–8 cm longa; laminae oblongae-anguste ellipticae, 30–60 cm longae, 2–4.5 cm latae, nervis primaries lateralibus 12–18 utroque; pedunculus 16–25 cm longus, 3 mm latus, pallide viridis; spatha effusa, luteus-viridis, 6–10 cm longa, 1–1.5 cm lata; spadice olivaceus 6–13 cm longa, 4 mm lata ad basum.

Epiphyte; stems pendent, ca. 20 cm long; **internodes** short, to 1 cm diam.; **cataphylls** 5–8 cm long, green, 1-ribbed and acuminate at apex, persisting more or less intact at upper nodes, drying brown into brittle fibers at lower nodes. **Petioles** spreading-pendent, sheathed to between 1/2 and 3/4 their length, geniculum upturned, thicker and drying darker than petiole; **blades** oblong-narrow elliptic, 4–8 times longer than petiole, 30–60 × 2–4.5 cm, broadest at 2/3 to 3/4 its length from base, moderately coriaceous, narrowly acuminate (acumen 2–4 cm), attenuate at base, both surfaces matte, upper surface dark green, drying gray, lower surface much paler, drying more brown; **midrib** convexly raised above, convex and much larger below; **primary lateral veins** 12–18 per side, departing midrib at 35° angle, raised slightly more below than above; interprimary veins only slightly less prominent than primary veins; collective veins arising from the base with same prominence as primary lateral veins, 2–5 mm from margin. Inflorescence spreading, shorter than leaves; **peduncle** 16–25 cm x 3 mm, pale green, quadrangular, the margins winged; **spathe** spreading, subcoriaceous, yellow-green, linear or narrowly lanceolate, 6–10 × 1–1.5 cm, broadest near base, inserted at a 60° angle on petiole, acuminate at apex, acumen inrolled and

5 mm long, spathe base margins meeting acutely at 50° angle, stipe 12–20 mm long in back; **spadix** olive at anthesis, paler prior to anthesis, long-ellipsoid, bluntly tapered at apex, curved upwards away from spathe, 6–13 cm long, 4 mm diam. at base and at middle, 3 mm diam. at apex, turning red with age. Flowers slightly rhombic, 2.8 × 2.2–2.4 mm, 5 in principal spiral, 3 in alternate spiral, the sides nearly straight to slightly sigmoid; tepals matte pre-anthesis, 1.2 mm wide, inner margins rounded, outer margins 2-sided, **pistils** raised before stamens emerge, green, stigma slitlike, raised, droplets appearing several days before anthesis, 0.5 mm long, slightly papillate; stamens emerge in unusual manner, the alternates preceeding laterals by 2 spirals, barely emerging above tepal level, closely circling pistil but not obscuring pistil; anthers white; 0.6–0.7 × 0.4 mm; thecae 0.2–0.3 mm wide; pollen white; **berries** white.

Local Aguaruna name: ináimas, mánkamák.

This species occurs in the Tropical wet forest (T-wf), Premontane wet forest (P-wf), and Premontane rain forest (P-rf) life zones at 400–500 m.

Anthurium ceronii is named for Carlos Cerón who collected this species in the Napo Province of Ecuador.

Paratypes: ECUADOR. NAPO: Est. Biol. Jatun Sacha, 8 km E of Misahualli, 400 m, 1°04'S, 77°36'W, *Cerón 1475* (MO). PERU. AMAZONAS: Río Cenepa region, Quebrada Aintami, *Berlin 351* (US, USM); trail E of Hampami to Shaim, *Berlin 1903* (USM).

Anthurium chinimense Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Aguaruna de Wanás, km 92 Carretera Bagua-Imacita, Cerros Chinim, rocky borders of creek, 650–750 m, 27 Aug. 1997, *C. Díaz, A. Peña, L. Tsamajain & M. Roca 7987* (holotype, MO-04922228; isotypes, K, US, USM). Fig. 2a.

Planta terrestris; internodia ca. 1.5 cm longa, 1.3 cm diam. in sicco; cataphylla 5.5–9 cm longa; petioli 20.6–34.5 cm longi, 3–4 mm diam. in sicco; laminae ovatae, 26–31.3 cm longae, 10.3–12.4 cm latae; nervis primariis lateralibus 8–10 utroque; pedunculus 25–35.5 cm longus; spatha viridis, ca. 7 mm longa, 1–1.2 cm lata; spadice viridis, 7.5–8.5 cm longus, 3–5 mm diam.

Terrestrial; **internodes** ca. 1.5 cm long, drying ca. 1.3 cm diam.; **cataphylls** 5.5–9 cm long, finely ridged, oblong to lanceolate, persisting at upper internodes, remaining intact, then weathering to a reticulum of coarse tan fibers. **Petioles** 20.6–34.5 cm long, drying 3–4 mm diam., sometimes grooved near base, grayish brown to medium brown, finely ridged; geniculum shaped like petiole; slightly darkened, 1–2 cm long, drying 3–4 mm diam.; **blades** ovate, long-acuminate at apex (acumen 2–2.8 cm long), attenuate at base, 26–31.3 cm long (averaging 29 cm), 10.3–12.4 cm wide (averaging 11.5 cm), 2.4–2.5 times longer than wide, 0.9–1.3 times longer than petiole, drying olive to brownish green, weakly glossy, sometimes matte above, eglandular, slightly paler, weakly glossy to semi-glossy, densely glandular-punctate below; **midrib** 1–2 mm wide, concolorous to darker, convex to narrowly convex above; brown, narrowly rounded below; **primary lateral veins** 8–10 per side, 1–3 cm apart, departing midrib at a 55–60° angle (occasionally arising at an acute angle and then spreading to 55–60° angle), slightly curved to the collective vein, concolorous and almost obscure above, concolorous to brown and somewhat prominent below; collective veins usually 2, both arising at an acute angle from near base, the 2nd collective vein beginning to spread toward margin about 1–1.5 cm before the 1st, both more prominent than primary lateral veins, the 1st collective vein 0.5–2.5 cm from the margin, the 2nd 5–1 mm from margin near base, less than 1 mm from margin near middle and apex of blade. Inflorescences with **peduncle** 25–35.5 cm long, drying 2–3 mm diam., drying grayish brown or darkened; **spathe** reflexed-spreading, green, linear, ca. 7 mm × 1–1.2 cm; **spadix** green, more or less erect, 7.5–8.5 cm × 3–5 mm. Flowers 2–2.5 × 1.9–2 mm, 5 visible per spiral; lateral tepals 1.2–1.4 mm wide, 2-sided.

Anthurium chinimense is known only to northern Perú (Amazonas, Bagua) at 430–650 m in Premontane wet forest (P-wf) and Tropical moist forest (T-mf) life zones. This species is a member of *Anthurium* section *Porphyrochitonium* and is characterized by ovate blades, dark olive-green to green-brown drying blades, and two prominent collective veins. It is similar to *A. weberbauerii* Engl. in that both species have somewhat ovate blades with two prominent collective veins. However, *A. weberbauerii* has blades that dry a more yellow-brown color and are only acute or even rounded at the apex.

The species is named for the type locality, Cerros Chinim, in the Imaza District, Bagua Province, Amazonas Department, Peru.

Paratypes. PERU. AMAZONAS: Bagua, Quebrado El Almendro, 5°14'40"S, 78°21'24"W, 430 m, *van der Werff et al. 14548* (B, NY).

Anthurium diazii Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Aguaruna de Wanás (km 92 Carretera Bagua-Imacita), Chinim hills, 650–750 m, 27 Aug. 1996, *C. Díaz, A. Peña, L. Tsamajain & M. Roca 7987A* (holotype, MO-04922229). Fig. 2b.

Planta terrestris; internodia brevia, 1 cm diam. in sicco; cataphyllae 12.5 cm longae; petioli 22–37.5 cm longi, 3–5 mm diam. in sicco; laminae 31–33 cm longae, 6.3–7 cm latae, nervis primariis lateralibus (11–)13–15 utroque; pedunculus 37 cm longus, ca. 2 mm diam. in sicco; spatha viridis, 6.5 cm longa, 5 mm lata in sicco; spadice viridis, 11 cm longus, 6 mm lata in sicco.

Terrestrial; **internodes** short, drying ca. 1 cm diam.; **cataphylls** 12.5 cm long, drying pale tan, weathering to longitudinal fibers near apex, to a reticulum of finer fibers near base, at upper nodes, eventually deciduous. **Petioles** 22–37.5 cm long, drying 3–5 mm diam., medium brown-tinged with gray; **blades** +/- elliptic, narrowly acuminate at apex (acumen 2–2.6 cm long), slightly attenuate at base, 31–33 cm long, 6.3–7 cm wide, 4.7–4.9 times longer than wide, drying matte, greenish brown above, weakly to semiglossy, brown faintly tinged with yellow and dark glandular-punctate below; **midrib** slightly raised, concolorous above, narrowly rounded, concolorous below; **primary lateral veins** (11–)13–15 per side, scarcely more prominent than interprimary veins; collective veins arising from near base, prominent above and below, 3–8 mm from margin. Inflorescence with **peduncle** 37 cm long, drying ca. 2 mm diam.; **spathe** spreading, green, oblong to oblong-elliptic, 6.5 cm long, drying 5 mm wide at widest part near base, furled; **spadix** (post-anthesis) green, tapered near apex, 11 cm long, drying 6 mm wide. Flowers 2.8–3 mm long, 2.2–3.2 mm wide, (2–) 3–4 visible per spiral; lateral tepals 1.2–1.5 mm wide, outer margin 2-sided, inner margins not straight, concave at center with its lateral edges forming an acute angle with the sides of the tepal.

Anthurium diazii is endemic to the type locality in northern Perú (Bagua, Imaza) at 650–750 m in Tropical wet forest (T-wf) or Premontane rain forest (P-rf) life zones. This species is characterized by its darkened, elliptic to oblong-elliptic blades that are almost five times longer than wide. It is most closely related to *A. lingulare*, which also has blades somewhat longer than wide and a long spadix. However, *A. lingulare* is epiphytic, has strap-shaped blades 9 to 10 times longer than wide, and a maroon spadix.

The species is named in honor of Camilo Diaz, a prominent Peruvian collector and part of the group of botanists who collected the type specimen.

Anthurium galileanum Croat, sp. nov. **Type**: Perú. Amazonas: Río Santiago, vic. of Galilea, 180 m, 20 Aug. 1979, *V. Huashikat 79* (holotype, MO-2773365). Fig. 2c.

Planta terrestris; internodia brevia, 1.2–2 cm diam.; cataphylla persistens intacta; petioli ca. 43 cm longi; laminae triangularis-hastatae, 43 cm longae, 40 cm latae; lobulae posterioris 20.5 cm longae, 11 cm latae; pedunculus 28 cm longi;

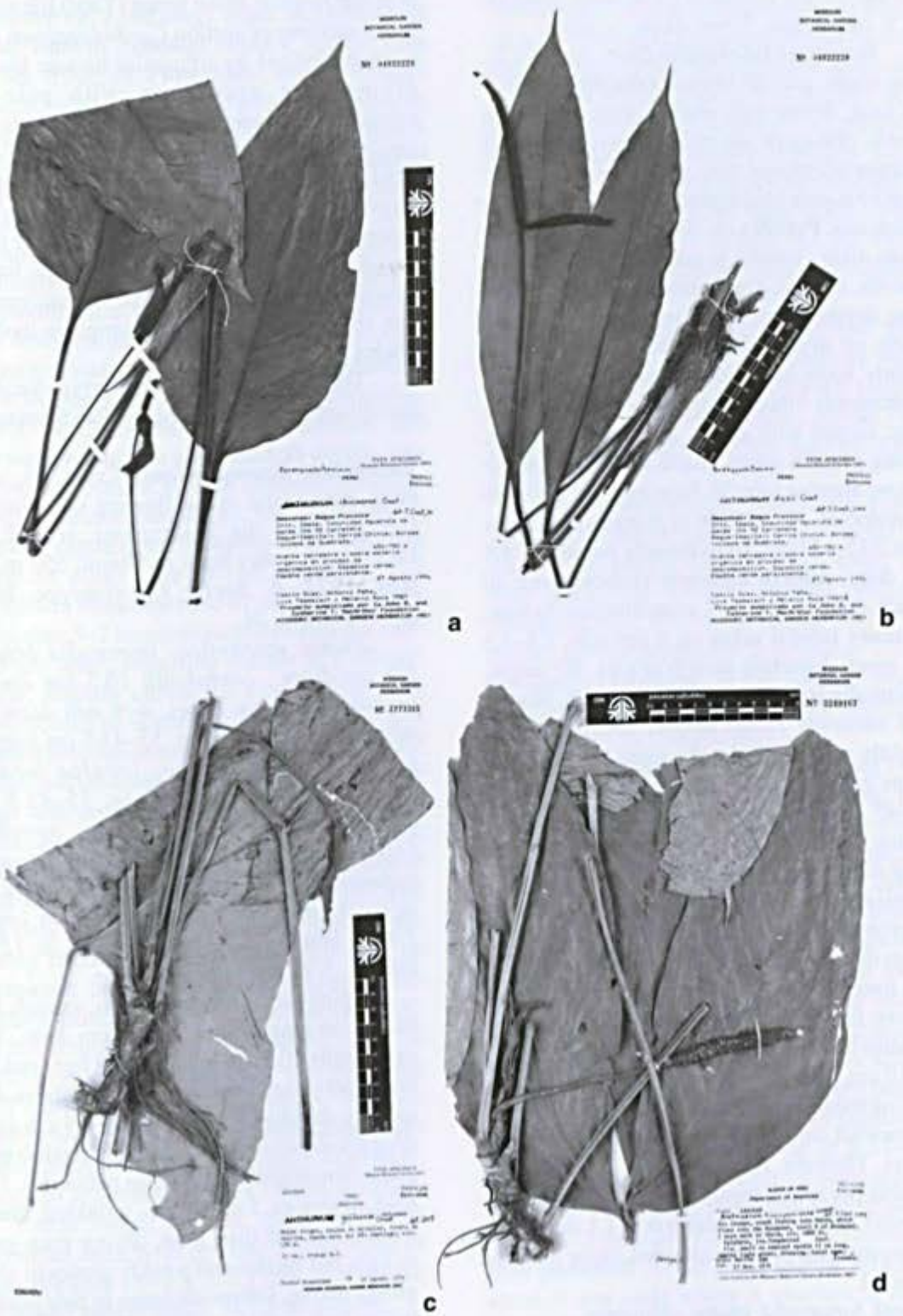


Figure 2 - a. *Anthurium chinimense* Croat. Type specimen. (*Díaz et al. 7987*); b. *Anthurium diazii* Croat. Type specimen. (*Díaz et al. 7987A*); c. *Anthurium galileanum* Croat. Type specimen. (*Huashikat 79*); d. *Anthurium huampamiense* Croat. Type specimen. (*Berlin 389*)

spatha 7.5 cm longa, 0.9 cm lata; spadice ca. 6 cm longus, 5 mm diam. in sicco.

Terrestrial; **internodes** short, drying 1.2–2 cm diam., grayish brown; **cataphylls** ca. 5.5 cm long, drying pale reddish gray or reddish brown, oblong or lanceolate, persisting intact at upper internodes only, sometimes starting to weather to pale longitudinal fibers, then quickly deciduous. **Petioles** ca. 43 cm long, drying 4–6 mm diam., sulcate at least near base, drying smooth, reddish gray; geniculum red, 1.5 cm long, drying 4 mm diam., minutely ridged and warty on drying; **blades** triangular-hastate, bluntly acute and shortly acuminate at apex, prominently lobed at base, 43 × 40 cm, drying gray, tinged with green, semi-glossy above, drying grayish green, matte to weakly glossy below; anterior lobe 38.5 cm long, 12 cm wide at midpoint, +/- straight at margins; posterior lobe 20.5 × 11 cm, sinus broadly parabolic, 4.5 cm deep; **midrib** narrowly rounded with an acute medial rib, +/- concolorous below; **primary lateral veins** ca. 8 per side, 1.5–3.5 cm apart, departing midrib at a ca. 50° angle, essentially straight to a collective vein, bluntly and narrowly raised above, concolorous to slightly paler and bluntly acute below; basal veins ca. 4 per side, 1st almost free to base, 3rd–4th coalesced to 5.5 cm, +/- concolorous below, weakly raised; posterior rib naked 5 cm long along the sinus; collective veins arising from one of the lower basal veins, about equally as prominent as primary lateral veins, 7–10 mm from margin. Inflorescence with **peduncle** 28 cm long, drying 1–2 mm diam., pale reddish brown tinged with gray; **spathe** erect, drying reddish brown tinged with gray, lanceolate, 7.5 × 0.9 cm, gradually acuminate at apex; **spadix** drying reddish brown, somewhat tapered, erect, somewhat curved, ca. 6 cm long, drying 5 mm diam. Flowers 1.6–1.9 × 1.8–2.1 mm, 4–5 visible per spiral; tepals minutely granular and frosted white; lateral tepals 0.8–1.1 mm wide, inner margins broadly rounded, outer margins 3-sided.

Local Aguaruna name: shinumas.

Anthurium galileanum is known only from the type locality in northern Perú at 180 m in the Tropical moist forest (T-mf) life zone. It is a member of section *Cardiolonchium* and is characterized by triangular-hastate blades drying pale gray-green with pale or concolorous venation. It is similar to *A. breviscapum* in drying color of the blades and spadix, but *A. breviscapum* is a hemiepiphytic climber, with cordate blades with convex margins, and internodes typically longer than broad with a smooth, moderately pale, finely striate epidermis. In contrast, *A. galileanum* has short internodes and triangular-hastate blades.

The species is named for the type locality, the village of Galilea along the Río Santiago.

Anthurium huampamiense Croat, sp. nov. Perú. Amazonas: creek flowing into Nahim, flowing into the Huampami, trail E of Huampami, 1-day walk to Shaim, 550 m, 27 Nov. 1972, *B. Berlin 389* (isotype, MO-2249167). Fig. 2d.

Planta epiphytica; internodia brevia, 1.5 cm diam.; cataphylla 10.5 cm longa; petioli 60–69 cm longi, 4–6 mm diam. in sicco; laminae trisectae, 35–43.5 cm longae, griseo-viridis in sicco; lobulae mediae obovatae vel late ellipticae, 35–43.5 cm longae, 18–19.5 cm latae; nervibus primariis lateralibus 7–9 utroque; pedunculus 14.5 cm long, 4 mm diam. in sicco; spatha lanceolata, ca. 10 cm longa, 2.4 cm lata; spadice cylindroideus, 6–12 cm longus, 5–8 mm diam. in sicco.

Epiphytic; **internodes** short, smooth, less than 1 cm long, drying ca. 1.5 cm diam., tan; **cataphylls** 10.5 cm long, drying light red, +/- linear, persisting intact at upper internodes, then quickly deciduous. **Petioles** 60–69 cm long, drying 4–6 mm diam., drying light reddish gray; geniculum slightly darker than petiole, ca. 1 cm long, drying ca. 5 mm diam., wrinkled; **blades** trisect, broader than long, drying gray-green to light red-brown and weakly glossy to semi-glossy above, yellowish green to pale orange-brown and semi-glossy below; segments entire, median segment obovate to broadly elliptic, 35–43.5 × 18–19.5 cm, abruptly acuminate

(acumen ca. 2 cm long), acute to attenuate at base; **midrib** narrowly convex, thicker than broad, drying ca. 1 mm diam., surface densely marked with minute, brown irregular lines on magnification, light brown to light red brown above, light brown below; **primary lateral veins** 7–9 pairs, 2.5–4 cm apart, departing midrib at a 40–50° angle; interprimary veins almost as prominent as primary veins; collective veins arising from near base, almost as prominent as primary lateral veins, 0.6–1.2 cm from margin; lateral segments somewhat ovate to broadly elliptic, markedly inequilateral (one side up to 1.5 cm longer than the other), 30–37 × 13–14 cm, directed upward and outward, rounded at apex; **midrib** slightly less prominent than on median segment, brown to almost concolorous above, not extending to apex of segment but merging with collective vein on outer side of the segment; 1–2 prominent veins near base on one side of midrib only, then 5–7 less conspicuous veins per side, 2–5 cm apart, departing midrib at a 35–45° angle, slightly curved to a collective vein, concolorous to slightly paler above, the less conspicuous veins sometimes more raised and prominent on outer side of the midrib than the inner side; collective veins 1 or 2 arising from prominent primary lateral veins on outer side of midrib (2 collective veins only on the side of midrib with 2 prominent primary lateral veins, still only 1 collective vein on the other side), arising from near base on the other side, as prominent or slightly less prominent than primary lateral veins, 1st collective vein 0.5–1.2 cm from margin, 2nd collective vein 2–4 cm from margin. Inflorescence with **peduncle** 14.5 cm long, drying 4 mm diam., medium reddish brown; **spathe** erect-spreading, light green, lanceolate, ca. 10 cm long, 2.4 cm wide, gradually acuminate at apex (acumen curled, ca. 8 mm long); **spadix** (post anthesis) cylindroid, erect, 6–12 cm long, drying 5–8 mm diam. Flowers 1.9–2 × 2–2.1 mm, 7–8 visible per spiral; lateral tepals 1–1.2 mm diam., 2-sided.

Anthurium huampamiense is known only from the type locality in Perú at 550 m in Premontane wet forest transitioning to Tropical (P-wf/T) life zone. It is characterized by broad, trisect blades with lateral segments and midribs that do not reach all the way to the apex of the segment. It is closely related to *A. triphyllum* in blade shape, size and venation, but *A. triphyllum* has blades that dry more brown and lack the minute, irregular lines on the surface.

This species is named for the village Huampami, near the type collection locality.

Anthurium huashikatii Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Río Santiago valley, ca. 65 km N of Pinglo, Quebrada Caterpiza, 2–3 km behind Caterpiza, 200 m, 13 Feb. 1980, *V. Huashikat 2089* (holotype, MO-2828544). Fig. 3a.

Planta epiphytica; internodia brevia, 1–1.3 cm diam. in sicco; cataphyllae ca. 6.5 cm longae; petioli 18.5–46.5 cm longi, 2–4 mm diam. in sicco; lamina anguste oblanceolatae, 37–38 cm longae, 6.2–7 cm latae; nervis primariis lateralibus 12–13 utroque; pedunculus 30 cm longus; spatha reflexa, ca. 3 mm lata; spadice stipitatus 1.5–1.8 cm, ca. 10 cm longus.

Epiphytic, **internodes** short, drying 1–1.3 cm diam.; **cataphylls** ca. 6.5 cm long, pale tan, weathering to coarse longitudinal fibers, persistant at upper nodes, then eventually deciduous. **Petioles** 18.5–46.5 cm long, drying 2–4 mm diam., yellowish brown; **blades** narrowly oblanceolate, somewhat narrowly acuminate at apex (acumen 3–3.5 cm long), 37–38 × 6.2–7 cm, greenish brown above, eglandular, paler below with dark punctations; **midrib** slightly raised, concolorous above, rounded, concolorous below; **primary lateral veins** 12–13 per side, slightly more prominent than interprimary veins, arising at a 35–40° angle from the midrib; collective veins arising from near base, more prominent than primary veins, 3–5 mm from margin. Inflorescences with **peduncle** 30 cm long; **spathe** reflexed, about 3 mm wide where it attaches to base, otherwise lost; **spadix** slightly tapered, prominently stipitate (stipe 1.5–1.8 cm long), ca. 10 cm long. Flowers 1.9–2 × 1.1–1.5 mm,

3–4 visible per spiral; lateral tepals 0.9–1.1 mm wide, outer margins two-sided. Infructescence 12 cm long, drying 6 mm wide, setting fruit in lower 3/4 only.

Local Aguaruna name: yakiya sugkip.

Anthurium huashikatii is endemic to the type locality in northern Perú (Santiago river valley) at 200 m in Tropical moist forest (T-mf) and Premontane wet forest (P-wf) life zones. This species is a member of section *Porphyrochitonium* and is characterized by a very long stipe and narrowly oblanceolate blades. It is similar to *A. tunquii*, but that species has a much shorter stipe and more oblong-elliptic blades.

The species is named in honor of Victor Huashikat, an indigenous plant collector who assisted Brent Berlin with anthropological studies among the Aguaruna and Huambisa Indians in the State of Amazonas, Perú. Huashikat collected many excellent specimens and discovered many new species.

Anthurium kayapii Croat, sp. nov. **Type**: Perú. Loreto: Alto Amazonas, Andoas, left margin of Río Pastaza, Campameto OXI, 2°55'S, 76°25'W, 4 June 1981, *R. Vasquez & N. Jaramillo 1880* (holotype, MO-3097485; isotypes, K, USM). Fig. 3b.

Planta epiphytica; internodia brevia, 1–1.5 cm diam; cataphyllae 7–10.3 cm longae; petioli 19 cm longi, 3–4 mm diam. in sicco; laminae oblanceolatae, 36.8–49 cm longae, 5.1–8 cm latae; pedunculus 23–44 cm longus, 2–3 mm diam. in sicco, atrobrunneolus; spatha 7.5–10 cm longa, 4–8 mm lata; spadice viridis vel subroseus, 9.5–18.5 cm longus, 2–4 mm diam.

Epiphytic; **internodes** short, 1–1.5 cm diam.; **cataphylls** 7–10.3 cm long, persisting as fine fibers in a semi-intact network or moderately disorganized. **Petioles** subterete, 19 cm long, drying 3–4 mm diam.; **blades** narrowly oblanceolate, 36.8–49 × 5.1–8 cm, 4.3–7.8 times longer than wide, 1.8–3.1 times longer than petioles, gradually long-acuminate at apex, narrowly acute at base, subcoriaceous, drying weakly glossy to semiglossy, dark yellow-brown to gray-brown above, slightly paler and yellow-brown below, margin curled under; **midrib** drying convex to +/- acute and finely and irregularly several-ridged and concolorous above, narrowly raised and finely many-ridged, slightly darker than surface below; **primary lateral veins** 9–12 per side, arising at 25-40° angle, moderately more conspicuous than the interprimary veins and about as prominent as the collective veins; collective veins arising from the base and mostly 2–5 mm from the margins; tertiary veins moderately prominent on the lower surface. Inflorescence erect, about as long as or shorter than the leaves; **peduncle** 23–44 cm long; drying 2–3 mm in diam., dark yellow-brown; **spathe** 7.5–10 cm × 4–8 mm, oblong-ligulate, green to white, narrowly acuminate, (soon falling on most herbarium material); **spadix** green to pink, narrowly linear-tapered, 9.5–18.5 cm × 2–4 mm, drying dark brown. Flowers 1.5–1.6 mm long and wide, 5–6 visible per spiral, sides straight parallel to the spirals, smoothly sigmoid perpendicular to the spirals; lateral tepals 0.8 mm wide, broadly rounded on inner margin, 2-sided on outer margin; **berries** lavender (B&K purple 2.5/6), +/- globose, 3–4 mm diam., drying dark yellow-brown with subglobular, white cellular inclusions in pericarp; seeds 3 or more per berry, ca. 1.4 mm long.

Local Aguaruna name: eep.

Anthurium kayapii is apparently endemic to Perú in Amazonas and Loreto Departments at 210–650 m in Premontane wet forest transition to Tropical (P-wf/T) and Tropical moist forest (T-mf) life zones. It is a member of section *Porphyrochitonium* and is recognized by short internodes, persistent pale cataphyll fibers, moderately long petioles, narrowly oblanceolate brownish yellow-drying blades with widely spaced primary lateral veins and by a long, slightly tapered spadix and small, globose, lavender berries.

Anthurium kayapii is similar to *A. apanui*, but differs in having narrower, more oblanceolate, darker yellow-brown leaf blades (5.5–7.8 times longer than wide versus 4.6–4.7 times longer than wide in *A. apanui*) with

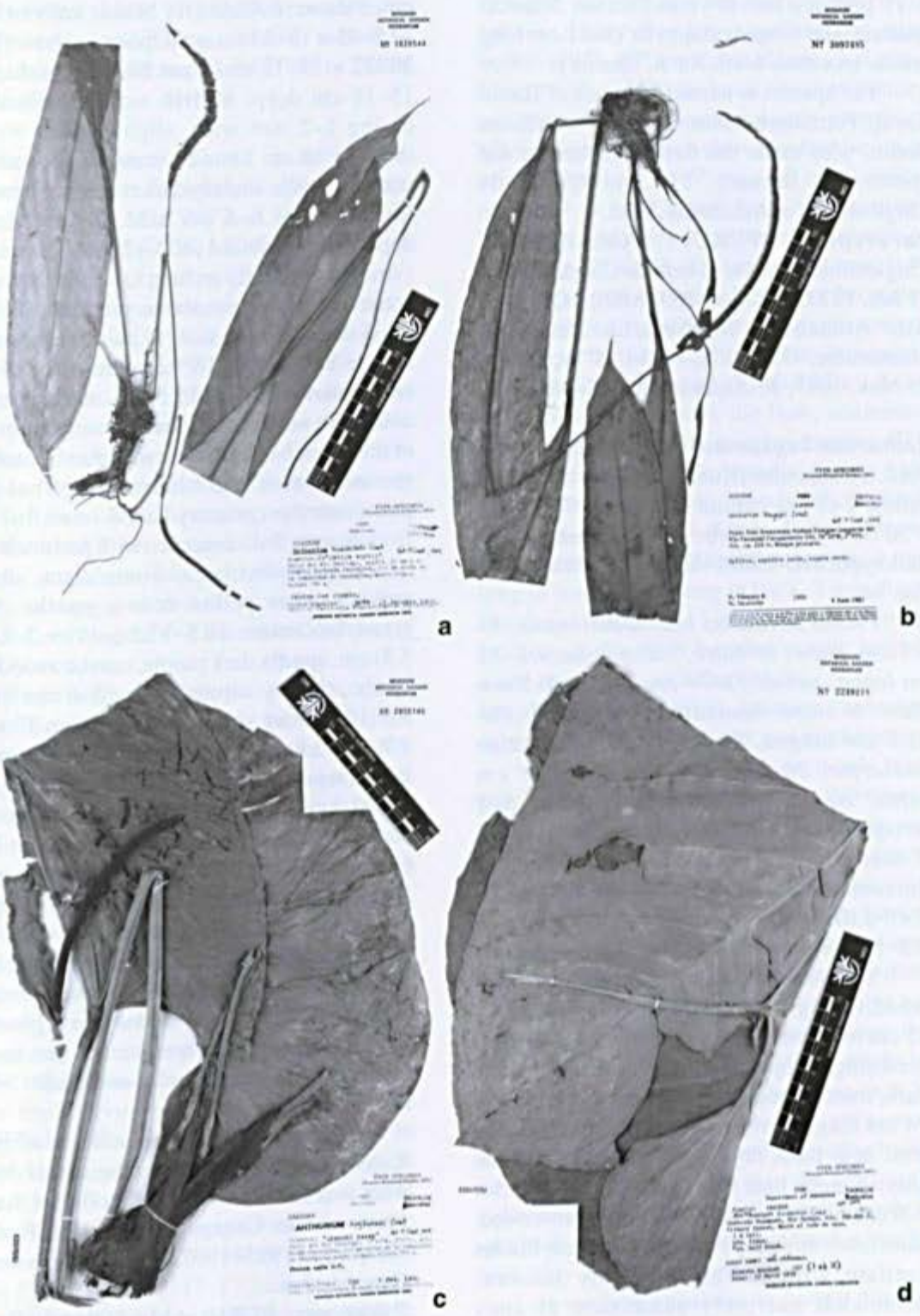


Figure 3 - a. *Anthurium huashikatii* Croat. Type specimen. (*Huashikat 2089*); b. *Anthurium kayapii* Croat. Type specimen. (*Vásquez & Jaramillo 1880*); c. *Anthurium kugkumasii* Croat. Type specimen. (*Tunqui 730*); d. *Anthurium kusuense* Croat. Type specimen. (*Ancuash 137*)

8–11 primary lateral veins (versus 5 for *A. apanui*), and longer cataphylls (8–11 cm long versus less than 6 cm for *A. apanui*).

The species is named in honor of Rubio Kayap, Peruvian botanist collecting with Brent Berlin, who made the first collection of the species in January, 1973 at Quebrada Chigkishinuk in Amazonas, Perú.

Paratypes: PERU. AMAZONAS: Chigkishinuk, monte al lado de Chigkishinuk, 31 Jan. 1973, *R. Kayap 285* (MO); LORETO: Alto Amazonas, Manseriche, Pongo de Manseriche, 4°26'01"S, 77°34'18"W, 650 m, 25 Nov. 1997, *R. Rojas et al. 647* (MO).

Anthurium kugkumasii Croat, sp. nov. **Type**: Perú. Amazonas: Huambisa, Río Santiago valley, 2–3 km behind Caterpiza, 77°40'W, 3°50'S, 200 m, 6 Feb. 1980, *S. Tunqui 730* (holotype, MO-2900146; isotype, USM). Fig. 3c.

Planta terrestris; internodia brevia, 3–3.5 cm diam. in sicco; cataphylla 9.5–15 cm longa; petioli 71–74 cm longus, 5–7 mm diam. in sicco; laminae late cordatae, 59–61.5 cm longae, 39–43 cm latae; lobulae posterior, 20–22 cm longae, 14–15 cm latae; nervis primariis lateralibus 6–8 utroque; pedunculus 28–31 cm longus, ca. 5 mm diam. in sicco; spatha viridis, lanceolata, 10.5–15.5(–19) cm longa, 2–2.4(–5.3) cm lata; spadice atropurpureus, 9.5–16 cm longus, 6–7 mm diam. in sicco.

Terrestrial; **internodes** shorter than broad, drying 3–3.5 cm diam.; **cataphylls** 9.5–15 cm long, unribbed, drying dark red-brown, persisting at upper internodes as dense, coarse, dark, mostly longitudinal fibers. **Petioles** 71–74 cm long, drying 5–7 mm diam., sulcate at least near base, drying gray, sometimes pale grayish green near base; geniculum 1.8–2.5 x 5–9 cm, concolorous or sometimes brown-red, sometimes minutely ridged or wrinkled; **blades** cordate with margins broadly convex; somewhat narrowly acuminate at apex (acumen 1.3–2.5 cm long), 59–61.5 × 39–43 cm, 1.3–1.5 times longer than broad, ca. 0.8 times the length of the petiole, drying gray-green above, reddish gray below; anterior lobe 42.5–45 × 19–23 cm at midpoint; posterior lobe 20–22 × 14–15 cm; sinus broadly spathulate, 15–16 cm deep; **midrib** narrowly rounded, drying 1–2 mm wide, slightly paler above, thicker than broad, sometimes acute, concolorous to slightly darker below; **primary lateral veins** 6–8 per side, 2–5 cm apart, departing midrib at a (40°–) 50°–60° angle, +/- straight or slightly arching to a collective vein, somewhat prominent above, prominent below; basal veins 7–9 per side, 1st pair free or almost free to base, 6th and 7th coalesced to 5.5–6.5 cm; posterior rib naked 5.5–7.5 cm along sinus; collective veins some-times arising from one of the lower basal veins, sometimes from about the middle of the blade, somewhat less prominent than primary lateral veins, 3–7 mm from margin. Inflorescence with **peduncle** 28–31 cm long, drying ca. 5 mm diam., drying grayish red or yellow-brown; **spathe** erect, green, lanceolate, 10.5–15.5 (–19) × 2–2.4 (–5.3) cm; **spadix** dark purple, curved away from spathe, slightly stipitate (stipe 5–6 mm long), 9.5–16 cm long, drying 6–7 mm diam. Flowers 1.7–2 × 1.8 mm, 6–7 (–8) visible per spiral; lateral tepals 1.2–1.5 cm wide, 2-sided.

Local Aguaruna name: uyanchi yakay.

Anthurium kugkumasii occurs in Perú (Amazonas) at 180–200 m in Premontane wet forest transition to Tropical (P-wf/T) life zone. It is a member of section *Belolonchium* and is characterized by a dark purple spadix, large cordate blades with broadly convex margins, and a spathulate sinus. *Anthurium kugkumasii* is similar to *A. brent-berlinii*, but that species has a larger, orange spadix and blades with a constricted anterior lobe.

The species is named in honor of Rubel Kugkumas, an indigenous Aguaruna Indian who was an assistant plant collector for the Flora of Río Cenepa project with Rodolfo Vasquez in 1995–1997. Rubel lives in the Río Cenepa area.

Paratypes: PERU. AMAZONAS: Bagua, Yamayakat, Kusu-Chapi, Imaza, Río Marañon, area permanente 500 x 500 m, parcel "E", 4°55'S, 78°19'W, 550 m, Feb. 1995, *Vasquez*

et al. 19769 (MO). HUANUCO: ca. 46 km NNE of Huánuco-Tingo María, tunnel at Carpish pass, 2600 m, 14 July 1981, *Dillon 2589* (F).

Anthurium kusuense Croat, sp. nov. **Type**: Peru. Amazonas: Huampami, Río Cenepa, 213–244 m, 12 Mar. 1973, *E. Ancuash 137* (holotype, MO-2249118, MO-2239373). Figs. 3d, 4a.

Planta terrestris vel epiphytica; internodia brevia, 1.5–2 cm longa, 2.7–3.5 cm lata; cataphylla (6.5) 8.5–9.2(10) cm longa; petioli 78.6–92.5(111) cm long, 6–11 mm diam.; laminae ovatae vel late ovatae, profunde cordatae, 63–65.5 cm longae, 38–58 cm latae; nervis primariis lateralibus 7–8 utroque; pedunculus (21.8)28–43.2 cm longus, 2–8 mm diam.; spatha pallida virido vel viridis, (7) 9.5–12.7 cm longa, 1.9–2.6 cm lata; spadice 5.6–9.4 cm longus, 4–8 mm diam., albus vel pallide viridis.

Terrestrial or epiphytic, to 1 m, stems erect, 16 × 2.7–3.5 cm, drying brownish gray, woody; leaf scars conspicuous, hippocrepiform, 1–2 cm deep, 1.4–1.9 cm wide; **internodes** short, 1.5–2 × 2.7–3.5 cm, roots adventitious, emerging from nodes of the erect stem, drying brownish gray, scurfy, to 16 cm long, roots 2.5–3 mm diam.; **cataphylls** ribbed, (6.5) 8.5–9.2 (10) cm long, lanceolate, acute at apex, subcoriaceous, drying grayish brown, persisting semi-intact, dilacerating as coarse, yellow-brown linear fibers with the apex occasionally remaining intact. **Petioles** 78.6–92.5(111) cm × 6–11 mm, erect, sulcate, purple when fresh, drying gray-green, weakly striate to speckled; **blades** subcoriaceous, ovate to widely ovate, acute at apex, deeply cordate at base, 63–65.5 × 38–58 cm, broadest at point of petiole attachment, margins entire, convex; anterior lobes 31.2–45.6 × 38–58 cm; posterior lobes 17.3–21.9 × (12) 17–17.2 cm, bicolorous, abaxially paler, matte on both surfaces; **midrib** narrowly rounded above to narrowly convex below; **primary lateral veins** 7–8 per side, recurved ascending to the collective vein, straight, curving toward margin, narrowly convex, darker than lower surface, departing midrib at 45°–60° angle; **basal veins** 5–8 pairs, fused 1st–5th or 6th to the basal ribs; interprimary and secondary veins conspicuously prominent below, slightly sunken above; collective veins arising from 4th to 6th pair of basal veins, marginal or to 0.3 mm from the margins. Inflorescence erect to erect-spreading; **peduncle** (21.8) 28–43.2 cm × 2–8 mm, 0.4–0.5 longer than the petiole; drying brownish green, ribbed; **spathe** erect, subcoriaceous, light green to green, drying yellow-brown and weakly striate, lanceolate, (7)9.5–12.7 × 1.9–2.6 cm, broadest just above the base, acuminate at apex, obtuse at base, margins forming 40°–60° angle on peduncle; **spadix** drying light reddish brown, cylindric to slightly tapered, erect, 5.6–9.4 cm × 4–8 mm diam., white to light green; stipe light reddish brown, 3 mm long in front, 2 mm long in back, 2 mm diam. Flowers rhombic, 1–1.5 × 1–1.5 mm. Infructescence with **berries** purple tinged, white base, along twisting spadix.

Local Aguaruna names: ináimes, chinumas, or mun chinumas, muun eep, and migkáya eep.

Anthurium kusuense is known only from the Bagua and Condorcanqui Provinces (Amazonas) at 250–100 m in Premontane wet forest transition to Tropical (P-wf/T) life zones. The species is a member of section *Cardiolonchium* and is distinguished by having semi-intact cataphylls with numerous loose fibers, dark gray-green-drying, ovate-cordate, deeply lobed blades with collective veins not apparent and not running evenly along the margin, as well as by a spadix with 9–10 flowers per spiral. *Anthurium kusuense* is similar to *A. shinumas*, but *A. shinumas* differs in having intact persistent cataphylls, smaller leaf blades (less than 54 cm long), collective veins extending all along the margin and 4–6 mm from the margin, and a spadix with only 5–6 flowers pers spiral.

Anthurium kusuense is named for the collecting locality, the village of Kusu, where it was first discovered by Dr. Brent Berlin, University of California, Berkely, in March 1973.

Paratypes: PERU. AMAZONAS: Bagua, Río Cenepa, Huampami, ca. 5 km E of Chávez Valdívia, 4°30'S, 78°30'W, 200–250 m, 11 July 1978, *Berlin 2058* (MO); 1978, *Kujikat 313* (MO); Condorcanqui, Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdivia, Quebrada Apigkan entsa, 4°30'S, 78°30'W, 200–250 m, 3 Aug. 1978, *Kujikat 144* (MO); Chigkan entsa, Quebrada Aintami, 17 Aug. 1978, *Kujikat 416* (MO); Quebrada Sasa, 250 m, 14 June 1973, *Ancuash 639* (MO); village of Kusu, Río Numpatakai (tributary of Río Cenepa), 1100–1300 m, 10 Mar. 1973, *Berlin 918* (MO); S of Huampami trail to house of Theodora, S of Río Cenepa, 800–850 m, 17 July 1974, *Berlin 1670* (MO); trail E of Huampami to Shaim, 1 Aug. 1974, 600–1750 m, *Berlin 1919* (MO); Quebrada Huampami, 640 m, 5 July 1974, *Kayap 1062* (MO).

Anthurium leveauii Croat, sp. nov. **Type**: Perú. Amazonas: Río Santiago, ca. 65 km N de Pinglo, 1 km behind Caterpiza, 3°50'S, 77°40'W, 200 m, 7 Sep. 1979, *V. Huashikat 459* (holotype, MO-2800123–4; isotype, USM). Fig. 4b.

Planta epiphytica; internodia brevia, 1–1.5 cm diam.; cataphylla (7.7)9–12 cm longa; lamina 36.5–58.7 cm longa, 5.7–8.2 cm lata, anguste oblanceolata, anguste acuta ad basim; nervis primariis lateralibus (6)7–9(12) utroque; pedunculus 28–40 cm longus, 2.5–3 mm diam.; spatha ad 6–10 cm longa, viridis, 7 mm lata; spadice 9–12 cm longus, 3–4 mm diam.; baccae ovoideae vel globosae, ca. 3 mm diam., roseae vel rubrae.

Epiphytic; **internodes** short, 1–1.5 cm diam.; **cataphylls** (7.7)9–12 cm long, persisting as +/- parallel pale fibers, reddish brown at base. **Petioles** (8)14–17(21) cm long, terete, semiglossy, drying finely striate; geniculum 1–2 cm long, much darker than the petiole; **blades** 36.5–58.7 × 5.7–8.2 cm, (4.6)6.3–7.7(9) times longer than wide, 3.4 times longer than petioles, narrowly oblanceolate, caudate-acuminate at apex, narrowly acute at base, subcoriaceous, drying yellowish green or yellow-brown above, yellow-brown below; **midrib** drying concolorous and +/- acute above, convex and finely ridged, slightly darker below; **primary lateral veins** (6)7–9(12) pair, arising at 30–35(40)° angle, bluntly acute on lower surface on drying; collective veins arising from the base, +/- straight to the margin, 3–6 mm from the margin, only weakly loop-collecting at the primary lateral veins, scarcely more prominent than the interprimary veins, more prominent than the primary lateral veins, sunken above, drying weakly raised below; upper surface minutely granular on magnification; lower surface densely glandular-punctate. Inflorescence **peduncle** 28–40 cm × 2.5–3 mm, **spathe** linear, green, 10–16 cm × 7 mm, thin, nearly always missing in age; **spadix** long and slender, 9–12 cm × 3–4 mm, elongating to 41 cm long in fruit; green to purplish violet, drying dark brown; **berries** ovoid to globose, ca. 3 mm diam. pinkish to red.

Local Aguaruna names: úshap sugkíp, saukáp, sugkíp.

Anthurium leveauii is known only from Amazonas Department of Perú in Bagua and Condorcanqui Provinces at 180–400 m in Premontane wet forest transition to Tropical (P-wf/T) and Tropical moist forest (T-mf) life zones. The species is a member of section *Porphyrochitonium* and is characterized by a small stem, short internodes, persistent network of pale loose cataphyll fibers, long oblanceolate caudate-acuminate blades which dry somewhat yellowish brown and have more conspicuous collective veins than primary lateral veins on drying. In addition, the species has a slender ephemeral green spathe, a slender, scarcely tapered green to purplish violet spadix, and small globular reddish berries.

The species is very similar in leaf blade shape and drying color to *A. huashikatii* Croat, but that species has primary lateral veins that dry as conspicuous as the collective veins and has a prominently stipitate spadix. *Anthurium leveauii* keys out near *A. apaporanum* R. E. Schult., but that species has blades which are more typically oblong-elliptic, broadest in the

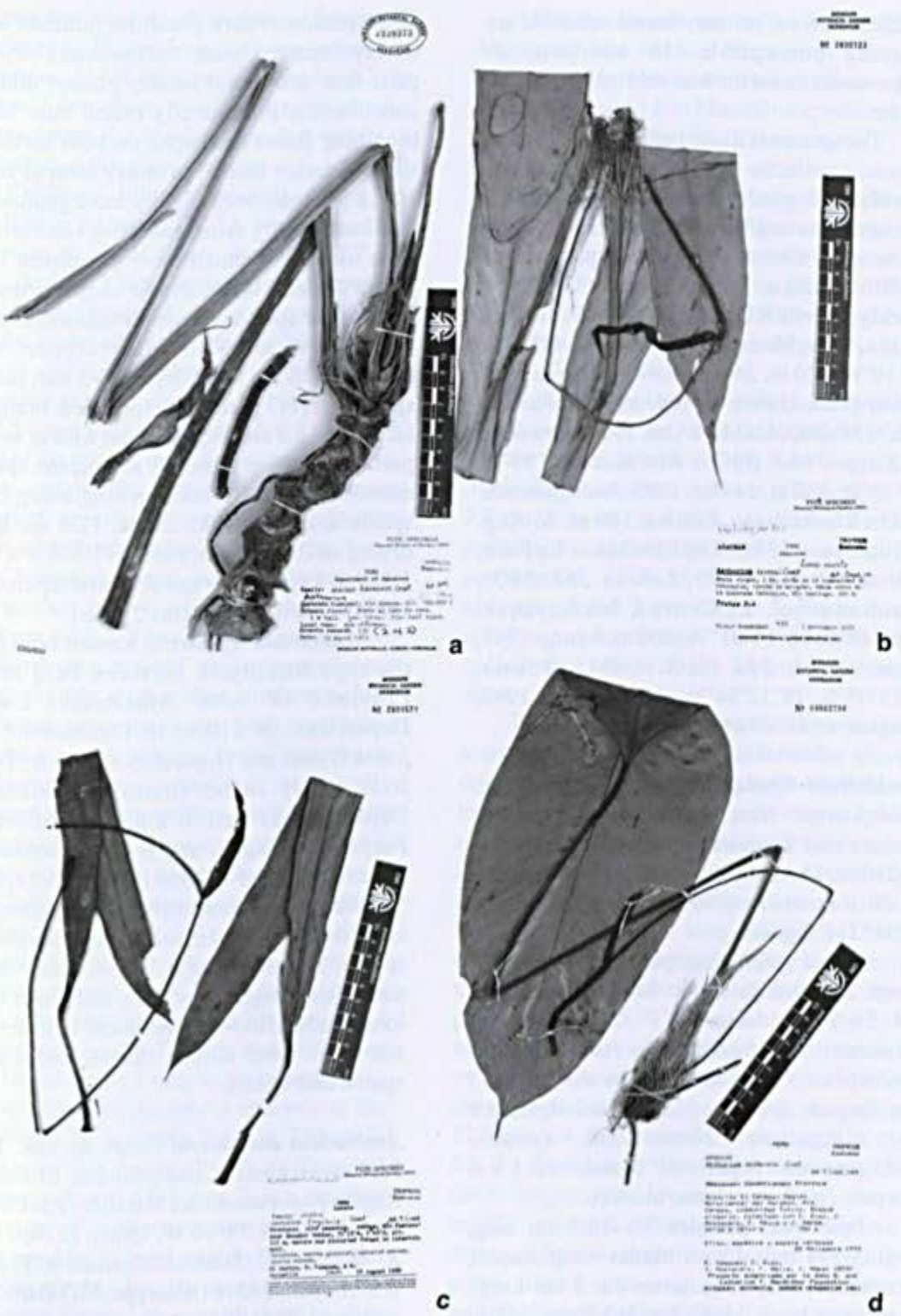


Figure 4 - a. *Anthurium kusuense* Croat. Type specimen. (*Ancuash 137*); b. *Anthurium leveauii* Croat. Type specimen. (*Huashikat 459*); c. *Anthurium lingulare* Croat. Type specimen. (*Gentry et al. 29695*); d. *Anthurium mostaceroi* Croat. Type specimen. (*Vasquez et al. 18530*)

middle with more primary lateral veins that are scarcely perceptible. In addition, *A. apaporanum* has a thicker, shorter spadix and spathe.

The species is named after José Asuncíon Leveau, a collector working with Brent Berlin on anthropological and linguistic studies with the Aguaruna and Huambisa Indians of Peru. He was the first to collect this species near the Río Santiago.

Paratypes: PERU. AMAZONAS: Bagua, Imaza, Río Marañon, Yamakat, 4°55'S, 78°19'W, 320 m, 24 Nov. 1993, *Vasquez et al. 18560* (MO, USM); 9 Aug. 1994, *Jaramillo et al. 358* (MO, USM); 6 Oct. 1995, *Jaramillo & Katip 788A* (MO); Río Kusu, 4°55'S, 78°19'W, 350 m, 14 Oct. 1995, *Rodrigues 502* (MO); Río Santiago, Galilea, 180 m, 16 Aug. 1979, *Leveau 198* (MO); 1 km below La Poza, 180 m, 22 Aug. 1979, *Leveau 263* (MO); Condorcanqui, El Cenepa, Mamayaque, 4°34'49"S, 78°14'01"W, 400 m, 9 Aug. 1997, *Rojas et al. 214* (MO, USM); Tutino, 4°33'05"S, 78°12'54"W, 340, 28 July 1999, *Vasquez et al. 24482* (MO, USM).

Anthurium ligulare Croat, sp. nov. **Type**: Perú. Loreto: Alto Amazonas, Andoas, Río Pastaza near Ecuador border, 76°28'W, 2°48' S, 210 m, 14 Aug. 1980, *A. Gentry, R. Vasquez & N. Jaramillo 29695* (holotype, MO-2901571). Fig. 4c.

Planta epiphytica; petioli 9.5–10.5 cm longi, 3–4 mm in sicco; laminae ligularis, 34–39.5 cm longae, 3–3.7 cm latae, cuneatae ad basim; nervis primariis lateralibus 10–12 utroque; pedunculus 38 cm longus; spatha viridis, lanceolata, 8.5 cm longa, ca. 1 cm lata; spadice rubiginosus, stipitatus 2 mm, 12.5 cm longus, ca. 3 mm diam. in sicco.

Epiphytic; **petioles** 9.5–10.5 cm long, drying 3–4 mm diam.; **blades** strap-shaped, acuminate at apex (acumen ca. 2 cm long), cuneate at base, 34–39.5 × 3–3.7 cm, 9.9–11 times longer than wide, incurled at margins; upper surface eglandular, drying dark yellowish brown and matte; lower surface inconspicuously dark glandular-punctate with widely scattered warty excrescences, drying paler than above and weakly glossy; **midrib** concolorous, prominently raised near base, becoming flatter near apex on both surfaces, slightly darker below; **primary lateral veins** 10–12 per side, only slightly more prominent than interprimary veins; collective veins arising from near base, much more prominent than primary lateral veins, almost as prominent as midrib near apex, noticeably sunken above, 3–4 mm from margin. Inflorescence with **peduncle** 38 cm long, drying 2–3 mm diam.; **spathe** erect, greenish, speckled maroon, lanceolate, 8.5 cm long, ca. 1 cm wide at widest portion near base, narrowly acuminate; **spadix** maroon, stipitate 2 mm, arching away from spathe to almost a 90° angle, 12.5 cm long, drying ca. 3 mm diam. Flowers 1.5–1.9 × 1.1–1.3 mm, 3 visible per spiral; lateral tepals 0.8–1 mm wide, outer margins 2-sided.

Anthurium ligulare is known only from the type locality in northern Perú in the Province of Alto Amazonas, Loreto Department at 210 m in Premontane wet forest (P-wf) and Tropical moist forest (T-mf). It is likely to be found in Amazonas Department as well. It a member of section *Porphyrochitonium* and is characterized by its strap-shaped blades (hence the epithet "ligulare") with prominently sunken collective veins on the upper surface and its long slender spathe. It is closest to *A. diazii*, which is also somewhat longer than wide and has a fairly long spathe. However, *A. diazii* is terrestrial, has much more elliptic blades, and a green spathe and spadix.

Anthurium mostaceroi Croat, sp. nov. **Type**: Perú. Amazonas: Condorcanqui, El Cenepa, Región Nororienatal del Marañon, Río Cenepa, Tutino, 4°33'S, 78°10'W, 750 m, 22 Nov. 1993. *R. Vasquez, C. Diaz, J. Mostacero, F. Mejia & J. Ampam 18530* (holotype, MO-04662756, isotype, USM). Fig. 4d.

Planta epiphytica; internodia brevia, 1.5 cm diam. in sicco; cataphylla 13 cm longa; petioli 52.7 cm longi, 3 mm diam. in sicco;

laminae late ovatae, attenuatae ad basim, 37 cm longae, 15 cm latae; nervis primariis lateralibus 15–18 utroque; pedunculus 32 cm longus, 1 mm diam. in sicco; spatha viridis, 5.7 cm longa, 1.1 cm lata; spadice viridis, 8 cm longus, 4 cm diam. in sicco.

Epiphytic, **internodes** short, drying 1.5 cm diam.; **cataphylls** 13 cm long, tan, persisting as linear fibers. **Petioles** 52.7 cm long, drying 3 mm wide, grayish brown; geniculum darkened, 2.5 × 3 cm; **blades** broadly ovate, slightly inequilateral, one side up to 1 cm wider, abruptly and narrowly acuminate at apex, attenuate at base, 37 × 15 cm, 2.5 times longer than broad, 0.7 times the length of the petiole, drying olive green, weakly glossy, eglandular above, paler and more brownish, semi-glossy, glandular-punctate below; **midrib** narrowly convex, drying 1 mm diam., brownish above, convex, darker than blade surface below; **primary lateral veins** 15–18 per side, 1–2 cm apart, departing from the midrib at a 50–60° angle, concolorous above, slightly darker than surface below, somewhat prominent on both surfaces; collective veins arising from near base, prominently loop-connected, as equally prominent as primary veins, 1 cm from margin to less than 1 mm from margin near apex. Inflorescences with **peduncle** 32 cm long, drying 1 mm diam., darkened; **spathe** reflexed-spreading, green, linear, 5.7 × 1.1 cm, 0.2 times the length of peduncle, abruptly and narrowly acuminate at apex, apex 3 mm long; **spadix** green, cylindrical, erect, 8 cm long, drying 4 cm diam. Flowers 2 × 1.8 mm, 4–5 visible per spiral; lateral tepals 1 mm wide, two-sided.

Anthurium mostaceroi is endemic to the type locality in northern Perú at 750 m in Premontane wet forest (P-wf) or Tropical moist forest (T-mf) life zones. It is a member of section *Porphyrochitonium* and is characterized by its long cataphylls and large, broad, ovate blades. It is similar to *A. quipuscoae* Croat, also published in this manuscript, but that species has smaller cataphylls, is broader with respect to length, and more abrupt at the apex.

The species is named in honor of J. Mostacero one of the collectors of the type specimen. Mr. Mostacero was a collector for Dr. Brent Berlin's Río Marañón expeditions in the Río Santiago and Río Cenepa areas.

Anthurium penae Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Aguaruna Putuim, anexo Yamayakat, Zona de Colinas altas 24°SW of Putuim, 700–820 m, 23 Sep. 1994, *C. Diaz, A. Peña & P. Atamain 7204* (holotype, MO-05095094, isotypes, K, US, USM). Fig. 5a.

Planta epiphytica; internodia brevia, 1–1.5 cm diam. in sicco; cataphylla 4.2–8.2 cm longa; petioli 4.5–18.5 cm longi, 2–3 mm diam. in sicco; laminae ellipticae, 14–22 cm longae, 4.4–8.9 cm latae; nervis primariis lateralibus 6–7 utroque; pedunculus 17.5–26 cm longus; spatha oblonga, 2.8–3.5 cm longa, 5–7 mm lata; spadice purpureus vel atroruber, cylindricus, 7–14.5 cm longus, 5–9 mm diam.

Epiphytic; stems drying dark brown; leaf scars 5–6 mm × 1–1.5 cm; **internodes** short, drying 1–1.5 cm diam.; **cataphylls** 4.2–8.2 cm long, drying reddish brown, persisting at upper nodes as almost intact to pale linear fibers near apex, as a reticulum near base, eventually deciduous, acute to acuminate at apex. **Petioles** 4.5–18.5 cm long, drying 2–3 mm diam., sharply sulcate above, drying light green to brown-yellow; geniculum slightly thicker than petiole, darkened, 7–12 mm long, drying 3–4 mm diam.; **blades** +/- elliptic, obtuse to rounded or emarginate at apex, cuneate to slightly attenuate at base, 14–22 cm long, averaging 17.9 cm, 4.4–8.9 cm wide, averaging 6.2 cm, 2.5–3.1 times longer than broad, averaging 2.9 times longer, broadest at or slightly above middle, revolute at margins; upper surface drying yellowish green; lower surface brownish green, tinged with gray, glandular-punctate; **midrib** convex, sometimes flat, sometimes sunken above, drying ca. 0.5–1 mm diam., concolorous, narrowly convex below, drying 1–2 mm wide, concolorous; **primary lateral**

veins 6–7 per side, about 1.2–2.2 cm apart where they arise from the midrib, arsing at a 30°–35° angle from the midrib, straight to the collective vein, concolorous, sometimes drying sunken with an irregular ridge along both margins, sometimes slightly raised above, slightly loop-connected above and below; interprimary veins almost as conspicuous as primary veins, usually one, sometimes two between each primary vein; collective veins arising from near base, concolorous, more prominent than primary veins, 5–11 mm from margin. Inflorescence with **peduncle** 17.5–26 cm long, averaging 22.8 cm, drying 1–4 mm diam., reddish brown; **spathe** reflexed-spreading to reflexed, red or purple, sometimes tinged with green, oblong, 2.8–3.5 cm × 5–7 mm, held at a 155°–180° angle on peduncle, acute or apiculate at apex; **spadix** purple or dark red, cylindrical, curved away from spathe, spreading to 45°–90° angle, 7–14.5 cm x 5–9 mm. Flowers ca. 3 × 2 mm, 3–4 visible per spiral, lateral tepals 2 mm wide, margins 2-sided. Infruvtescences 8.6 cm long, drying 1.6 cm diam., setting berries in lower 1/2 to 3/4 of its length, **berries** pink.

Anthurium penae is known only to northern Perú at 430–800 m in Premontane wet forest transitioning to Tropical (P-wf/T) life zone. It is a member of section *Porphyrochitonium* and is characterized by small, yellowish green, elliptic blades with rounded to emarginate apices and prominent collective veins. It is very similar to *A. tsamajainii*, which also has small, yellowish green, elliptic blades, but that species has blades that are narrowly acute or even weakly acuminate at the apex.

The species is named in honor of Antonio Peña, Peruvian plant collector and excellent parataxonomist, who was part of the team working with Rodolfo Vasquez in Oxapampa, Peru, that collected the type specimen.

Paratypes: PERU. AMAZONAS: Condorcanqui, El Cenepa, Region Nororiental del Marañon, Río Cenepa, Tutino, 4°33'S, 78°10'W, 750 m, 22 Nov. 1993, *Vasquez et al. 18533* (MO); Bagua, Imaza, Tayu Mujaji, Wawas, 5°15'25"S, 78°21'41"W, 800 m, 23 Oct. 1997, *Rojas et al. 461* (MO); Aguaruna de Wanás, km 92 Carretera Bagua-Imacita, Cherros Chunim, 700–800 m, 29 Aug. 1996, *Diaz et al. 8070* (MO); Quebrado El Almendro, along creek and on sandstone, 5°14'40"S, 78°21'24"W, 430 m, 9 Mar. 1998, *van der Werff et al. 14576* (MO).

Anthurium quipuscoae Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Yamayakat, NE of Marañon RENOM, rd. to Putuín, 4°55'S, 78°19'W, 350–430 m, 17 Oct. 1995, *V. Quipuscoa S. 288* (holotype, MO-05053799, isotype, USM). Fig. 5b.

Planta terrestris; internodia 2 cm diam. in sicci; cataphylla 8 cm longa; petiolus 54 cm longus; lamina late ovata vel late elliptica; 31 cm longa, 19 cm lata; nervis primariis lateralibus 15 utroque; pedunclus 33.5 cm longus; spatha rubra; spadice cylindricus, 4.4 longus, 4 mm diam. in sicco.

Terrestrial; **internodes** drying 2 cm diam.; **cataphylls** 8 cm long, pale tan, persisting at upper internodes as longitudinal fibers. **Petioles** 54 cm long, drying 3 mm wide, dark yellowish brown; geniculum approximately same shape as petiole, slightly darkened, 1.5 cm × 4 mm; **blades** broadly ovate to broadly elliptic, very abruptly acuminate at apex (acumen 2.7 cm long), cuneate to rounded at base, 31 × 19 cm, 1.6 times longer than wide, 0.57 times length of petiole, drying light brownish green, matte to weakly glossy, eglandular above, pale brown, semi-glossy, glandular-punctate below; **midrib** drying broadly convex to convex, concolorous to slightly darker below; **primary lateral veins** 15 per side, 1.2–2.5 cm apart, departing midrib at a 45–50° angle, concolorous above, concolorous to slightly darker than surface below; collective veins arising from near base, equally prominent as primary veins, 4–7 mm from margin. Inflorescence with **peduncle** 33.5 cm long, drying 2 mm diam., drying dark reddish brown; **spathe** red; **spadix** cylindrical, erect, 4.4 cm long, drying 4 mm diam. Flowers 2.5 × 2 cm, 4–5 visible per spiral; lateral tepals 1 cm wide, outer margins 2-sided.

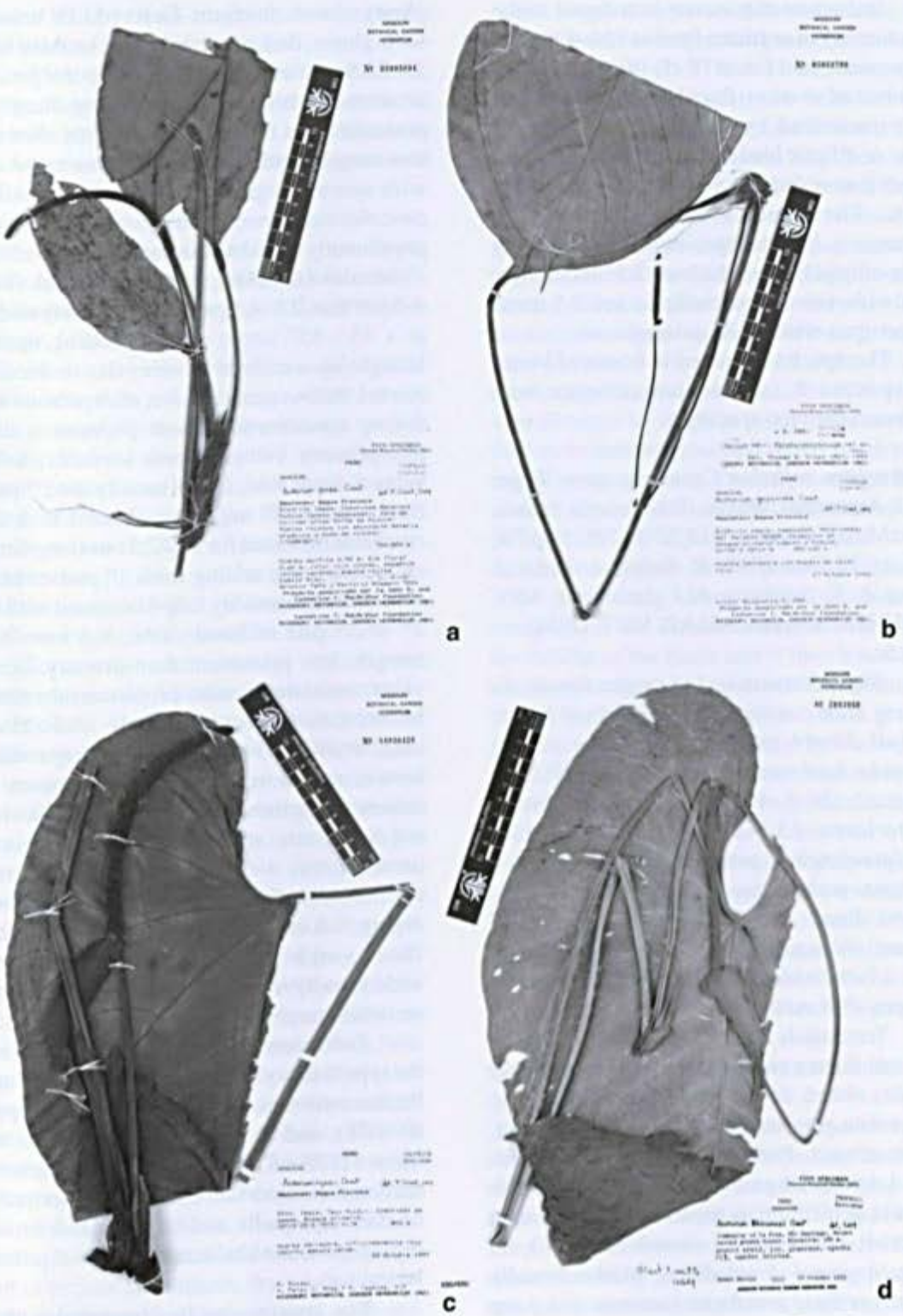


Figure 5 - a. *Anthurium penae* Croat. Type specimen. (*Díaz et al. 7204*); b. *Anthurium quipuscoae* Croat. Type specimen. (*Quipuscoa 288*); c. *Anthurium rojasiae* Croat. Type specimen. (*Rojas et al. 413*); d. *Anthurium shinumas* Croat. Type specimen. (*Berlin 3602*)

Anthurium quipuscoae is endemic to the type locality in northern Perú at 350–430 m in Premontane rain forest (P-rf) life zone. It is a member of section *Porphyrochitonium* and is characterized by large, extremely broad ovate or elliptic blades that are only 1.6 times longer than wide and a very abruptly acuminate apex. The species keys out near *A. mostaceroi*, but that species differs in having ovate-elliptic blades which are 2.5 times longer than wide versus ovate-elliptic and 2.5 times longer than wide in *A. quispuscoae*.

The species is named in honor of Victor Quispuscoa S., a Peruvian collector who collected the type specimen.

Anthurium rojasiae Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Río Cenepa, Imaza, Tayu Mujaji, Wawas, 5°15'25"S, 78°21'41"W, 800 m, 23 Oct. 1997, *R. Rojas, A. Peña, J. Anag & E. Yagkuag 413* (holotype, MO-04920428; isotypes, AMAZ, HUT, USM). Fig. 5c.

Planta terrestris; internodia brevia, 1–1.8 cm diam.; cataphylla 10.5–16 cm longa; petioli 39–64 cm longi, 5–8 mm diam.; laminae late ovato-cordatae, 35–42.2 cm longae, 26.5–36 cm latae; lobulae posteriores, 13.5–17 cm longae, 12–13.5 cm latae; nervis primariis lateralibus 4–5 utroque; pedunculus 15.5–20 cm longus, 3–5 mm diam. in sicco; spatha viridis vel crema, oblonga-elliptica, 10–13.5 cm longa, 1.8–2.7 cm wide; spadice rubrus, 15–18 cm longus, 7–8 mm diam. in sicco.

Terrestrial; **internodes** short, drying 1–1.8 cm diam.; **cataphylls** 10.5–16 cm long, weakly ribbed, drying brown to reddish brown, lanceolate, persisting at upper internodes intact, acute at apex. **Petioles** 39–64 cm × 5–8 mm, 1.1–1.4 times longer than blades, drying reddish brown; geniculum as broad as or thicker than petioles, blackened or concolorous, 2–3 cm long, drying 4–5 cm diam.; **blades** broadly ovate-cordate, acuminate (acumen 1–1.3 cm long with short apiculum ca. 1 mm long), 35–42.2 × 26.5–36 cm, 1.1–1.3 times longer than wide, drying dark yellowish brown, weakly glossy above, medium-dark reddish brown, semi-glossy, dark punctate below; anterior lobe 27–32.5 cm long, broadest above the petiole attachment, broadly convex alng margins; posterior lobes 13.5–17 × 12–13.5 cm, directed downwards; **midrib** broadly convex to convex with acute margins, drying to 1 mm wide, concolorous above, broadly convex to convex, prominently raised with an acute medial rib, +/- concolorous below; **primary lateral veins** 4–5 per side, 2.5–4.5 cm apart, departing midrib at a 45°–55° angle and extending nearly straight to a collective vein, flat to broadly convex below, raised above, conspicuous and drying concolorous, more prominent than interprimary veins on both surfaces; **basal veins** 5–6 per side, 1st and usually the 2nd pairs free to base, 4th and 5th coalesced to 2–3.8 cm; basal rib naked for 1.5–2.5 cm along sinus; collective veins arising from 1st pair of basal veins but often weakly loop-connected with the 2nd or 3rd pair of basal veins, 1–3 mm from margin, less prominent than primary lateral veins; reticulate veins prominently raised. Inflorescence erect; **peduncle** 15.5–20 cm long, drying 3–5 mm diam., drying reddish brown; **spathe** reflexed-spreading, green or creamy white, narrowly oblong-elliptic, 10–13.5 × 1.8–2.7 cm, acuminate at apex (acumen inrolled, ca. 4–5 mm long); **spadix** red, cylindroid–tapered, erect, 15–18 cm long, drying 7–8 cm diam. Flowers 1.8 × 1.4 mm, 10–11 visible per spiral; lateral tepals 1 mm wide, broadly rounded on inner margin, 2-sided on outer margin.

Anthurium rojasiae is only known from the type locality in northern Perú at 800 m in Premontane wet forest transition to Tropical (P-wf/T), and Tropical Lower Montane wet forest (TLM-wf) life zones. It is a member of section *Calomystrium* that is characterized by its dark red spadix and large reddish brown-drying, punctate blades with only 4–5 primary lateral veins.

The species can be compared with *A. grande* N. E. Br. which differs from *A. rojasiae* in having blades 1.9 times longer and a greenish yellow spadix, in contrast to leaf

blades 1.1–1.3 times longer than wide, and a red spadix for *A. rojasiae*.

This species is named for the collector, Rosie Rojas, Peruvian botanist and wife of Rodolfo Vasquez, who made many collections of Araceae in the Río Cenepa region and collected the type specimen.

Anthurium shinumas Croat, sp. nov. **Type**: La Poza, Río Santiago, 180 m, 15 Oct. 1979, *B. Berlin 3602* (holotype, MO-2893958; isotype, USM). Fig. 5d.

Planta terrestris vel rarius epiphytica; internodia 0.5–1.5 cm longa, 1.1–2.8 cm diam.; cataphylla 6–11(–18) cm longa; petioli (25.5–) 38.5–82 cm longi, 3–5 mm diam. in sicco; lamina ovato-cordata, lobulata ad basim, 32.5–54 cm longa, 22–33 cm lata; nervis primariis lateralibus7–10 utroque; pedunculus 20–48.5 cm longus; spatha 8–12.5 cm longa, 0.8–2.1 cm lata; spadice 5.5–12.5 cm longus, 4–7 mm diam. in sicco.

Terrestrial or rarely epiphytic; **internodes** usually less than 5 mm long at lower internodes, sometimes up to 1.5 cm at uppermost internodes, drying 1.1–2.8 cm diam., tan; **cataphylls** 6–11 (–18) cm long, unribbed or weakly 1-ribbed, drying reddish or greenish gray, lanceolate, persisting intact at upper internodes only, then quickly deciduous or remaining as small fragments. **Petioles** (25.5–) 38.5–82 cm long (averaging 56 cm), drying 3–5 mm diam., drying deeply grooved, gray, faintly tinged with red or green, sometimes sulcate adaxially; geniculum terete (or at least not grooved), often slightly darkened, 1.5–2.5 cm long, drying 3–4 mm diam., smooth; **blades** +/- ovate-cordate, gradually acuminate to acute at apex, often apiculate, lobed at base, 32.5–54 cm long (averaging 41.2 cm), 22–33 cm wide (averaging 25.3 cm), 1.5–1.7 times longer than wide, 0.6–1 (–1.3) times the length of the petiole, usually broadest at or just above the point of petiole attachment, drying dark gray-green, occasionally faintly tinged with red above, paler, light gray-green below; anterior lobe 25–39 cm long, 14–27 cm wide at midpoint, 1.3–2 times longer than wide, 1.9–2.3 (–2.6) times longer than posterior lobe, broadest near base, convex to straight along margins; posterior lobes rounded, 11–17 × 6–11 cm, sometimes broadest at base, sometimes broadest near middle, directed more or less inward; sinus hippocrepiform to spathulate, 7.5–15 cm deep; **midrib** almost flat to broadly convex, drying 1–2 mm wide, concolorous or sometimes slightly paler than surface above, narrowly convex, thicker than broad, prominently raised, white, conspicuously paler than surface, sometimes ridged, speckled below; **primary lateral veins** 7–10 per side, 1–3.5(–4.5) cm apart, departing midrib at a 35°–50° angle, concolorous to slightly paler than surface, convex to narrowly rounded above, much paler, raised below, curving towards margins; basal veins 5–7 per side, with first and second free to base, 4th and higher coalesced 2.5–4 cm, conspicuously paler below; posterior rib naked 2.5–4.5 cm along sinus; collective veins not conspicuous (or if there is one, it arises from the middle of the blade and is then less than 1 mm form margin). Inflorescence with **peduncle** 20–48.5 cm long, drying 3–4 mm wide, gray to grayish red; **spathe** usually spreading to reflexed; sometimes green, lanceolate to oblong, 8–12.5 × 0.8–2.1 cm, generally acute at apex; **spadix** purple or brown, often somewhat tapered, sometimes slightly stipitate (with stipe less than 2 mm), often curved, 5.5–12.5 cm long, drying 4–7 mm diam., 9.7–25 times longer than wide (usually more than 15 times longer than wide). Flowers 2–2.6 × 1.8–1.9 mm, 5–6 visible per spiral; lateral tepals 1–1.2 mm wide, 3-sided, shield shaped.

Local Aguaruna names: shinumas, shinúmas éep.

Anthurium shinumas is known only to northern Perú in the Río Cenepa-Río Santiago region at 180–200 (–700) m in Premontane wet forest transition to Tropical (P-wf/T), and likely Tropical wet forest (T-wf) as well. It is characterized by greenish-gray drying blades, very pale venation on the lower blade surfaces, and posterior lobes directed more or less inward.

The species is similar to *A. kusuense*, in the shape and color of the blade and venation,

but *A. kusuense* has cataphylls that weather to fibers instead of persisting intact, much longer petioles, wider blades, and spadices with more flowers visible per spiral. One collection, *Berlin 3699*, could possibly be *A. shinumas* because its blades have a similar drying color with somewhat pale white venation beneath and a white spadix with somewhat similarly shaped lateral tepals. However, the posterior lobes of the blades of *Berlin 3699* are directed more or less outward instead of inward as in *A. shinumas*.

The species is named for the common Aguaruna Indian name for the species, "shinumas".

Paratypes: PERU. AMAZONAS: Bagua, Río Cenepa region, Monte del isla, la isla 1 km, bajo de La Poza, 180 m, 8 Aug. 1979, *Leveau 8* (MO); Condorcanqui, above Quebrada Tuhusik, 5 min. down river from Chavez Valdivia, 213–244 m, 16 Dec. 1972, *Berlin 579* (MO); Río Santiago, 180 m, *Huashikat 1237* (MO); ca. 65 km al N de Pinglo, 200 m, 12 Feb. 1980, *Huashikat 2051* (MO); 2 km below Caterpiza, Río Santiago, 200 m, 13 Sep. 1979, *Huashikat 606* (MO); 1 km behind La Poza, 180 m, 12 Nov. 1979, *Tunqui 12* (MO); Río Santiago valley, ca. 65 km N de Pinglo, 2–3 km behind Caterpiza, 200 m, 15 Feb. 1980, *Huashikat 2094* (MO).

Anthurium tsamajainii Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Aguaruna Putuim, annex Yamayakat, zona de Colinas altas 24°SW de Putuim, 700 m, 22 Sep. 1994, *C. Díaz, A. Peña & P. Atamain 7196* (holotype, MO-05095095; isotypes, USM). Fig. 6a.

Planta epiphytica vel terrestris, ca. 0.5 m alta; internodia brevia, 8–10 mm in sicco; cataphylla 3–5.5 cm longa; petioli 4.5–17.5 cm longi, 1–2 mm diam. in sicco; laminae ellipticae, 10–23.5 cm longae, 2.5–6.1 cm latae; nervis primariis lateralibus 4–6(–7) utroque; pedunculus 15–29.5 cm longus; spatha 2–3.5 cm longa, ca. 4 mm lata; spadice viridis, ca. 7 cm longus, 4 mm diam. in sicco.

Epiphytic or terrestrial ca. 0.5 m tall; **internodes** short, drying 8–10 mm diam.; **cataphylls** 3–6 (–9) cm long, drying usually red to brown, lanceolate, persisting at upper nodes as a reticulum of fibers, apex sometimes remaining intact. **Petioles** 4.5–17.5 cm long (averaging 11 cm long), drying 1–3 (– 4) mm diam., yellow-brown, sulcate above; geniculum slightly thicker than petiole, darkened, 5–20(–30) × 2–5 mm; **blades** elliptic to oblong elliptic, acute to gradually acuminate at apex, (acumen 0.5–2 cm long), cuneate or slightly attenuate at base, (8–) 10–23.5 cm long, (averaging 17.9 cm long), 2.5–7.5 cm wide (averaging 4.5 cm wide), 2.4–5 times longer than broad, 1.2–3.4 times longer than petiole, broadest near middle, margins slightly revolute; upper surface drying grayish green to yellow green; lower surface drying brownish green, tinged with gray and sometimes reddish brown; **midrib** fairly uniform throughout on both surfaces, broadly convex, sometimes sunken, drying less than 1 mm diam., and concolorous above, narrowly raised and concolorous to slightly paler below; **primary lateral veins** 4–6 (–7) per side, ca. 2 cm apart, arising at a 20–40° angle from the midrib, straight, loop-connected to the collective veins, concolorous, sometimes scarcely more prominent than interprimary veins, sometimes drying sunken with an irregular ridge extending along both margins, sometimes bluntly raised; collective veins arising from base, as prominent as primary lateral veins, 3–11 mm from margin. Inflorescence with **peduncles** 15–29.5 cm long, drying 1–3 mm diam., 1.3–2.2 times longer than petiole, drying dark reddish brown; **spathe** erect when immature, becoming reflexed-spreading to reflexed, red to purple, sometimes pink, green or tinged with green, linear, sometimes with a subapical apiculum 2 mm long, sometimes furled inward, 2–3.5 cm long, ca. 2–4 mm wide, ca. 0.11–0.13 times the length of peduncle, 0.5 times length of spadix, sharply acuminate; **spadix** green to pink (red on infructescence), sometimes purple, curved away from spathe, spreading to an almost 90° angle, ca. 6–9 cm long, drying 4

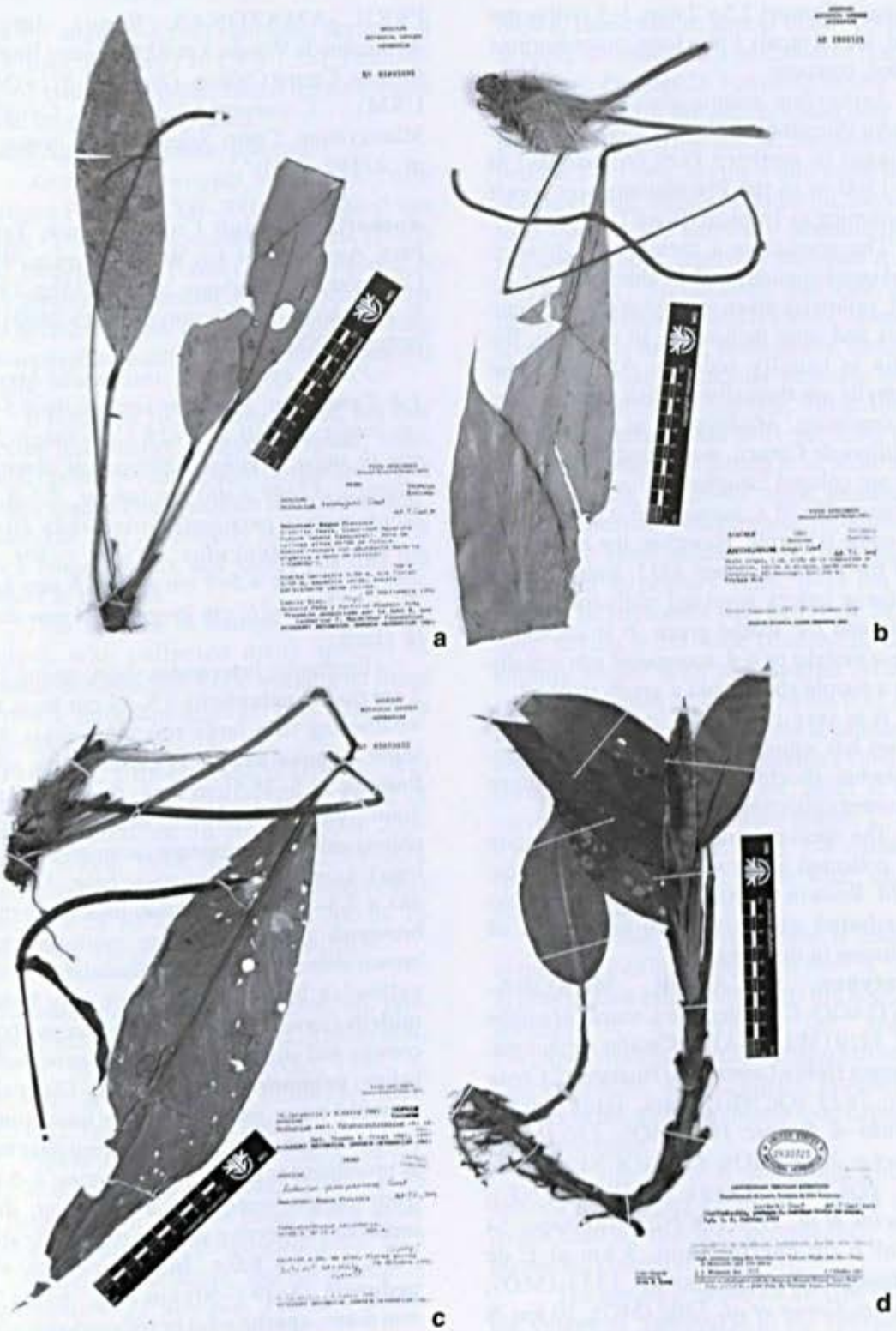


Figure 6 - a. *Anthurium tsamajainii* Croat. Type specimen. (*Díaz et al. 7196*); b. *Anthurium tunquii* Croat. Type specimen. (*Huashikat 723*); c. *Anthurium yamayakatense* Croat. Type specimen. (*Jaramillo & Katip 788*); d. *Dieffenbachia wurdackii* Croat. Type specimen. (*Wurdack 2131*)

mm diam. Flowers 2.5 × 2 mm, 3–5 visible per spiral, lateral tepals 1 mm long, outer margins 2-sided, concave.

Anthurium tsamajainii ranges from Ecuador (Sucumbios, Napo, Pastaza, Morona-Santiago) to northern Peru (Amazonas) at 300–1300 m in the Premontane wet forest transitioning to Tropical (P-wf/T) life zone.

The species is a member of *A.* sect. *Porphyrochitonium*, and is characterized by small, yellowish green to grayish green elliptic blades and long peduncles. In addition, the spadix is usually reddish. Although the cataphylls are typically reddish to brownish, one specimen, *Madison et al. 3310*, from Cordillera de Cutucú, was found to have very light tan colored cataphylls. Finally, we note that the spadix of *A. tsamajainii* is green while the spathe is purple. However, the herbarium label for *Freire & Santi 3315*, from Pastaza has these colors reversed with the spadix purple and the spathe green. It is unclear if this is a mistake or if *A. tsamajainii* can actually have a purple spadix and a green spathe.

It is very close to *A. pennae*, but that species has rounded to emarginated blades, somewhat shorter peduncles, and a more prominent collective vein.

The species is named for L. Tsamajain who collected along with C. Díaz, A. Peña, and M. Roca in the Río Cenepa area, and has contributed extensively to collection of specimens in this area.

Paratypes. ECUADOR. MORONA-SANTIAGO: Cordillera de Cutucú, *Madison et al. 3310* (SEL). NAPO: Cantón Archidona, Carretera Hollín Loreto, Rio Huataraco, *Cerón et al. 7625* (QCNE); Tena, Jatun Sacha, *Delinks & Suarez 194* (MO); *230* (MO); *Palacios 2454* (MO); *4329* (QCNE); *Cerón 771* (QCNE); *Cerón 1630* (QCNE); *Palacios et al. 5138* (QCNE); Rio Napo, 14 km al E de Puerto Napo, 9 km al E de Atahualpa, *Palacios et al. 1551* (MO); Sumaco, *Cerón et al. 5302* (MO); 10 km N of Lago Agrio on road to Rio San Miguel, *Oldeman et al. 36* (QCA, US). PASTAZA: Cantón Arajuno, *Freire et al. 3315* (MO). PERU. AMAZONAS: Bagua, Imaza, Aguaruna de Wanás, km 92 Carretera Bagua-Imacita, Cerros Chinim, *Díaz et al. 8119* (MO, USM); Condorcanqui, El Cenepa, Mamayaque, Cerro Sakee-gaig, *Vásquez et al. 22592* (MO).

Anthurium tunquii Croat, sp. nov. **Type**: Perú. Amazonas: 1 km W of Caterpiza, W of Caterpiza, Río Santiago, 200 m, 20 Sep. 1979, *V. Huashikat 723* (holotype, MO-2800125; isotype, USM). Fig. 6b.

Planta epiphytica; internodia brevia, 1.2–2 cm diam. in sicco; cataphylla 9.5–14 cm longa; petioli 21.5–25.5 cm longi, 2–5 mm in sicco; laminae oblonga vel oblongo-elliptica, 37–40 (–46) cm longae, 7.5–8 cm latae; nervis primariis lateralibus 10–13 utroque; pedunculus 28–39 (–50) cm longus; spatha 4.5–5 cm longa, 6 mm lata; spadice 5–8 (–21) cm longus, 3–4 mm diam. in sicco.

Epiphytic; **internodes** short, drying 1.2–2 cm diam.; **cataphylls** 9.5–14 cm long, tan, weathering to a large reticulate mass with some longitudinal fibers closer to the apex. **Petioles** 21.5–25.5 cm long, drying 2–5 mm diam., yellowish brown; **blades** oblong to oblong-elliptic, acuminate (acumen 2.5–3 cm long), cuneate to attenuate at base, 37–40 (–46) × 7.5–8 cm, eglandular, pale to medium brownish green, sometimes more yellowish brown above, closely dark glandular-punctate, yellowish brown tinged with gray below; **midrib** convex, brown to concolorous above, convex and slightly more raised, concolorous below; **primary lateral veins** 10–13 per side, scarcely more prominent than interprimary veins; collective veins arising from near base, as prominent as primary lateral veins, 4–6 mm from margin, sometimes a very faint, short, secondary collective vein exists, ending about 1.3 cm from base. Inflorescences with **peduncle** 28–39 (–50) cm long, drying 2–3 mm diam.; **spathe** erect or reflexed-spreading, oblong-elliptic, 4.5–5 cm × 6 mm at widest part near base unfurled, acuminate; **spadix** reddish brown, cylindrical, erect but sometimes arching

to a 90° angle, 5–8 (–21) cm long, drying 3–4 mm diam. Flowers 1.6–1.9 × 1.2–1.3 mm, 4–5 (–6) visible per spiral; lateral tepals 0.9 mm wide, outer margins 2 sided.

Local Aguaruna name: idaimas.

Anthurium tunquii is known from northern Perú from 200–300 m in Tropical wet forest (T-wf), Premontane wet forest (P-wf) and Tropcial moist forest (T-mf) life zones. It is a member of section *Porphyrochitonium* and is characterized by large cataphylls, long oblong to oblong-elliptic shaped blades, and red spadix.

It is closest to *A. apanui* Croat, but that species has smaller cataphylls, fewer, more distinct primary veins spaced farther apart, and a green spadix. One specimen from Amazonas, *Huashikat 723*, is probably *A. tunquii*, but it has a longer spadix and cataphylls that are bushier at the base.

This species is named for Santiago Tunqui, who collected many species of Araceae in Amazonas while working on Brent Berlin's anthropological Río Marañón expeditions in Peru.

Paratypes. PERU. AMAZONAS: Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdívia, ca. 78°30'W, 4°30'S, 200–250 m, 8 Feb. 1978, *Ancuash 1259* (MO); Condor-canqui, El Cenepa, San Antonio, Río Cenepa, 4°29'30"S, 78°10'30"W, 300 m, 16 June 1997, *Vásquez et al. 24038* (MO).

Anthurium yamayakatense Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Yamayakat, 4°55' S, 78°19' W, 6320 m, Oct. 1995, *N. Jaramillo & S. Katip 788* (holotype, MO-05053652, isotype, USM). Fig. 6c.

Planta epiphytica; internodia brevia, 1.2 cm diam. in sicco; cataphylla 7.5–16 cm longa; petioli 28.5 cm longi, 5 mm diam. in sicco; laminae oblongo-ellipticae, 40.5 cm longae, 11 cm latae; nervis primariis lateralibus 9–11 utroque. Flores 1.5 mm longa, 1.7 mm lata.

Epiphytic; **internodes** short, drying 1.2 cm diam.; **cataphylls** 7.5–16 cm long, drying brown, lanceolate to almost linear, persisting at upper internodes as a reticulum of fine, pale tan fibers. **Petioles** 28.5 cm long, drying 5 mm diam., yellowish brown, darkened near base; geniculum shaped like petiole, concolorous with petiole, 2 cm long, drying 4 mm wide; **blades** oblong-elliptic, slightly inequilateral, one side up to 5 mm wider, narrowly acuminate and apiculate at apex, narrowly attenuate at base, 40.5 × 11 cm, 3.7 times longer than wide, drying light grayish brown, weakly glossy, eglandular above, darker brown, semi-glossy, somewhat inconspicuously glandular-punctate below; **midrib** narrowly convex, concolorous; **primary lateral veins** 9–11 per side, 0.8–2 cm apart, sometimes arising at an acute angle, then spreading to a 25–40° angle, prominently loop connected, concolorous, prominulous; collective veins arising from base, equally prominent as primary veins, 6–11 cm from margin. Inflorescence with **peduncle** 38.5 cm long, drying 6 cm wide (flattened), brown slightly tinged with red; **spathe** reflexed-spreading, linear, 12 cm × 11 mm, 0.31 times the length of peduncle, narrowly acuminate and aristate (to 7 mm) at apex; **spadix** cylindrical, abruptly tapering near apex, erect at base, curving to a 90° angle toward spathe, 17 cm × 6 mm. Flowers 1.5 × 1.7 mm, 7–8 visible per spiral; lateral tepals 0.8 mm wide, outside margins 2-sided.

Anthurium yamayakatense is endemic to the type locality in northern Perú at 320 m in Premontane rain forest (P-rf) life zone. The species is a member of section *Porphyrochitonium* and is characterized by long cataphylls, elliptic blades, prominulous primary veins, and prominently loop-connected collective veins.

It is similar to *A. atamainii*, but that species has shorter cataphylls, much more ovate blades, and less prominently loop-connected collective veins.

The species is named for the type locality, the village of Yamayakat in the Province of Bagua, Amazonas Department, Peru.

Dieffenbachia wurdackii Croat, sp. nov. **Type**: Perú. Loreto: high forest along Río Marañon near Teniente Pinglo, just above Pongo de Manseriche, 300–350 m, 4–7 Oct. 1962, *J. Wurdack 2131* (holotype, US-2430721; isotypes NY, USM). Fig. 6d.

Planta terrestris; ad 50 cm alta; internodia 1–26 cm longa, 8–10 cm diam. (in sicco); petioli 13–18 cm longus; vaginati 2/3–4/5 per totam longitudinem; lamina elliptica vel oblongo-elliptica, 11.5–18.5 cm longa, 4.2–7.8 cm lata, acuta vel rotunda ad basim; nervis primariis lateralis non manifestis; pedunculus 5–9.5 cm longus; spatha 9.5–14.5 cm longa; spadice 7.8–12.8 cm longus; parte pistillata 3.7–4.5 cm longus; pistili 18–20; pars staminibus sterilibus 9–11 mm longa.

Terrestrial or on old tree stumps, to 50 cm tall; **internodes** 1–2.6 cm long, drying 8–10 mm diam., medium yellow-brown to dark yellow-brown, matte, finely striate. **Petioles** 13–18 cm long, 0.8–1.3 times longer than blade, sheathed 10–12.5 cm, 2/3–4/5 its length; sheath slender, decurrent to weakly rounded at apex, drying dark yellow-brown, the margins thin, often somewhat undulate; free portion 1.5 mm diam. at apex; **blades** elliptic to oblong-elliptic, 11.5–18.5 × 4.2–7.8 cm, 2.2–3.1 times longer than wide, inequilateral, one side 0.4–0.7 cm wider, drying greenish yellow-brown above, slightly paler and yellow-green below, gradually acuminate at apex, slightly inequilateral, acute to rounded at apex; **midrib** drying weakly flat-raised and finely striate, slightly paler above, flat, moderately paler and sparcely low-acute-striate below; **primary lateral veins** not obvious on either surface; minor veins close, fine, arising from midrib at 30–40° angle. Inflorescences solitary; **peduncle** 5–9.5 cm long, drying 3–4 mm diam, medium-dark yellow-brown; **spathe** 9.5–14.5 cm long, drying 1.2–1.8 cm wide, scarcely constricted above, drying yellowish brown; **spadix** 7.8–12.8 cm long, pistillate spadix 3.7–4.5 cm long, **pistils** 18–20, moderately well-spaced, no more than 3 across the width of the spadix; sterile portion 9–11 mm long; fertile staminate portion 4.0–5.0 cm long; **berries** orange, globose, 6–7 mm diam.

Local Aguaruna name: shikapach sagkap.

Dieffenbachia wurdackii is endemic to Perú, known from Amazonas, Madre de Dios and Loreto Departments at 200–350 m in Tropical moist forest (T-mf) life zone. The species is recognized by its small stature, petioles about as long as blades and sheathed 2/3–4/5 their length, and especially by the more or less elliptic blades with no primary lateral veins.

The species has no clear relatives.

Dieffenbachia wurdackii is named in honor of the late John Wurdack, whose career included work at both the New York Botanical Garden and the Smithsonian Institution. He was perhaps the first to collect in the Río Santiago region and collected the type specimen of this species.

Paratypes: PERU. AMAZONAS: Huambisa, Río Santiago, ca. 65 km N of Pinglo, Caterpiza, 200 m, 6 Feb. 1980, *Huashikat 1971* (MO). Madre de Dios: Tambopata, 26 May 1986, *Funk et al. 8211* (US).

Monstera aureopinnata Croat, sp. nov. **Type**: Perú. Amazonas: Cajamarca, San Ignacio, Huarango, Nuevo Mundo-Pisaguas, secondary forest, 5°10'00"S, 68°32'00"W, 13 Nov. 1997, *J. Campos & S. Nuñez 4639* (holotype, MO-04971512; isotypes, F, K, US, USM). Fig. 7a.

Planta hemiepiphytica; internodia brevia, 2–2.5 cm diam.; petioli 29–44 cm longi; laminae pinnatipartitae, flavida (in sicco); pinnae 3–6 utroque, 1–7.1 cm latae; pedunculus 7.5–9 cm longus; spatha 12–22 cm longa; spadice aurantiacus, 9.5–15 cm longus.

Appressed-climbing hemiepiphytic; **internodes** shorter than broad on adult plants, to 2–2.5 cm diam., longer than broad and to 3 cm long on preadult plants, epidermis drying yellow-brown, semiglossy, conspicuously longitudinally folded-ridged and transversely fissured. Leaves erect-spreading with **petioles** thicker than broad, 29–44 cm long, drying finely ribbed, 6–8 mm thick on free

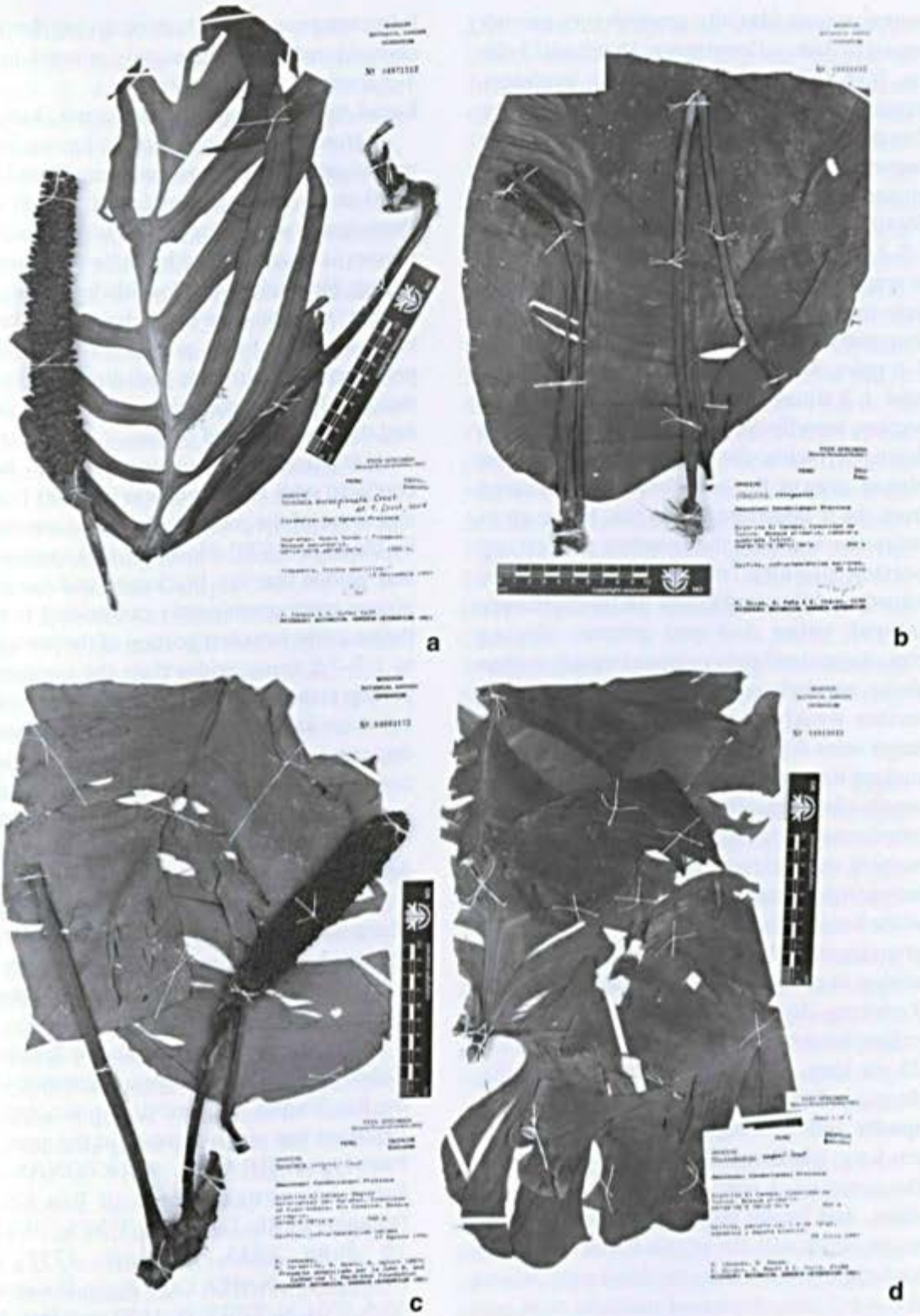


Figure 7 - a. *Monstera aureopinnata* Croat. Type specimen. (*Campos & Nuñez 4639*); b. *Monstera cenepensis* Croat. Type specimen. (*Rojas et al. 0133*); c. *Monstera vasquezii* Croat. Type specimen. (*Vasquez et al. 18870*); d. *Philodendron ampamii* Croat. Type specimen. (*Vasquez et al. 24488*)

portion, sulcate adaxially, greenish gray, grayish brown to dark yellow-brown, sheathed 13–26 cm, 0.36–0.78% its length; sheath persistent intact; geniculum 2.5 cm long, drying darker than the petiole; **blades** pinnately lobed, usually unevenly with an unequal number of pinnae or pinnae of much different widths, 44–58 × 19–26(40) cm, (1.4)2–2.6 times longer than wide, 1.3–1.9 times longer than petioles, drying gray to gray-green to yellow-brown above, usually pale to medium yellow-brown below, less frequently dark yellow-brown below; pinnae 3–6 pairs, 1–7.1 cm wide, the middle of the lobe 1.2 times wider than the constricted portion, broadly decurrent at base both up and down the rachis, the broadest portion of the pinnae always the very base (as measured from the 2 decurrent sides) this being up to twice the width of the broadest part of any portion distally; the lowermost pinnae sometimes bifurcated to near the base; **primary lateral veins** 1–4 per pinnae, drying concolorous to slightly paler and weakly sunken above, narrowly raised and paler below; upper surface weakly and minutely granular, with major veins drying slightly paler, flat or weakly sunken; lower surface drying with minor veins, mostly closely parallel, with occasional oblique interconnectivity (especially toward margins), raphide cells clearly visible as raised lines between the minor veins with occasional short white linear cellular inclusions visible, weakly granular on high magnification. Inflorescence arising in clusters of up to 3; **peduncles** 7.5–9 cm long, drying 5–7 mm wide, dark to light yellow-brown, matte, finely striate; **spathe** 12–22 cm long, 1.4–2 times longer than spadix, drying yellow-brown to dark reddish brown; **spadix** yellow-orange (post-anthesis) 9.5–15 cm long; **pistils** ca. 3 mm long, drying with the ovary ca. 1 mm wide, the style 1.5 mm diam., dark brown, minutely papillate-granular, matte, acute with the stigma borne at the apex and slightly wider than the dried style; stigma 0.6 × 0.3 mm, depressed medially with pale brown raised margin; stamens free, ca. 2 mm long on drying, the thecae 1.2 mm long, oblong, closely parallel, the filament flattened. Infructescence to 21 × 3 cm on drying; **berries** obovoid, red to orange, acutely pointed, to 8 x 4–5 mm.

Local Aguaruna name: magkamak, katípas.

Monstera aureopinnata is known from northeastern Peru, Brazil and Ecuador at 130–1550 m in Tropical wet forest (T-wf) and Premontane wet forest (P-wf) life zones. The species is characterized by yellowish brown-drying, pinnately-lobed leaf blades (hence the epithet 'aureopinnata'), which are lobed to the base with the basal portions of the lobes prominently decurrent in both directions on the rachis. Also characteristic are the acute pistils and the orange to red berries.

Monstera aureopinnata has been confused with *M. subpinnata* (Schott) Engler and some of the paratypes were so annotated by Madison (1977). However, that species has leaf blades that dry blackened and have the pinnae more prominently constricted toward the base (the broadest portion of the pinnae up to 3.7–7.8 times wider than the constricted portion at the base with the total decurrent only 1.5–4 cm long), and are not so conspicuously decurrent in both directions on the rachis. In contrast, for *M. aureopinnata* the broadest portion of the pinnae is only 1.2–2 times as wide as the narrowest portion, and the total decurrent portion is 3.5–10.3 cm wide.

A single sterile collection from Brazil in Maranhao, Municipio Monçao along the Río Turiaçu has very similar leaf blades, but that collection dries with the stem dark brown, moderately smooth, and finely striate.

The species is also similar to *Schultes & Cabrera 19325* from Vaupes, Colombia, along the Río Vaupes at Cerro de Tipiaca, but that specimen has pistils truncate at the apex.

Paratypes: BRAZIL. AMAZONAS: Río Jurua basin, near mouth of Río Embira (tributary of Río Tarauaca), 7°30'S, 70°15'W, 10 June 1933, *Krukoff 4752* (A). ECUADOR. NAPO: Lago Agrio-Baeza at km 67.5, 0°01'N, 77°19'W, 1180 m, 6 Oct. 1980, *Croat 50465* (MO). PASTAZA: Finca El Valle de Muerte on Río Curaray, ca. 10 km E of Curaray (Jesus Pitishka), 200 m, 22 Mar.

1980, *Harling 17647* (MO). PERU. San Antonio, Río Samiria. 23 Aug. 1983, *Ayala & Arévalo S. 4229* (MO). AMAZONAS: Yamayakat, Kusu-Chapi, Imaza, Región del Marañon, area permanente 500 x 500 m, Parcela "E", 4°55'S, 78°19'W, 550 m, Feb. 1995, *Vasquez et al. 20066* (MO); 4°55'S, 78°19'W, 320 m, 23 Jan. 1996, *N. Jaramillo et al. 963* (MO); Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdívia, 4°30'S, 78°30'W, 200–250 m, 3 Aug. 1978, *Kujikat 148* (MO); 2 km bajo de La Poza, entrando por la trocha de la isla de La Poza, Río Santiago, 180 m, 16 Aug. 1979, *Leveau 166* (MO); Condorcanqui, S of Huampami trail to house of Theodora, S of Río Cenepa, 240–260 m, 17 July 1974, *Berlin 1673* (MO, USM); ridge above Chikisinuk, a tributary of Huampami, entering from S about 5 km from confluence with Río Cenepa, 240–315 m, 21 Dec. 1972, *Berlin 665* (MO, USM); Kachaig, 11 June 1973, *Ancuash 618* (MO, USM); trail N of Río Cenepa to Tuhushiku Creek, 215–240 m, 30 July 1974, *Berlin 1875* (MO); Bashuchunuk, Huampami, 17 Jan. 1973, *Kayap 140* (MO); 1 km behind Caterpiza, E of Quebrada Caterpiza, Río Santiago, 180 m, 24 Nov. 1979, *Huashikat 1397* (MO); Cajamarca, San Ignacio, Huarango, Nuevo Mundo-Pisaguas, 5°10'00"S, 68°32'00"W, 1550 m, 13 Nov. 1997, *Campos & Nuñez 4639* (MO). LORETO: 17 km SE of Iquitos; 25 July 1972, *Croat 18483* (MO); Tigre, Río Corriente, Forestales (Shiviyacu), 25 Nov. 1979, *Ayala 2370* (MO); Alto Amazonas, Andoas, Río Pastaza near Ecuador border, 230 m, 17 Nov. 1979, *Gentry & Diaz 28256* (MO); Maynas, Guarnición "Pijuayal", una hora de camino, trocha hacia la parte porterior del Cuartel Militar, 130 m, 7 Sep. 1978, *Díaz et al. 547* (MO); Iquitos, Aucaya, 130 m, 7 May 1973, *Rimachi 308* (MO); Carretera de Zungaro Cocha a la qurbrada de Shushuna, 120 m, 5 Dec. 1985, *Rimachi 8131* (MO); Allpahuayo, Est. Exp. Instituto de Investigaciones de la Amazonía Peruana (IIAP), transect 4, 120 m, 2 June 1990, *Vásquez & Jaramillo 14014* (MO); Indiana, 115 m, 3°30'S, 72°58'W, 16 Dec. 1987, *Vásquez & Jaramillo 10160* (MO); Allpahuayo, Est. Exp. del Instituto de Investigaciones de la Amazonia peruana (IIAP), 4°10'S, 73°30'W, 150–180 m, 21 May 1991, *Vasquez et al. 16235* (F, KYO, MO, NY); vic. of Iquitos, collection data lost, 120 m, 1977, *Revilla 3676* (MO); Pacaya-Samiria, Res. Nac. Pacaya-Samiria, Est. Biol. Pithecia, Río Samiria, 3°18'S, 74°50'W, 130 m, 21 Oct. 1990, *Grández & Jaramillo 2018* (MO); Requena, Saquena, Río Ucayali, trail from Quebrada de Aucayacu, above Genaro Herrera, 9 Feb. 1979, *Rimachi 4278* (MO). SAN MARTÍN: Tingo María, 625–1100 m, 30 Oct.-19 Feb. 1950, *Allard 21633* (US); *22436* (US); Mariscal Caceres; 650 m, Tocache Nuevo, Río de la Plata, cerca a la Chacra del Sr. Esteban Arévalo, 14 Sep. 1980, *Schunke-Vigo 12284* (MO); Pebas, Quebrada Shishita, 10 km de Pebas, 14 May 1976, *Revilla 606* (MO); hills above Chazuta, ridge to W of Chazuta, 6°34'S, 76°12'W, 200–300 m, 21 Sep. 1986, *Knapp 8358* (MO, USM); Río Huallaga basin, 150–350 m, Balsapuerto, 28–30 Aug. 1929, *Killip & Smith 28421* (US).

Monstera cenepensis Croat, sp. nov. **Type**: Peru. Amazonas: Condorcanqui, El Cenepa, Tutino, headwaters of Tutino, 4°34'31"S, 78°11'34"W, 300 m, 22 July 1997, *R. Rojas, A. Peña & E. Chávez 133* (holotype, MO-04920432; isotypes, K, USM). Fig. 7b.

Planta hemiepiphytica; internodia, brevia, 1.2 cm diam.; petioli 48 cm longi, 6–7 mm diam. in sicco; laminae ovatae, 43.5 cm longae, 18.5 cm lata, infime subcordata; nervis primariis 12 utroque; pedunculus 19.5–20 cm longus; spadice 5.6–6 cm longus, 10–12 mm diam.

Hemiepiphytic; **internodes** short, 1.2 cm diam., drying blackened, matte, conspicuously warty. **Petioles** 48 cm long, drying 6–7 mm diam., 1.1 times longer than the blade, narrowly flattened adaxially with marginal ribs, becoming obtusely sulcate toward the apex, obtusely ribbed around the circumference, dark brown toward the base, in part pale yellow-brown, sheathed 7.5 cm long at base;

geniculum 3 cm × 5 mm, drying blackened; **blades** ovate, 43.5 × 18.5 cm, 1.5 times longer than wide, semiglossy, drying thinly coriaceous, blackened above, dark brown below, inequilateral and acute at apex, weakly subcordate and inequilaterally weakly attenuate at base, inequilateral, one side 1.5 times wider; **midrib** weakly raised and slightly darker above, thicker than broad, obtusely several-ribbed, minutely granular, slightly darker than the surface; **primary lateral veins** 12 per side, arising at an acute angle then spreading at 30–50° angle in upper half of the blade, 70–85° toward the base, convex and concolorous above, convex and paler below; minor veins arising from both the midrib and the primary lateral veins, becoming subparallel and mostly unbranched in the proximal ½ of the blade, but with frequent branching toward margins, very weakly raised and concolorous on lower surface; sinus shallow, ca. 2.5 cm deep, broadly arcuate. Inflorescence with **peduncles** 19.5–20 cm long, drying dark yellow-brown, matte; prophyll 11 cm long, drying dark brown; **spathe** not seen, **spadix** 5.6–6 cm × 10–12 mm; **pistils** 1.6–2 mm long, less than 1 mm diam.; style dark brown-black, matte, densely papillate, ellipsoid to subrounded 2.8–3.2 × 2.6–3.0 mm; stigma 2.2–2.4 × 0.2–0.3 mm, the margins raised and pale brown; stamens 1.4 mm long, thecae 0.4 mm wide. Infructescence brown.

Monstera cenepensis is known only from the type locality in the Río Cenepa region (hence the epithet "cenepense") at 300 m in the Premontane wet forest (P-wf) life zone.

The species is perhaps most closely related to *M. adansonii* var. *laniata*, but that species has shorter, thicker peduncles that are proportionately much shorter than those of *M. cenepensis*. In addition, the leaf blades of *M. adansonii* var. *laniata* typically dry much more green.

Monstera vasquezii Croat, sp. nov. **Type**: Perú. Amazonas: Condorcanqui, El Cenepa, Kusu-kubaim, Río Conaina, 4°25'S, 78°16'W, 17 Aug. 1994, *R. Vasquez, R. Apanu,* and *M. Ugkuch 18870* (holotype, MO-04664172). Fig. 7c.

Planta hemiepiphytica; internodia ad 2.5 cm longa, 1.8 cm diam. in sicco; petioli 29 cm longi, 8–9 mm x 5–6 m lata; laminae anguste ovatae, 56 cm longae, 26 cm latae, rotundata ad basim; nervis primariis lateralibus 14 utroque; pedunculus 13 cm longus; spadice 17 cm longus, 3.1 cm latus (in sicco).

Hemiepiphytic climber; **internodes** to 2.5 cm long, drying 1.8 cm diam., epidermis semiglossy, drying medium gray-brown, frequently peeling free, the underlying stem drying blackened, matte, weakly & closely ribbed. **Petioles** 29 cm long, thicker than broad, 8–9 mm thick, to 1 cm wide at the base, 5–6 mm wide toward the apex, drying matte, gray-brown, narrowly sulcate adaxially with the margins raised, sheathed throughout most of its length, the margin promptly deciduous with a few brown fibers persisting; **blades** entire, narrowly ovate, 56 × 26 cm, 2.1 cm longer than wide, acuminate at apex, rounded at base, yellowish gray-green above and below; **midrib** broadly raised and weakly paler above, narrowly rounded and paler below, drying yellow-brown, matte; **primary lateral veins** 14 per side, arising at an acute angle, then spreading at 70–85° angle, drying flattened and darker than surface, finely and minutely ridged; minor veins reticulate throughout the region between the midrib and the margin but moderately obscure on lower surface. Inflorescence solitary; **peduncle** 13 cm long, drying blackened, 6 mm diam.; **spadix** 17 cm long, drying 3.1 cm wide; pistil 1.2 × 2.2–2.5 mm; stigma 3.2–3.6 × 3.8–3.0 mm, dark brown, matte, irregularly oblong to rounded or hexagonal; stigma oblong, 3–3.4 mm long, 1 mm wide, deeply sunken medially with a brown raised rim.

Monstera vasquezii is known only from the Río Cenepa region at 700 m in Premontane wet forest (P-wf) life zone. The species is a member of section *Monstera*, most closely related to *M. dubia* because of similar blade shape and drying color. *Monstera dubia* differs in having a more or less subcordate blade base and conspicuously reticulate tertiary veins. In contrast, *M. vasquezii* has merely rounded blades at the base, and much less conspicuous reticulate venation. In addition, *M. dubia* typically has 1–2 rows of perforations on both sides of the midrib, whereas *M. vasquezii* is not obviously perforate.

The species is named after Rodolfo Vasquez, Missouri Botanical Garden, preeminent Peruvian botanist and the collector of the type specimen.

Philodendron ampamii Croat, sp. nov. **Type**: Perú. Amazonas: Condorcanqui, El Cenepa, Tutino, 4°33'05'S, 78°12'54"W, 28 July 1997, *R. Vasquez, D. Amam, E. Quiaco, A. Ampam & C. Dupis 24488* (holotype, MO-04919049; isotypes K, US, USM). Figs. 7d, 8a.

Planta epiphytica; internodia brevia, 3.5 cm diam. in sicco; petioli ca. 1 m longi; laminae profunde 3-lobatae, 72 cm longae, 75 cm latae; lobus medius 51.5–57.5 cm longus, 30–40 cm latus; lobas posterioribus 32–41 cm longus, 17.5–26 cm latus; nervis primariis lateralibus 5–7 utroque. Inflorescentia 5 in quoque axilo; pedunculus 5–8.5 cm longus, 3 mm diam. in sicco; spatha alba, 12.5–17.5 cm longa, 2–3 cm diam. in sicco; spadice 15.6 cm longus; parte pistillata 7.2 cm longa; parte staminata 8.6 cm longa.

Large, epiphytic; **internodes** short, drying 3.5 cm diam., yellow-brown, coarsely and irregularly acute-ridged; **cataphylls** not seen, but promptly deciduous. **Petioles** to ca. 1 m long, subterete near apex, drying narrowly and deeply sulcate toward the based, broadly flattened near the base, finely to coarsely ribbed abaxially, drying dark reddish brown, matte; **blades** deeply 3-lobed, 72 × 75 cm, subcoriaceous, drying dark yellowish gray-brown above, paler and reddish brown below; medial lobe 51.5–57.5 × 30–40 cm; posterior lobes 32–41 × 17.5–26 cm, spreading laterally, the lower margin straight or prominently sinuate; basal veins 18 pairs, the 1st pair free to the base, the remaining variously united into a posterior rib which extend straight to the tip of the blade, 11–12 veins basioscopic, 7 acroscopic; **midrib** broadly convex and slightly paler above, more nearly convex and finely ribbed below, drying yellow-brown and paler than the surface; **primary lateral veins** 5–7 per side, arising at 60–70° angle; minor veins drying weakly raised, concolorous, arising from both the midrib and the primary lateral veins. Inflorescence 5 per axil, white, drying dark red-brown; **peduncle** 5–8.5 cm long, drying flattened, 3 mm diam., finely ridged; **spathe** white, 12.5–17.5 × 2–3 cm on drying, matte, minutely granuliform and covered sparsely with minute white globular protrusions (not capable of being scraped free without disintegrating); **spadix** 15.6 cm long; pistillate portion 7.2 cm long; staminate portion 8.6 cm long; pistils 2 × 1 mm on drying; style 1.2 mm diam., drying pale brown; 0.8–0.9 mm diam.; locules 5; ovules 1 per locule.

Philodendron ampamii is known only from Amazonas, Peru at ca. 340 m elevation, and occurs in the Premontane wet forest (P-wf) life zone.

This new species is characterized by deeply 3-lobed blades that are dark brown on the upper surface and dark yellow-brown on the lower surface with major veins convex on the lower surface. The spathe is white and the peduncles dry slender and blackened. It is closely related to *P. brent-berlinii* Croat, which shares similarly deeply 3-lobed blades with prominent lateral auricles. *Philodendron brent-berliniii* differs in having blades that dry yellowish gray on both surfaces and major veins that dry bluntly acute on the lower surface. *Philodendron brent-berlinii* also differs in having the spathe tinged orange or reddish brown with the peduncles thicker.

Philodendron ancuashii Croat, sp. nov. **Type**: Perú. Amazonas: Río Cenepa, vic. Hampami, ca. 5 km E of Chávez Valdivia, ca. 4°30'S, 78°30'W, 200–250 m, 14 Aug. 1978, *E. Ancuash 1463* (holotype, MO-2708162). Fig. 8b.

Planta hemiepiphytica; internodia ad 2 cm longa, 1.5 mm diam; petioli 32–32.5 cm longi, 4–5 mm diam.; laminae oblongo-lanceolatae 37.5–46.5 cm longae, 11.8–16.5 cm latae, nervis primariis debilis, 4 utroque; inflorescentia 2 in quoque axila; pedunculus 3.5–4.5 cm longus, 2.5 mm diam.; spatha 4.4–4.6 cm longa, 4–5 mm diam; spadice 3.8 cm longus; parte pistillata 1.7 cm longa, 1.1 mm diam.

Hemiepiphytic plant; **internodes** to 2 cm or more long, to 1.5 cm diam., drying deeply folded, light reddish brown, the surface smooth or sometimes closely transverse-fissured; **cataphylls** not seen. **Petioles** 32–32.5 cm × 4–5 mm, drying somewhat flattened throughout, obtusely sulcate toward the base and toward the apex, medium reddish brown, irregularly and minutely sulcate-ribbed throughout, matte; **blades** oblong-oblanceolate, 37.5–46.5 × 11.8–16.5 cm, 3.1–3.8 times longer than wide, abruptly acuminate at apex, narrowly rounded at base, drying gray above, faintly reddish brown below; **midrib** drying obtusely sunken to weakly raised and +/-concolorous above; **primary lateral veins** 4 per side, drying not at all apparent above, weakly visible, but scarcely raised below, arising at an acute angle then spreading at 55–60° angle; minor veins drying quilted-sunken and concolorous above, close and moderately fine, distinctly visible, much less apparent below, scarcely raised, concolorous. Inflorescences 2 per axil; **peduncle** 3.5–4.5 cm long, drying pale reddish brown, finely ridged, 2.5 mm diam.; **spathe** 4.4–4.6 cm × 4–5 mm, finely ridged externally; **spadix** 3.8 cm long; pistillate portion 1.7 cm × 1.1 mm throughout; staminate portion 2.1 cm long, the sterile staminate flower in a single whorl; pistils 4–6-sided or subcircular at apex, 4 mm diam. except for those at the apex and base to 6 mm diam., the outer margin pale brown, the center dark brown; locules 3, one basal ovule per locule; ovules 0.2 mm long, densely papillate, white.

Philodendron ancuashii is known only from the type locality near Huampami along the Río Cenepa at 200–250 m elevation in Tropical wet forest (T-wf) and Premontane wet forest (P-wf) life zones.

The species is most similar to *P. herthae* K. Kr. or *P. uleanum* Engl., but differs from both by the lack of primary lateral veins on the upper blade surface and by the tiny inflorescences. *Philodendron ancuashii* is a member of *Philodendron* subgenus *Philodendron*, section *Baursia*, in part characterized by the general lack of primary lateral veins. Both *P. herthae* and *P. uleanum* are members of section *Philodendron* series *Glossophyllum* Croat.

The species is named in honor of Ernesto Ancuash, an Aguaruna plant collector who collected the type specimen as part of Brent Berlin's ethnobotanical research expeditions to the Alto Marañón river region.

Philodendron avenium Grayum & Croat, sp. nov. **Type**: Perú. Amazonas: Río Santiago valley, Huambisa, 65 km N of Pinglo, 2–3 km behind Caterpiza, 200 m, 8 Feb. 1980, *V. Huashikat 2016* (holotype, MO-2828537). Fig. 9d.

Planta hemiepiphytica; internodia 3.5–6 cm longa, 4–5 mm diam.; petioli 7–8 cm longi, 7.4–7.5 mm lati; laminae oblongo-ellipticae, 21.2–21.8 cm longae, 2.6–2.9 cm latae; nervis primariis lateralibus obscuris; pedunculus 5.5 cm longus; spatha 7.5–10 cm longa, 1.8 cm diam., viridis extus, pallide viridis intus; spadice 8.7 cm longus; parte pistillata 2.5 cm longa, 1.0 cm diam.

Hemiepiphytic vine; **internodes** 3.5–6 cm long, drying 4–5 mm diam., coarsely and irregularly ridged longitudinally, pale yellow-brown, semiglossy, the epidermis otherwise smooth. **Petioles** 7–8 × 7.4–7.5 cm, sheathed to within 8 mm from base of blade; sheath 5.5–7.4 cm × 5–7 mm on each side, held erect, along with the shaft of the petiole finely ribbed

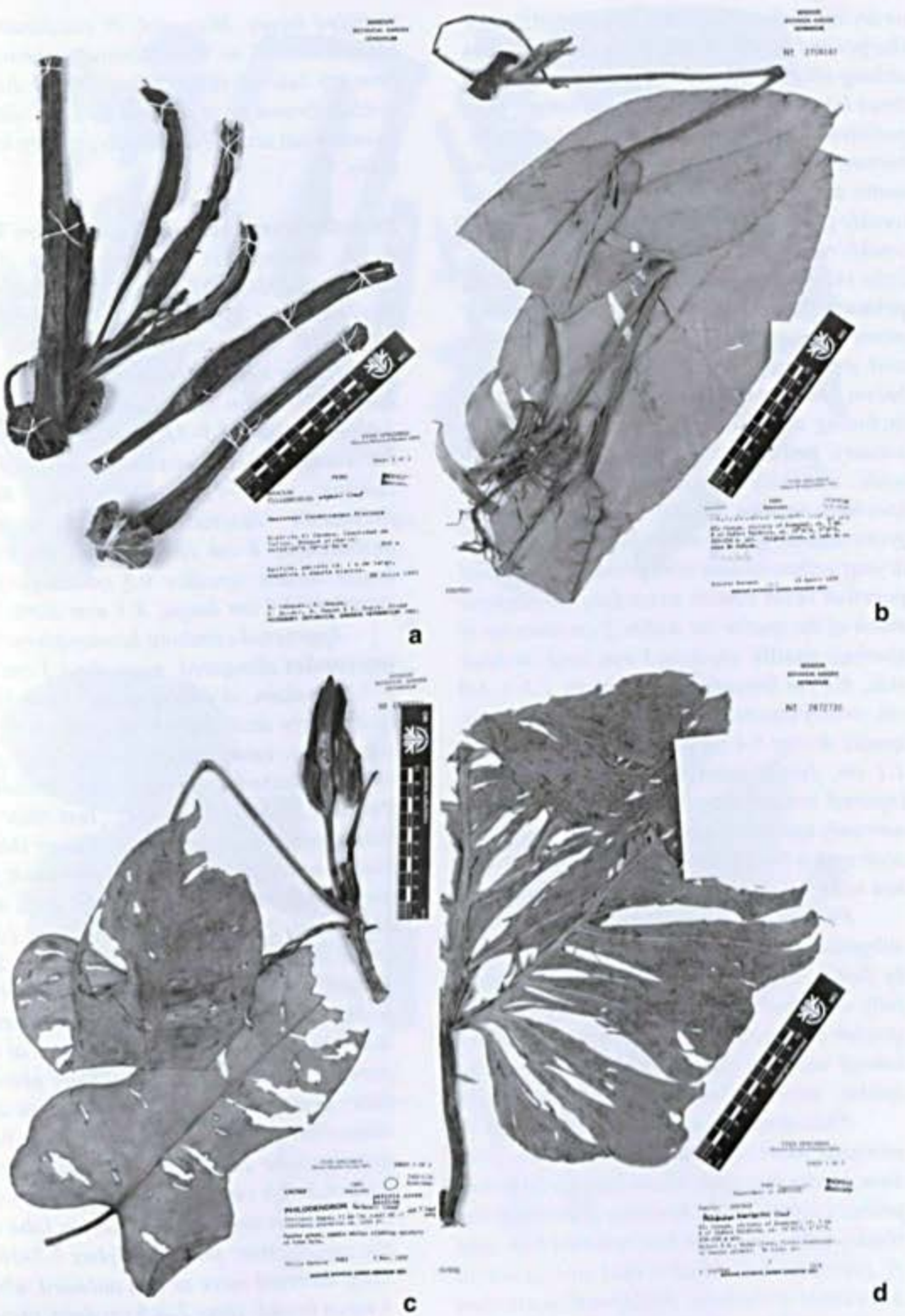


Figure 8 - a. *Philodendron ampanii* Croat. Type specimen. (*Vasquez et al. 24488*); b. *Philodendron ancuashii* Croat. Type specimen. (*Ancuash 1463*); c. *Philodendron barbourii* Croat. Type specimen. (*Barbour 4511*); d. *Philodendron brent-berlinii* Croat. Type specimen. (*Kujikat 6*)

on drying, yellowish brown; free part of petiole sharply and narrowly sulcate on drying; **blades** oblong-elliptic, 21.2–21.8 × 7.5 cm, 2.6–2.9 times longer than wide, 3.1 times longer than petioles, weakly short-acuminate at apex, narrowly rounded at base, drying gray and matte above, paler and yellowish gray and weakly glossy below; **midrib** scarcely visible, weakly raised and concolorous above, convex, light yellow brown and finely ridged below; **primary lateral veins** not at all apparent; minor veins arising at ca. 35° angle, narrowly and weakly raised above, scarcely raised below, both surfaces finely granular throughout including on the minor veins. Inflorescence solitary; **peduncle** 5.5 cm long, drying 3.5 mm wide, coarsely ridged and densely pale-speckled; **spathe** 7.5–10 × 1.8 cm, medium green outside, drying matte, paler green within, drying yellow-brown with prominently raised purplish resin canals extending throughout much of the spathe (to within 2 cm from tip of spathe); **spadix** stipitate 3 mm long on back side, 8.7 cm long; pistillate spadix 2.5 × 1.0 cm, weakly tapered toward the base; staminate spadix drying 6.4 cm long, sterile portion 1 × 1.1 cm; fertile staminate portion narrowly tapered toward apex, 6 mm diam.; **pistils** narrowly tapered to apex, drying 0.5 mm diam.; style with a broad thin wafer-like apron 1–1.2 mm wide; stigma donut-shaped, 0.8 mm diam.

Philodendron avenium is a member of subgenus *Pteromischum*. It is characterized by finely ridged yellow-brown stems, nearly fully sheathed petioles, and oblong-elliptic, grayish-drying blades that lack obvious primary lateral veins on the dried blades (hence the epithet "avenium" meaning "without veins").

Philodendron avenium is similar to *P. pteropus* Mart. ex Schott because they both have blades less than 10 cm long and obscure primary lateral veins, however, *P. avenium* has blades with a more or less rounded base and *P. pteropus* has blades that are acute to attenuated at the base. *Philodendron avenium* is also similar to *P. caudatum* K. Kr. because they both have blades less than 10 cm long, obscure primary lateral veins, and blades with rounded bases. However, *P. caudatum* has blades with 5 to 7 moderately prominent primary lateral veins, often drying dark to reddish brown on the lower surface, while *P. avenium* has scarcely apparent primary lateral veins.

Philodendron barbourii Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, 43 km NE of Chiriaco, 1050 m, 7 Nov. 1978, *P. Barbour* 4511 (holotype, MO-2800701; isotypes, USM). Fig. 8c.

Planta hemiepiphytica; internodia 5 cm longa, 1–1.5 cm lata; cataphylla 5.2–6 cm longa; petioli 25.5–31.5 cm longi, minus 1 cm diam.; laminae panduriformi, 26–30 cm longae, 14.5–19.5 cm latae; nervis primariis lateralibus 3–5 utroque; pedunculus 6 cm longus; spatha 9.5 cm longa, viridis; spadice 9.5 cm longus; pars pistillata 2.9 cm longa, 8.5 mm diam.

Appressed-climbing hemiepiphytic vine; **internodes** elongated, more than 5 cm long, 1–1.5 cm diam., drying medium yellow-brown, irregularly and sharply ridged on drying, semiglossy; **cataphylls** 5.2–6 cm long, green, sharply flattened on one side, deciduous. **Petioles** 25.5–31.5 cm long, less than 1 cm diam., equal to or somewhat longer than the blades, terete, drying dark yellow-brown, finely and acutely ribbed, the genicular area drying blackened, 2.5–3 cm long, sheathed 1.0–1.5 cm at the base; **blades** panduriforme, 26–30 × 14.5–19.5 cm, 1.5–1.8 times longer than wide, subcordate with somewhat spreading lobes at base, abruptly acuminate at apex, prominently constricted 8–12 cm above the base; drying matte and grayish yellow above, somewhat paler and yellow-brown below; anterior lobe 24–25 cm long, the constricted area 6.5–9.5 cm wide, 9.5–14.7 cm wide in the broadest area of the anterior lobe above the constriction; posterior lobes 7.7–10.5 cm long, directed more or less outward, about as long as broad; sinus 2–4.5 cm deep, arcuate to parabolic at apex; **midrib** drying +/- flattened, closely and finely ridged, darker than surface above, narrowly raised, closely and finely

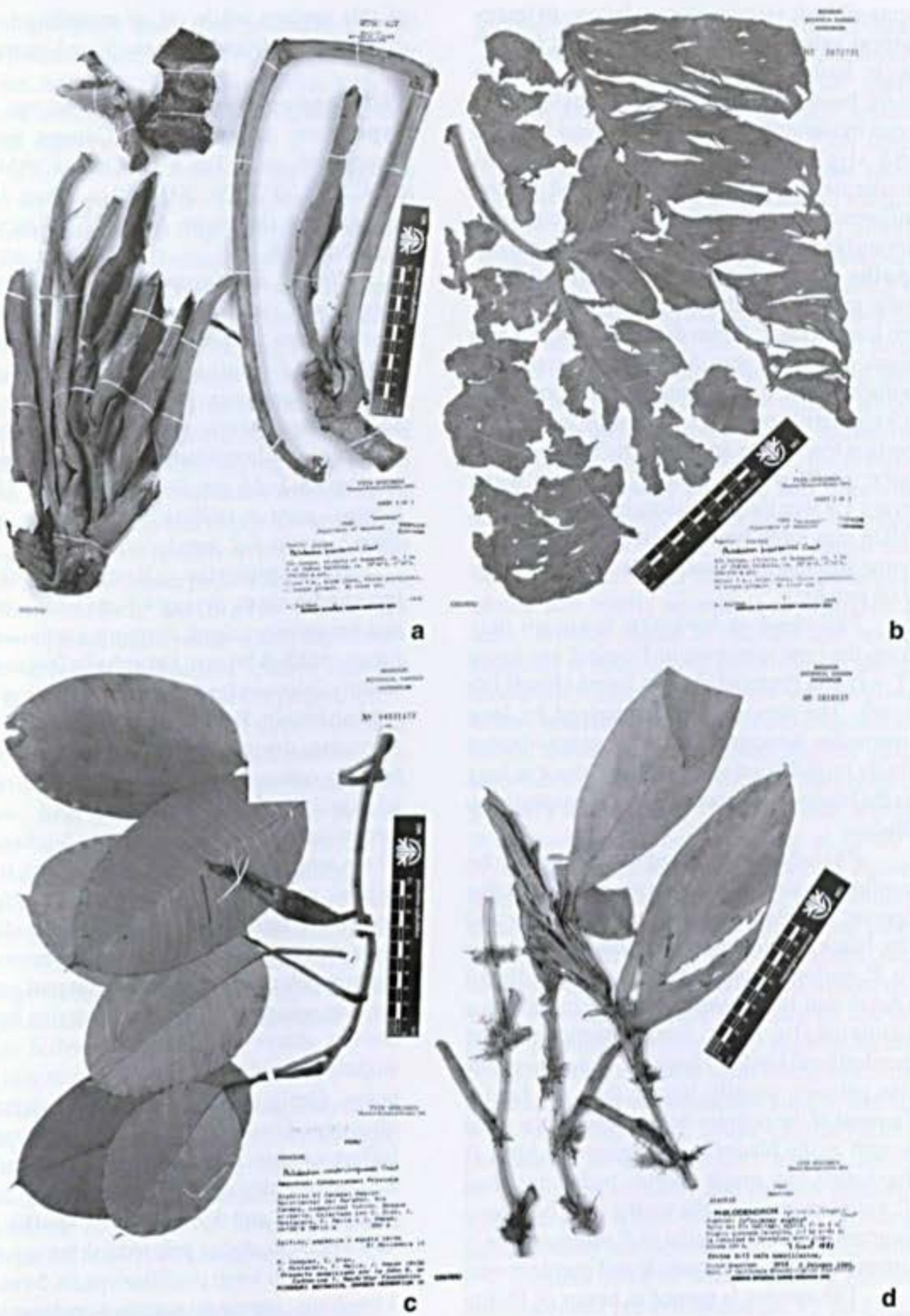


Figure 9 - a, b. *Philodendron brent-berlinii* Croat. Type specimen. (*Kujikat 6*); c. *Philodendron codorcanquense* Croat. Type specimen. (*Vasquez et al. 18438*); d. *Philodendron avenium* Grayum & Croat. Type specimen. (*Huashikat 2016*)

acute-ribbed, +/- concolorous below; **primary lateral veins** 3–5 per side, arising at 65–70° angle; basal veins 3 per side, the 1st pair free to the base, spreading at 80–90° angle; major veins moderately obscure above, weakly raised and slightly paler below; minor veins moderately distinct, weakly raised below. Inflorescence solitary; **peduncle** 6 cm long, drying blackened and finely ridged, 4 mm wide; **spathe** 9.5 cm long, green; **spadix** 9.5 cm long; pistillate spadix 2.9 cm long in front, 2.7 cm long in back, 8 mm diam. at base, 8.5 mm diam. midway, 7 mm diam. at apex; staminate portion white, 6.5 cm long; sterile portion 1 × 0.9 cm; fertile portion 1.1 cm wide in broadest portion toward the apex, bluntly tapered at the apex; **pistil** with stigma 0.7–1.0 mm wide; ovary 1.8 mm long, 3–4-locular; ovules basal, 0.026 mm long; funicle 0.014 mm, the ovary borne within a translucent gelatinous envelope 0.08 mm long.

Philodendron barbourii is known only from the type specimen in Tropical wet forest (T-wf) and Premontane wet forest (P-wf) life zones. The species is characterized by long internodes, hemiepiphytic habit, yellow-brown finely ridged dried stem, petioles about as long as the blades, and especially by the panduriform blades.

Philodendron barbourii might be confused with *P. panduriforme* Schott, but that species has blades that are much broader and dry black. *Philodendron barbourii* is similar to *P. nullinervium* E. G. Gonc. from Brazil (Acre) and the western Amazon in having a hemiepihytic habit, long internodes, and panduriform blades. However, *P. nullinervium* has petioles usually longer than the blades (instead of the petioles being closer to the same length as the blades in *P. barbourii*). Also, *P. barbourii* has much shorter peduncles than *P. nullinervium*, and the spathe in *P. barbourii* is green, while the spathe in *P. nullinervium* is green to whitish pink outside and purple inside.

The species is named in honor of Phillip Barbour from Louisiana, a former student at the Missouri Botanical Garden who collected many Araceae, including the type specimen of this species while on an expedition with ornithologists from Louisiana State University.

Philodendron brent-berlinii Croat, sp. nov. **Type**: Peru. Amazonas: Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdívia, ca. 4°30'S, 78°30'W, 200–250 m, 3 Aug. 1978, *A. Kujikat 6* (holotype, MO-2672730).
Figs. 8d, 9a, b.

Planta hemiepiphytica; internodia brevia, 4.5 cm diam. in sicco; cataphylla 26 cm longa; petioli 77 cm longi; laminae profunde 3-lobatae, 46–57 cm longae; lobulus auteriores 36–38 cm longae, 29–36 cm latae; nervis primariis lateralibus 5 utroque; pedunculus, 4–5.5 cm longus; spatha 14.5–16 cm longa; spadice 13 cm longus, pars pistillata 5 cm longa, 1 cm diam.; ovula 1-2 per loculum.

Hemiepiphytic climber to 4 m, **internodes** short, drying 4.5 cm wide, closely and irregularly ridged, forming a reticulum of ridges, reddish brown; **cataphylls** 26 cm long, sharply 2-low-ridged, deciduous, drying light reddish brown. **Petioles** subterete, 77 cm long, subterete, drying reddish brown, convex to broadly concave abaxially, coarsely 3-ribbed adaxially, finely ridged and warty circumferentially; **blades** deeply 3-lobed, 46–57 cm long, drying gray above, reddish brown below; anterior lobe 36–38 × 29–36 cm, acuminate; **midrib** obtusely raised and slightly paler above, convex, grayish yellow-brown and slightly paler below; **primary lateral veins** 5 per side, arising at 55–65° angle, drying broadly convex above with a weak medial sulcus, slightly paler above, broadly convex and paler below, finely striate; minor veins moderately obscure; lower surface finely granular. Inflorescences 3 to 4 per axil; **peduncle** 4–5.5 cm long, drying pale reddish brown, matte, finely ribbed and densely warty; **spathe** 14.5–16 × 2–2.5 cm, drying pale reddish brown, matte; **spadix** 13 cm long; pistillate spadix 5 cm long, 1 cm diam.; staminate portion 8 cm long; sterile staminate portion 1 × 1.4 cm; fertile staminate portion 8 × 10–11 mm at base, promptly constricting to 8 × 10 mm diam. constricted area

1 cm above the base, then gradually tapered to a pointed apex; locules 5–6; ovules 1–2 per locule, basal, ca. 1 mm long along with the slender funicle, funicle about as long as the ovule. **Local Aguaruna name**: kachi.

Philodendron brent-berlinii is known from the Department of Amazonas, Peru and on Cerro Antisana in Napo Province, Ecuador at 200–440 m in Tropical wet forest (T-wf) and Premontane wet forest (P-wf) life zones.

The species is characterized by deeply 3-lobed, yellowish gray-drying blades. It is closely related to *P. ampamii*, which shares similarly deeply 3-lobed blades with prominent lateral auricles. *Philodendron ampamii* differs in having blades drying dark brown above, dark yellow-brown below with the major veins drying broadly convex on lower surface. In addition, the spathe dries somewhat blackened with slender peduncles. In contrast, *P. brent-berlinii* has blades which dry yellowish gray, major veins, which dry bluntly acute on lower surface and spathes that dry pale reddish brown with thicker peduncles.

Grubb et al. 1601, from Cerro Antisana near Shinquipino at 1450 m has a petiole 100–115 cm long and is said to have white lower flowers with brown tips and pink to pinkish green upper flowers. However, no inflorescences were available for study.

Paratypes: ECUADOR. Cerro Antisana, Shinquipino, 440 m, 13 Sep. 1960, *P.J. Grubb et al. 1601* (K). PERU. AMAZONAS: Río Santiago valley, ca. 65 km N Pinglo, 2–3 km behind Caterpiza, 200 m, *Huashikat 2297* (MO).

Philodendron condorcanquense Grayum & Croat, sp. nov. **Type**: Perú. Amazonas: Condorcanqui, El Cenepa, Río Cenepa, Tutino, 350 m, 21 Nov. 1993, *R. Vasquez, C. Diaz, J. Mostacero, F. Mejia, J. Ampam 18438* (holotype, MO-04931473; isotype, USM). Fig. 9c.

Planta hemiepiphytica; internodia 1–4 cm longa, 4–5 mm diam in sicco; petioli 6-cm longi; laminae ellipticae vel ovata-ellipticae, 12 cm longae, 7.8 cm latae; nervis primariis lateralibus 13–16 utroque; inflorescentia 1 in quoque axilo; pedunculus 1.5 cm longus, 5 mm diam in sicco; spatha 9.5 cm longa, 1.7 cm lata in sicco; spadice 8.2 cm longus; parte pistillata 3.2 cm longa.

Hemiepiphytic vine; **internodes** terete, 1–4 cm long, drying 4–5 mm diam., medium yellow-brown, moderately glossy, closely longitudinally folded-ridged with moderately acute edges and with a sparce scattering of dark lenticilate protrusions. **Petioles** 6–9 cm long, sheathed 3/5 the length, or more commonly, nearly throughout, drying dark yellowish green-brown and finely ribbed outside, yellowish brown inside, sometimes transverse-fissured near the base, the margins sometimes minutely undulate and somewhat scarious near base; **blades** elliptic or ovate-elliptic, ca. 12 × 7.8 cm, 1.5 times longer than wide, 1.8 times longer than petiole, rounded to obtuse and briefly acuminate to cuspidate at apex, broadly obtuse to rounded and briefly attenuate at base, drying greenish gray above, moderately paler and grayish yellow-green below; **midrib** weakly sunken and concolorous above, narrowly round-raised, slightly paler below, drying yellow-brown and finely ridged; **primary lateral veins** 13–16 per side, arising at an acute angle then spreading at 75–80°, drying weakly raised and concolorous above, scarcely more prominent than the interprimary veins above, convex to flat-raised and paler below; minor veins weakly raised and concolorous above, interconnected with cross-veins especially toward the margins above, rather prominently raised and slightly darker below, the smaller minor veins interconnecting toward margins or sometimes simply ending with no connection; cross- veins rather prominent toward margins below; areas between veins minutely and densely granular and sparsely white-stitched above, more conspicuously but more sparsely granular with 1–2 irregular rows of white stitching below. Inflorescence 1 per axil; **peduncle** 1.5 cm long, drying 5 mm wide; **spathe** 9.5 cm long, 1.7 cm wide on drying, dark brown, finely short pale-lineate throughout outside, drying dark

brown inside with coarsely raised with resin canals inside; **spadix** 8.2 cm long; pistillate portion 3.2 cm × 8 mm; staminate portion 5.3 cm long; sterile staminate portion 8 × 9 mm; fertile staminate portion 4.5 cm × 7 mm midway; **pistils** 1.5 mm long, the stigma apron drying 7–8 mm wide, light brown, undulate; stigma button-shaped with a deep medial funnel, 4–5 mm diam., drying dark brown.

Philodendron condorcanquense is known only from the type material. It is a member of subgenus *Pteromischium* and is characterized by hemiepiphytic scandent habit, closely ridged, yellow brown-drying stems, mostly fully sheathed petioles, and especially by its elliptic blades which dry grayish yellow-green below and have conspicuous minor veins on both surfaces, with conspicuous granular surfaces below.

Philodendron condorcanquense is similar to *P. exile* in having narrowly ovate blades, less than 2.2 times lonter than wide, however, *P. condorcanquense* has lower blade surfaces with distinctly raised minor veins (as opposed to minor veins scarcely discernable on the lower blade surface in *P. exile*), no laticifers (laticifers present, although not prominently visible in *P. exile*), and one inflorescence per axil (2 inflorescences per axil in *P. exile*).

Philodendron huashikatii Croat, sp. nov. **Type**: Perú. Amazonas: Río Cenepa, vic. Huampami, ca. 5 km E of Chávez Valdívia, ca. 4°30'S, 78°30'W, 200–250 m, 3 km above the mouth of the Huampami, 25 July 1978, *E. Ancuash 1130* (holotype, MO-2672320; isotypes, K, US, USM). Fig. 10a.

Planta hemiepiphytica; internodia 1–2 cm longa; cataphylla (6) 9–14 cm longa, 2–6 mm lata; petioli (11–15) 18–26 cm longi, 4–5 mm lati; lamina oblonga-oblanceolatae, 49 cm longae, 14.5 cm latae; nervis primariis lateralis 8–14 utroque; inflorescentia 1–4 per quoque axila; pedunculus 4.2–6.5 cm longus, 2.5 mm diam in sicco; spatha viridis, 6.3–8.3 cm longa.

Hemiepiphytic appressed climber; **internodes** 1–2 cm long, light tan-brown, semiglossy, with epidermis transversely fissured, peeling; roots few at each node, to less than 10 cm long, drying reddish brown, densely puberulent; drying 5–7 mm wide; **cataphylls** (6) 9–14 cm × 3–6 mm at base to 2–4 mm wide near apex, drying medium brown to dark olive-green. **Petioles** subterete, with a dark purple ring at the apex, drying ribbed, (11–15) 18–26 cm × 4–5 mm; **blades** oblong-oblanceolate, 49 × 14.5 cm, drying dark grayish green to grayish brown, rarely tinged weakly with yellow above, yellowish green to grayish green below, gradually to abruptly long-acuminate at apex, cordulate, sometimes rounded-truncate at the base; sinus to 1.7 cm deep; **midrib** thickly convex and concolorous above, convex below, drying convex and concolorous above, bluntly acute and brownish below, darker than the surface; **primary lateral veins** 8–14 per side, arising at 60–90° angle, weakly arched to the margins, drying weakly raised and concolorous above, weakly raised with several weak ribs paler than surface below; minor veins moderately conspicuous, weakly raised and frequently minutely undulate on drying sometimes with weak cross-veins visible below. Inflorescence 1 to 4 per axil; **peduncle** 4.2–6.5 cm long (13–14 cm long in fruit), drying dark brown, 2.5 mm diam., matte; **spathe** green, 6.3–8.3 cm long, drying 7–1.7 cm diam., dark yellowish brown, matte; **spadix** drying reddish brown or cream-tan, 4–9 × 0.5–1 cm at midpoint, pistillate portion 4–5 × 0.8–1.1 cm, **pistils** 2 × 2 mm, sides ribbed, minutely granular; style 0.8–0.9 mm wide, quadrangular to subrounded, minutely granular on drying at high magnification; stigma funnel-shaped, 0.15 mm diam., raised above the style; **ovary** 4-locular; ovules 1 per locule; seeds narrowly fusiform, 1.4 × 0.4 mm, tapered weakly toward both ends, light brown.

Local Aguaruna names: 'chinchip daék' 'chinchip sugkip', 'chineschip daék' 'chu daék'.

Philodendron huashikatii is a member of section *Calostigma*, series *Belocardium*, and is currently known only from Amazonas

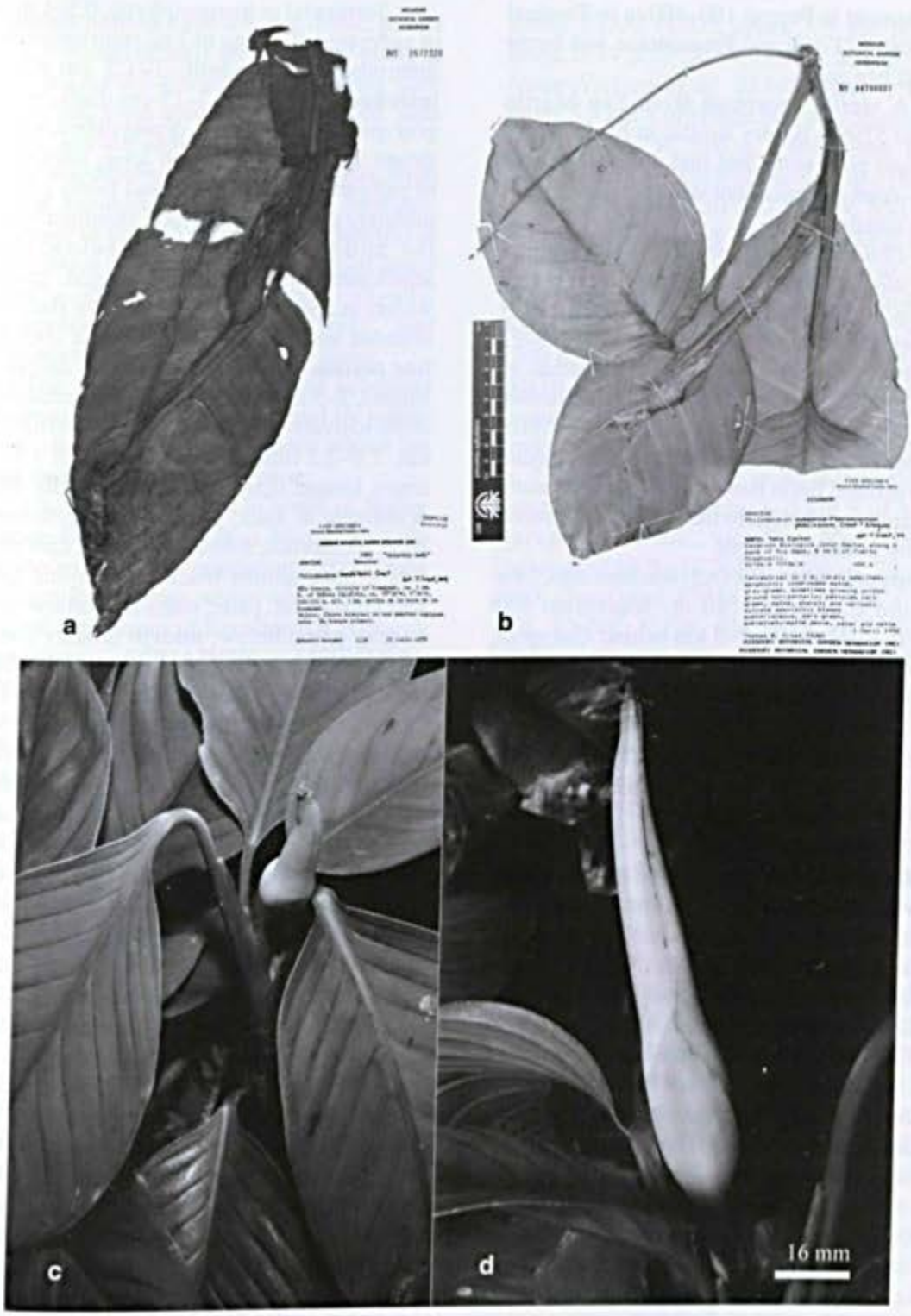


Figure 10 - a. *Philodendron huashikatii* Type specimen. (*Ancuash 1130*); b, c, d. *Philodendron palaciosii* Grayum & Croat. b. herbarium type specimen (*Croat 73380*); c. habit, showing leaf blades and inflorescence; d. close-up of inflorescence. c, d. Photos by Tom Croat.

Department in Peru at 180–400 m in Tropical wet forest (T-wf) and Premontane wet forest (P-wf) life zones.

A sterile specimen from San Martín (*Croat 57989*) is very similar in blade shape, size and coloration, but that collection lacks cross-veins and has minor veins alternating with resin canals.

Philodendron huashikatii is most similar to *P. uleanum* Engl., which has similar leaves and is in the same section and series, but *P. uleanum* has larger inflorescences to 15–22 cm long, peduncles 6–11 cm long, spathes 9–12.5 × 1.5–2.5 cm, and dries dark reddish brown.

This species is named for Victor Huashikat, an Aguaruna Indian plant collector who assisted Brent Berlin on his ethnobotanical research expeditions to the Alto Marañón river region in northern Perú.

Paratypes: AMAZONAS: Río Santiago, 2 km behind Caterpiza, 180 m, *Huashikat 858* (MO); *1018* (MO); 2–3 km behind Caterpiza, 200 m, 14 Jan. 1980, *Tunqui 610* (MO); Condorcanqui, Río Cenepa, Huampami, 4°28'S, 78°10'W, 189–213 m, 22 Aug. 1976, *Boster 74* (MO); El Cenepa, Tutino, 4°33'05"S, 78°12"54"W, 400 m, 20 July 1997, *Vasquez et al. 24386* (MO).

Philodendron palaciosii Croat & Grayum, sp. nov. **Type**: Ecuador. Napo: Tena Cantón, Est. Biol. Jatun Sacha, along S bank of Río Napo, 8 km E of Puerto Misahualii, 1°04'S, 77°36'W, 450 m, 1 Apr. 1992, *T. B. Croat 73380* (holotype, MO-04756557; isotypes, AAU, B, CAS, F, K, MEXU, NY, QCNE, US). Fig. 10b, c, d.

Planta terestris vel hemiepiphytica; internodia 1–4(6) cm longa, 7–15 mm diam.; petioli 12–23 cm longi; laminae ovatae vel ovatae-ellipticae, 19.5–29 cm longae, (7.8)10–13.7 cm latae; nervis primariis lateralibus 13–17 utroque; pedunculus 10–16 cm longus, 3–4 mm diam.; spatha 11.5–16 cm longa, 1.5–1.7 (3) cm lata, alba vel cremea vel primulina; spadice 6–15 cm longus; pars pistillata 2–3.3 cm longa, 7–9 mm diam.; pars staminata 5–5.5 cm longa.

Terrestrial or hemiepiphytic, 0.5–1 m tall or appressed climbing to 3 m; stem sometimes decumbent or pendent, 1–1.2 cm diam., **internodes** 1–4 (6) × 7–15 cm diam., matte, gray-green to olive-green, drying ribbed, weakly striate. **Petioles** 12–23 cm long, dark green to yellowish brown, matte and finely costate, minutely granular on surface, sheathed to near the middle or up to 1 cm below blade attachment, sheath broadly winged, splayed widely at apex to 3.4 cm wide when flattened, rounded and weakly free-ending at apex, the free portion of petiole sharply and deeply D-shaped, 2–3 mm diam.; **blades** subcoriaceous, ovate to ovate-elliptic, 19.5–29 × (7.8)10–13.7 cm, 1.6–2.3 times longer than wide, 1.2–1.6 times longer than petioles, gradually long-acuminate at apex, prominently decurrent at base, bicolorous, subvelvety matte, dark green (sometimes almost blackened) drying matte and gray above, paler, matte and yellow-green to gray-green below; **midrib** broadly convex and slightly paler to concolorous, finely costate above, broadly convex and paler, minutely granular below; **primary lateral veins** 13–17 per side, mostly aggregated near the base, arising in a sweeping curve (especially those near the base) at an acute angle then spreading at 40–70° angle, minutely undulate and scarcely more prominent than the minor veins on upper surface, weakly raised and paler than surface below, minor veins moderately obscure. Inflorescence 1 per axil, rarely 2 per axil (*Croat et al. 87854*); **peduncle** 10–16 cm × 3–4 mm, medium green with dark green striations, drying yellowish green, dark brown or pale yellow-brown; **spathe** 11.5–16 × 1.5–1.7 (3) cm, white to creamy white, or greenish yellow, the spathe tube green, the lower 2/3 of the entire inner surface greenish white, lined with intermittant red streaks, drying greenish yellow-brown, pale green within post anthesis with brown resin canals; **spadix** 6–15 cm long, elongating in fruit with the staminate spadix protruding slightly beyond the end of the spathe, creamy white; pistillate portion 2–3.3 cm × 7–9 mm, pale green to pale yellow-green; staminate portion 5–5.5 cm long, the sterile

staminate portion 1 cm × 8 mm diam.; **pistils** 1.8 × 7–9 mm, densely and minutely warty at apex; stigma 0.5–0.6 mm diam., drying dark brown, the style apron to 1 mm wide, pale brown. Infructescence orange.

Philodendron palaciosii ranges from Central Ecuador (Napo, Pastaza, Morona-Santiago) to Peru (Amazonas, San Martín) at 350–1700 m elevation in Tropical moist forest (T-mf), Tropical wet forest (T-wf), Premontane moist forest (P-mf), and Premontane rain forest (P-rf) life zones.

The species is a member of subgenus *Pteromischum* and is characterized by matte-drying, pale yellow-green blades which are ovate and attenuated at the base.

The species is named in honor of Walter Palacios, Ecuadorian botanist, who is currently with the Jatun Sacha Foundation and was first to collect this species while working for the National Herbarium of Ecuador (QCNE).

Paratypes: ECUADOR. MORONA-SANTIAGO: Macas-Riobamba, Proaño-Par. Nac. Sangay, 28.6 km W of Proaño, 2°14'31"S, 78°16'40"W, 1659 m, 13 Aug. 2002, *Croat et al. 86552* (MO); Patuca-Santiago along S edge of Cordillera del Cutucú, entering from main Limón-Macas rd. at 44.6 km N of Limón, 3.9 km from Bella Union and jct. to Méndez, 23.9 km from jct., 2°51'58"S, 78°14'51"W, 250 m, 9 Sep. 2002, *Croat 87337* (MO); Santiago-Río Morona and San José de Morona, 5 km E of Río Morona ferry crossing, 55.3 km E of Santiago, flood plain of Río Morona, 2°53'30"S, 77°42'59"W, 300 m, 10 Sep. 2002, *Croat 87441* (MO); W de la ciudad del Macas, 2°18'S, 78°07'W, 1160 m, 24 Feb. 1986, *M. Baker 6611* (NY); 33.7 km E of Santiago, 523 m, *Croat et al. 90711* (MO, QAP); Morona, Macas-Puyo, 31 km N of Macas, 28.5 km N of bridge over Río Upano, 2°01'S, 77°56'W, 1125 m, 7 Mar. 1992, *Croat 72796* (MO, QCNE). NAPO: Baeza-Lago Agrio, along rd. at km 154.5, 0°22'S, 77°50'W, 1750 m, 2 Oct. 1980, *Croat 50286* (MO); 39 km NE of jct. of rd. to Tena, 19.7 km NE of El Chaco, 141 km SW of Lago Agrio, 1750 m, 26 Apr. 1984, *Croat 58537* (MO); creek 3.5 km NW of Borja, 0°24'S, 77°50'W, 1850 m, 20 Sep. 1980, *Holm-Nielsen et al. 26348* (AAU); Tena-Puyo, 5.5 km S of bridge over Río Napo, ca. 1 °05'S, 77 °47'W, 510 m, 2 May 1984, *Croat 58920* (MO); 4.7 km S of Puerto Napo (bridge over Rio Napo), 1°10'S, 77°50'W, 650 m, 6 Apr. 1089, *Thomas & Rios 6664* (MO, NY); km 20, 430 m, 20 July 1982, *Besse et al. 1672* (MO, SEL); rd. N from El Chaco, Quito-Lago Agrio Rd., 20 km E of Baeza, 0°15'S, 77°50'W, 1500 m, 22 July 1986, *Gentry & Miller 55004* (MO); Baeza-El Chaco, vic. Río Sardinas Grande, along Río Quijos, 6 km NNE of San Francisco Borja, 0°22'32"S, 77°49'01"W, 1767 m, 17 Apr. 2003, *Croat et al. 87667* (MO); along rd. to Mushullacta, 1–5 km S of Main Narupa-Coca Rd., vic. Par. Nac. Napo-Galleras; 0°42'S, 77°36'W, 1500 m, 20 Apr. 2003, *Croat et al. 87854* (AAU, B, BR, CAS, COL, CUVC, F, GB, GH, HUA, INB, K, M, MEXU, MO, NY, SEL, US); along rd. SE of Francisco de Orelleno (Coco) to El Auca 14.6 km past bridge over Río Napo, 0°37'S, 76°40'W, 450 m, 5 Oct. 1980, *Croat 50378* (MO); Lago Agrio-Baeza at ca. km 107, 1°05'S, 77°30'W, 1410 m, 6 Oct. 1980, *Croat 50485* (MO); Nor-Oriente, Nuevo Rocafuerte, colecciones al Sur-Oeste de la población, 200–230 m, 2 Mar. 1981, *Jaramillo & Coello 4621* (QCA); Est. Biol. Jatun Sacha, 400 m, 3 Apr. 1998, *M. Schwerdtfeger 98030402* (MO); 300 m, 10 Mar. 1995, *Schwerdtfeger 031015* (MO); Río Napo, 8 km below Misahuallí, 1°04'S, 77°36'W, 450 m, 17 Jan.-6 Feb 1987, *Cerón 596* (QCNE); 8 km al E de Misahuallí, 1°04'S, 77°36'W, 450 m, 19–28 Mar 1987, *Cerón 971* (MO, QCNE); parcela permanente 3, 1°04'S, 77°36'W, 19–23 Mar. 1989, *Cerón 6367* (MO, QCNE); 8 km de Puerto Misahuallí, margen derecha del Río Napo, 1°04'S, 77°36'W, 8 Nov. 1987, *Cerón 2577* (MO, QCNE); along S bank of Río Napo, 8 km E of Puerto Misahualii, 1°04'S, 77°36'W, 1 Apr. 1992, *Croat 73380* (AAU, B, CAS, F, K, MEXU, NY, QCNE, US); Sumaco, Cantón Archidona, Carretera Hollín-

Loreto, km 25, Centro Challuayacu, 0°43'S, 77°40'W, 1230 m, 10–19 Nov. 1988, *Hurtado & Alvarado 1075* (MO); entre el Río Pucuno y el Cacerío de Guamaní, 0°46'S, 77°26'W, 1200 m, 12 Dec. 1987, *Cerón 2967* (MO, QCNE); km 25, Sector Challua Yacu, Faldas al sur del Volcán Sumaco, 0°45'S, 77°38'W, 1200 m, 21–27 Apr. 1989, *Cerón & Hurtado 6506* (MO); km 50, Guagua Sumaco, Faldas al sur del Volcán Sumaco, Informante: Pedro Avilés, 0°38'S, 77°27'W, 1000 m, 29 Apr.-2 May 1989, *Cerón & Hurtado 6687* (MO); km 31, Comuna Challua Yacu, Suelos volcánicos, 0°43'S, 77°40'W, 1200 m, 20–25 Mar 1989, *Palacios 4047* (MO, QCNE, QAP). PASTAZA: vic. of Shell, along Río Pindo, ca. 1.5 km N of Shell, 0°29'39"S, 78°03'52"W, 1085 m, 5 May 2003, *Croat et al. 88574* (MO); Mera-Río Anzu, 8.3 km N of Mera, 1°25'56"S, 78°04'54"W, 1300 m, 6 May 2003, *Croat et al. 88659* (MO); 7.7 km N of Río Alpayacu, 1°25'51"S, 78°04'34"W, 1267 m, 8 May 2003, *Croat et al. 88862* (MO); Río Villano, 1°24'S, 77°02'W, 260 m, 24 Mar. 1980, *Holm-Nielsen et al. 22658* (AAU); 1°25'S 77°02'W, 260 m, 24 Mar. 1980, *Holm-Nielsen 22714* (AAU); Curaray, ridge NE of Destacamanto, 1°21'S, 76°56'W, 250 m, 19 Mar. 1980, *Holm-Nielsen et al. 22080* (AAU); *21990* (AAU); N bank 2 km W of the school, 1°22'S, 76°58'W, 250 m, 18 Mar. 1980, *Holm-Nielsen et al. 21844* (AAU); 200 m, 20 Mar. 1980, *Harling & Andersson 17559* (GB); Valle de la Muerte, 1°25'S 76°52'03"W, 240 m, 22 Mar. 1980, *Holm-Nielsen et al. 22466* (AAU); Toñampari, poblacion Waorani (Aucas), Centro Oriente, sector izquierdo en la cuenca del Rio Curaray, 1°12'S, 77°20'W, 400–500 m, 14 Aug. 1980, *Jaramillo & Coello 3508* (QCA); Río Tinguiza, in the vic. of Canelos, 15 Mar. 1971, *Lugo 1687* (MO); Villano, Cantón Puyo, Comunidad Santa Cecilia, Suelo con capa mate-ria orgánica de hasta 40 cm de profundidad, bien drenado, 1°30'S, 77°27'W, 380 m, 1 May 1992, *Palacios 10073* (MO, QCNE); *10087* (MO, QCNE); Pozo petrolero "Ramirez", 20 km al sur de la población de Curaray, 1°32'S, 76°51'W, 300 m, 21–28 Feb. 1990, *Zak & Espinoza 4831* (MO, QCNE); *5265* (MO); *5266* (QCNE); *5279* (MO, QCNE); Shell-Mera, 5.3 km NW of center of Shell, along gravel rd, 1.1 km N of hwy, E end of rd., 1°27'S, 78°04'W, 1180 m, 3 Apr. 1992, *Croat 73460* (MO, QCNE); Mera-Río Anzu, 11.7 km N of main plaza in Mera (located on Puyo-Baños Rd), 1°20'S, 78°06'W, 1350-1380 m, 5 Apr. 1992, *Croat 73583* (MO, QCNE). ORELLANA: Tiputini Biodiv. St., 0°38'S, 76°09'W, 200 m, 21 Feb. 2002, *Koster et al. 1008* (MO). SUCUMBIOS: Lago Agrio, Lago Agrio-Coca, 26 km S of Lago Agrio, 4.6 km S of El Emo, then 2.8 km W of main Lago Agrio-Coca Rd, 0°05'S, 76°54'W, 355 m, 29 Feb. 1992, *Croat 72501* (MO, QCNE). ZAMORA-CHINCHIPE: Los Encuentros-El Sarsa, Cordillera del Cóndor, 14.4 km SE of Los Encuentros, 3°47'44"S, 78°37'01"W, 1188 m, 26 May 2003, *Croat & Menke 89487* (MO). PERU. AMAZONAS: Ba-gua, Imaza, Yamayakat, 5°03'24"S, 78°20'17"W, 350 m, 25 Mar. 2000, *Vásquez 26509* (MO); Shimutáz, Imaza, Margen derecha quebrada, Shimutáz, 2 hrs. de surcada desde la boca (con-fluencia con el Marañon), 400–550 m, 21 Oct. 1995, *Díaz et al. 7683* (MO); Kusu-Chapi, Región del Marañon, Area permanente 500 x 500 m, parcela "E", 4°55'S, 78°19'W, 350 m, Feb. 1995, *Vasquez et al. 20041* (MO); Condorcanqui, Valle del Rio Santiago, Caterpiza, 2–3 km atrás de la comunidad de Caterpiza, 3°50'S, 77°40'W, 180 m, 20 Feb. 1980, *Tunqui 927* (MO). SAN MARTÍN: Mariscal Caceres, Tocache Nuevo, Al E de Tocache, cerca a la Chacra del Sr. Estaban Arévalo, 500–700 m, 14 Oct. 1980, *Schunke-Vigo 12365* (MO).

Cultivated Plants: Cultivated at Waimea Arboretum and Botanical Garden, originally vouchered by *Lyon 82-1465*, *Waimea 83-919*, vouchered on 29 Apr. 1994 as *Croat 76162* (MO).

Philodendron reticulatum Grayum, sp. nov. **Type**: Perú. Amazonas: Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdivia, along Chigkan Entsa, Aintami, ca. 4°30'S, 78°30'W, 200–250 m, 17 Aug. 1978, *A. Kujikat 449* (holotype, MO-2674229). Fig. 11a.

Planta hemiepiphytica; internodia 1–2.5 cm longa; petioli 14.5 cm longi; laminae anguste ellipticae, 25.6–29.5 cm longae, 9.5–10.1 cm latae; nervis primariis lateralibus 8–9 utroque; pedunculus 3 cm longus; spatha 6.5 cm longa, 11 mm diam.; spadice 4.4 cm longus; parte pistillata 1.9–2.2 cm longa, 9 mm diam.

Hemiepiphytic climber; **internodes** 1–2.5 cm long, drying matte, medium to dark yellow-brown, closely folded-ridged. **Petioles** 14.5 cm long, sheathed to the base of blade or to within 6 mm of the base; sheath erect, drying yellow-green, many ribbed, matte; free portion of petiole sharply sulcate; **blades** narrowly elliptic, 25.6–29.5 × 9.5–10.1 cm, 2.6–2.9 times longer than wide, 2–3.1 times longer than petioles, gradually long-acuminate at apex, narrowly rounded at base, markedly inequilateral, one side 2.1–2.2 cm wider, dark green and semiglossy above, paler and semiglossy below, drying gray above, yellow-green below; **midrib** weakly sunken and paler, dark-speckled above, narrowly round-raised, yellow-brown and finely striate below; **primary lateral veins** 8–9 per side, arising at a steep angle then spreading at 60–70° angle, drying weakly raised and scarcely more apparent than the interprimary veins above, convex to narrowly rounded and moderately paler below with whitish stitching along margins; cross-veins moderately conspicuous below, less so on upper surface; the surface weakly pale punctate-lineate above, more conspicuously below. Inflorescence solitary; **peduncle** 3 cm ×2–3 mm, drying yellow-brown, drying dark short-lineate near apex; **spathe** 6.5 cm × 11 mm, drying dark yellow-brown, matte; **spadix** 4.4 cm long; pistillate portion 1.9–2.2 cm × 9 mm; style 0.8–1.2 mm diam., with a broad, thin apron; stigma 0.6–0.7 mm diam., donut-shaped; staminate portion 1.4 cm long, narrowly tapered 2 mm diam.

Local Aguaruna name: timtik.

Philodendron reticulatum is known only from the type specimen in Amazonas Department in Peru at 200–250 m elevation in Tropical wet forest (T-wf) and Premontane wet forest (P-wf) life zones.

The species is a member of subgenus *Pteromischum* and is characterized by closely folded yellow-brown drying stems, nearly fully sheathed narrow petioles, narrowly elliptic blades which dry yellow-green below with prominent cross-veins giving the surface a prominent reticulate venation (hence the specific epithet "reticulatum").

Philodendron swartiae Croat, sp. nov. **Type**: Perú. Amazonas: Río Cenepa, Quebrada Sasa, 910 m, 2 June 1973, *E. Ancuash 486* (holotype, MO-2249161; istotype USM). Fig. 11b.

Planta terrestris, ad 90 cm; internodia brevia, 1.5–2 cm diam.; cataphylla ad. 10 cm longa; petioli 62–63 cm longi, 4–7 mm diam. in sicco; laminae late ovato-cordatae, 36–40 cm longae, 32–33 cm latae, profunde cordatae ad basim; lobulae posticus 14–16 cm longus, 12–15 cm latus; nervis primaribus lateralibus 3 utroque; pedunculus 7.5–12 cm longus, 4–5 mm lata; spatha alba, 14.5 cm longa; tubo 7 cm longo, 3 cm lato; ovarium 5-locularibus; ca. 20 ovula per loculum.

Terrestrial, to 90 cm tall; **internodes** short, 1.5–2 cm diam.; **cataphylls** ca. 10 cm long, unribbed, drying thin, reddish brown, soon weathering to pale fibers. **Petioles** 62–63 cm long, drying 4–7 cm wide, light reddish brown, matte, densely and conspicuously warty-verrucose-scaly throughout, especially near the apex, the scales stalked, especially toward apex, blunt and knob-like at apex, sometimes with as many as 3 knobby excressences per stalk, the glands becoming sparce toward the base and shorter, merely warty, non-stalked excrescences; geniculum ca. 2 cm long, not conspicuously different that the petiole on dried material; **blade** broadly ovate-cordate, 36–40 × 32–33 cm, 1.5–1.7 times longer than wide, more or less rounded and weakly acuminate

at apex, deeply cordate at base, drying weakly glossy, gray-green above, grayish yellow-brown and weakly glossy below; anterior lobe 24–28 cm long, broadest about 6 cm above petiole attachment; sinus spathulate (closed or nearly so), 11.5–13 cm deep, 2.6–2.8 cm wide when flattened; posterior lobes 14–16 × 12–15 cm; basal veins 5–6 pairs, the first 1st and 2nd free to the base, the 1st pair turned down prominently along sharply along the midrib, the 3rd and higher order veins closely contiguous and almost fused for 1–1.5 cm, some of the basal veins branched about midway; **midrib** drying broadly convex, finely ribbed above, bluntly acute, finely ribbed below; **primary lateral veins** 3 per side, arising at an acute angle then spreading at 55–60° angle, flat and concolorous above, narrowly raised and reddish brown, darker than surface below; minor veins drying prominently undulate on both surfaces. Inflorescence with **peduncle** 7.5–12 cm long, drying 4–5 mm wide, medium reddish brown, bluntly striate; **spathe** white, drying reddish brown, 14.5 cm long, prominently constricted above the tube; tube 7 × 3 cm; **pistils** 2.5 × 1 mm; ovary 5-locular, the side densely purplish short-lineate-punctate; locules with ca. 20 ovules, with axile placentation; seeds 7–9 × 3–4 mm, coarsely longitudinally 8–12 ribbed around the sides.

Philodendron swartiae is known only from the type specimen along the Río Cenepa at 304 m in the Tropical wet forest (T-wf) life zone.

The species is recognized by terrestrial habit, creeping stems, persistent cataphyll fibers, densely warty-verrucose-scaly petioles, and ovate-cordate blades. *Philodendron swartiae* is related to other members in an unnamed section and species in the group include *P. pastazanum* K. Krause and *P. gloriosum* André. *Philodendron pastazanum* differs in having a peltate blade. *Philodendron gloriosum*, a species endemic to Colombia, differs in having the major veins prominently paler than the surface.

The species is named for Anne Swart, former research intern for the senior author through Washington University in St. Louis, where she was a student. During her research at the Missouri Botanical Garden she helped to sort and identify numerous specimens from the Río Cenepa region of Perú.

Rhodospatha acosta-solisii Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Imaza, Yamayakat, along creeks flowing into Río Kusú, 310 m, 18 Nov. 1990, *C. Diaz, J. Amaro & S. Yujna Katip 4232* (holotype, MO-3896596; isotype USM). Fig. 11c.

Planta terrestris vel hemiepiphytica; internodia 1.5–4 cm longa, 5–6 mm diam.; petioli 6.5–22 cm longi; laminae oblongo-lanceolatae vel oblongo-ellipticae, 12–18(27) cm longae, 2–8(9.2) cm latae; nervis primariis lateralibus (8)12–15(17) utroque; inflorescentia brevi-pedunculata; spadice stipitatus 10–12 mm, 6–8.5 cm longus, 2–5 mm diam. in sicco, viridis vel pallide aurantiacus; pistilla 1.2–1.5 mm diam.

Terrestrial or hemiepiphytic vine; **internodes** 1.5–4 cm × 5–6 mm, dark green to olive-green, semiglossy, becoming light brown to tan. **Petioles** sulcate to the base of the geniculum, 6.5–22 cm long, usually shorter than blade, 0.5–0.8 times as long as blade, rarely about as long as blade, sulcate above sheath, sheath erect, margins thin and scarious, sometimes weakly free-ending at apex, in part deciduous; geniculum narrowly and sharply sulcate; **blades** oblong-lanceolate to oblong-elliptic, 12–18(27) × 2–8(9.2) cm wide, 2.7–6.8 times longer than wide, slightly inequilateral, one side 4–9 mm wider (the narrower side 0.72–0.84 as wide as the wider side), sometimes weakly falcate, matte to weakly glossy, drying dark brown above, moderately paler and semiglossy, drying medium yellow-brown below, acuminate to gradually acuminate at apex, somewhat inequilateral and rounded to obtuse and sometimes briefly decurrent at base; **midrib** narrowly sunken and slightly paler above, round-raised and slightly paler below; **primary lateral veins** (8)12–15(17) per side, quilted-sunken above, pleated-raised below, mostly drying darker than

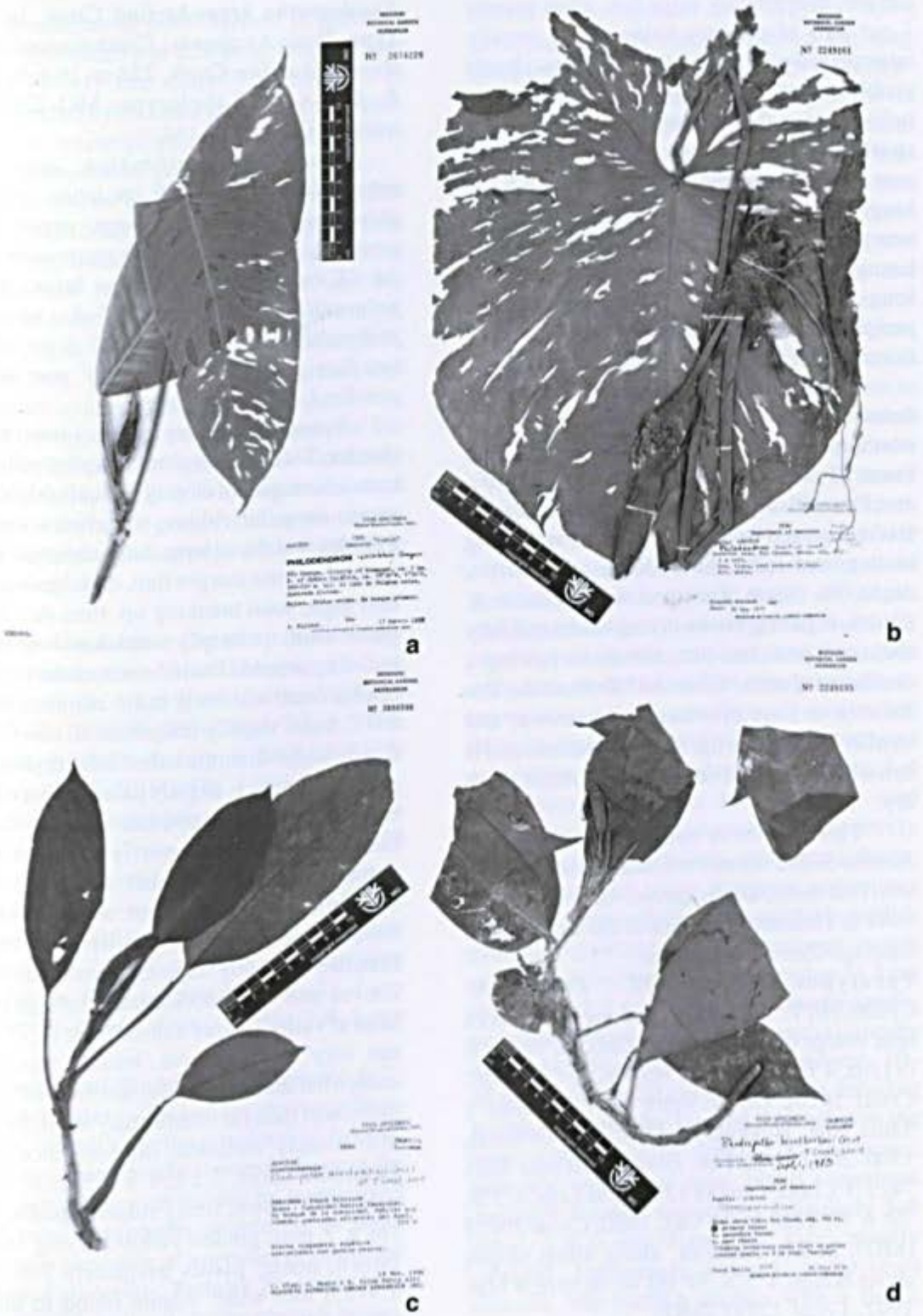


Figure 11 - a. *Philodendron reticulatum* Grayum. Type specimen. (*Kujikat 449*); b. *Philodendron swartiae* Croat. Type specimen. (*Ancuash 486*); c. *Rhodospatha acosta-solisii* Croat. Type specimen. (*Díaz et al. 4232*); d. *Rhodospatha brent-berlinii* Croat. Type specimen. (*Berlin 1613*)

surface; interprimary veins few, when present 1 per pair of primary veins, these usually interspersed with a pair of minor veins, clearly visible; minor veins distinct or obscure below. Inflorescence short-pedunculate, dark brown; **spathe** missing, leaving a prominent ring-like scar; **spadix** stipitate 10–12 mm, 6–8.5 cm long, drying 2–5 mm diam., green to pale orange; **pistils** 1.2–1.5 mm diam, irregularly hexagonal, drying dark brown; stigma 0.8 mm long, drying black, surrounded by a pale peripheral ridge. Infructescence becoming red in early fruit to 13 cm long, 2.2 cm diam.

Rhodospatha acosta-solisii ranges from southern Ecuador (Zamora-Chinchipe) to northern Perú (Amazonas) in Tropical wet forest (T-wf), Premontane rain forest (P-rf), and Premontane wet forest (P-wf) life zones. It is recognized by its small dark-brown drying blades, and fully sheathed petioles with a deciduous sheath. The species is similar to *R. latifolia* in having brown drying blades and fully sheathed petioles, but differs in having a deciduous sheath. *Croat 50760* from the Río Zamora in Loja Province has narrower and smaller blades than the other collections and is densely red-spotted on the lower surface when dry.

This species is named in honor of M. Acosta-Solis, reknown Ecuadorian botanist who first collected the species on February 15, 1944 at Huamboya, which at the time was in Santiago-Zamora Province.

Paratypes: ECUADOR. ZAMORA-CHINCHIPE: Loja-Zamora, along Río Zamora near bridge that crosses Río Zamora, 39 km E of Loja, 4°05'S, 79°0'W, 1610 m, 18 Oct. 1980, *Croat 50760* (MO); entre La Esperanza y Santa Ana, Huamboya, Cordillera Oriental, 1500–2000 m, 15 Feb. 1944, *M. Acosta-Solis 7413* (F); Loja-Zamora 13 km E of Loja, 4°5'S, 79° 6'W, 2220 m, 18 Oct. 1980, *Croat 50752* (MO); at Río Xamora, along steep slopes above bridge, 4°5'S, 79° 00'W, 1610 m, 4 Mar. 1992, *Croat 72691* (MO).

Rhodospatha brent-berlinii Croat, sp. nov. **Type**: Perú. Amazonas: Condorcanqui, ridge above Cikan Ece Creek, 228 m, 16 July 1974, *B. Berlin 1613* (holotype, MO-2249195; isotype, USM). Fig. 11d.

Planta hemiepiphytica, scandens; internodia brevia, 7–10 cm longa, 4–5 mm diam.; petioli 4–4.5 cm longi, vaginatia ad geniculo; laminae anguste ovato-ellipticae, 14–18 cm longae, 6–7.5 cm latae; nervis primariis lateralibus 7–8 utroque; pedunculus 2.2 cm longus, 2.3 cm diam.; spadice 3.4–5 cm longus, 7 mm diam.; pistilla 1.4–1.6 mm diam.

Scandent hemiepiphytic; **internodes** slender, 7–10 cm × 4–5 mm, drying yellowish brown, semiglossy, closely fissured-ridged with acute, irregular ridges, sometimes smooth. **Petioles** 4–4.5 cm long, fully sheathed to the geniculum, the margin thin, dark brown, ca. 2 mm high, soon breaking up, then deciduous; geniculum sharply sulcate, scarcely indistinguishable from the rest of the petioles; **blades** small, narrowly ovate-elliptic, 14–18 × 6.0–7.5 cm, slightly inequilateral, one side ca. 6 mm wider than the other side, drying dark gray-green above, slightly paler and gray-green below, gradually acuminate at apex, slightly inequilatateral and mostly acute at base, sometimes with one side acute the other subrounded at base, but always weakly decurrent onto petiole; **midrib** drying +/- flattened to weakly sunken, concolorous above, convex and +/- concolorous below; **primary lateral veins** 7–8 per side, arising at 50°–60°, not very visible above, weakly raised and somewhat undulate below, not markedly more prominent than the interprimary veins, the latter also weakly undulate. Inflorescence small; **peduncle** short, 2.2 cm × 2.3 mm, drying yellowish brown, finely ridged; **spadix** 3.4–5 cm × 7 mm, golden-yellow, drying orange-brown, matte; **pistils** irregularly 5–6-sided, 1.4–1.6 mm wide; stigma round to broadly elliptic, drying blackened with a pale rim, 6–8 mm wide.

Rhodospatha brent-berlinii is endemic to the type locality at 228 m in Tropical wet forest (T-wf) life zone. The species is characterized by its small size, short petiolate, narrowly ovate-elliptic leaves, and short-pedunculate, stubby golden-yellow spadix.

The species is closest to *R. acosta-solisii* Croat, which differs in having petioles less than 5 cm long, blades drying dark brown above and medium yellow-brown below, and the peduncle about 5 times longer than the stipe. *Rhodospatha brent-berlinii* has petioles 6.5–22 cm long, blades drying gray-green, and peduncles much shorter than the stipe.

This species is named in honor of Dr. Brent Berlin, anthropologist from the University of California, Berkely who made the first collection during linguistic studies among the native Aguaruna Indian populations of the Río Cenepa region.

Rhodospatha katipas Croat, sp. nov. **Type**: Perú. Amazonas: Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdívia, ca. 4°30'S, 78°30'W, 200–250 m, 7 Aug. 1978, *E. Ancuash 1308* (holotype, MO-2708165; isotypes K, US, USM). Fig. 12a, b.

Planta hemiepiphytica; internodia 1–3 cm longa, 1–2 cm diam.; petioli 22–56 cm longi, vaginatuis ad geniculo; laminae anguste ovatae vel ellipticae, 26–65 cm longae 16.5–34 cm latae; nervis primariis lateralibus 22–44 utroque; pedunculus 6.5–24 cm longus; spadice 11–21.2 cm longus, 10–15 mm diam.; pistilla 1.4–2 mm diam.

Appressed-climbing hemiepiphytic, to 2–4 m; **internodes** 1–3 × 1–2 cm, drying yellow-brown, smooth to longitudinally folded, sometimes transversely fissured, those in the upper part of the stem hidden by overlapping leaf bases; **cataphylls** deciduous or more commonly persisting as a network of fibers and patches of epidermis. **Petioles** 22–56 cm long (averaging 38 cm long), drying greenish brown, matte, mostly smooth, sometimes weakly folded, but never prominently ridged, sheathed to the geniculum (rarely ending 2–2.5 cm below the geniculum as in *Kayap 1359*), geniculum bluntly sulcate, 2.5–3.5 cm long; **blades** narrowly ovate to elliptic, 26–65 × 16.5–34 cm, broadest at middle or slightly below the middle (averaging 35 × 19 cm) 1.5–2.8 times longer than wide, averaging 1.3–1.7 times longer than wide, 0.89–1.9 times longer than petioles, inequilateral, one side 1–2.6 times wider than the other, mostly rounded and abruptly acuminate sometimes acute and acuminate at apex, moderately inequilateral at base, one or both sides often weakly subcordate, one side often merely rounded, drying greenish brown to grayish brown above, gray-brown to reddish brown below; **midrib** deeply sunken above, thicker than broad, sparsely granular and with pale raphide cells below; **primary lateral veins** 22–40 per side, 4–22 mm apart, mostly to 1 cm or more, closest near the base (to 4–5 mm apart), frequently arising at an acute angle then spreading at 66°–90° angle, straight to weakly curved to the margin, usually smooth, sometimes granular, sometimes pale with dark short lines in Peruvian populations; interprimary veins 1, usually much smaller than the primary veins, along with the minor veins sometimes drying undulate; minor veins 2–4 alternating between the primary and interprimary veins, sometimes sparsely granular; crossveins mostly oblique and obsure, mostly near the outer margins, sometimes throughout the surface; surface densely reddish granular-punctate; Inflorescence erect; **peduncle** 6.5–24 cm long, (averaging 14.5 cm long), 0.6–1.7 times longer than the spadix (averaging about as long as the spadix), **spadix** 11–21.2 cm long (averaging 15 cm long), 10–15 mm diam., to 20 cm in early fruit, broadest at about the middle, tapered somewhat to the base, substantially tapered to the apex, narrowly rounded at apex; pistils sometimes regularly 4-sided, sometimes irregularly 5–6 sided, 1.4–2 mm diam., the sides mostly straight, frequently convex, sometimes concave, the surface usually with a finely granular waxy layer, sometimes with fine pale globules of wax or the wax irregularly furrowed, usually faintly purplish brown, sometimes

brown; stigmas mostly oblong-elliptic, black & glossy, 0.6–0.8 × 0.3–0.5 mm, sunken medially; stamens included, anthers 1 mm long, 0.5 mm diam. Infructescence to 3 cm diam., pale red; seeds brown, subdiscoid, 1–1.2 × 0.4–0.5 mm, slightly broader in one dimension with a prominent notch on one end, with a sharp granular ridge around the outer margins.

Rhodospatha katipas ranges from southern Colombia (Putumayo & Caquetá) to northern Perú (Amazonas) at 250–1000 m in Tropical moist forest (T-mf) and Premontane wet forest (P-wf) life zones. The species is characterized by appressed-climbing habit, moderately elongate internodes, petioles with deciduous and fibrous sheaths, the bluntly sulcate geniculum, more or less elliptic, slightly inequilateral blades with the blade rounded to weakly cordate, the midrib drying granular and with pale raphide cells visible on magnification, and moderately inconspicuous cross veins that are oblique and positioned relatively near the margins.

Rhodospatha katipas is most easily confused with *R. mukuntachia* Croat from Peru, Ecuador and Bolivia. That species differs in being terrestrial with short internodes hidden by the overlapping leaf bases, petiole sheaths not extending to the geniculum, the sharply sulcate geniculum, and blades with prominent cross veins extending throughout the surface of the leaves. In addition, the lower midrib of *R. mukuntachia* is densely and softly crustiose-puberulent on drying, rather than sparsely granular, as in *R. katipas*.

The species was first collected by Erik Asplund in November, 1939. However, since another species has already been named for both the first collector and the collector of the type, this epithet is based on the common local name for the species "katipas".

Paratypes: COLOMBIA. Caqueta, 10 km SW of San José del Fragué, SW of Florencia, 320–340 m, 10 Jan. 1974, *Davidse et al. 5704* (COL, MO). PUTUMAYO: Mocoa, *Schultes & Cabrera 19045* (US); Villa Garzon, Río Gineo, 8 km W of Villa Garzon, < 300 m, 22 Nov. 1968, *Plowman 2057* (F, GH). ECUADOR. NAPO: Río Cuyabeno, Pureto Bolivar, Siona, *Jaramillo & Criollo 2854* (MO); Tena, *Asplund 8897* (MO); Res. Floristica "El Chuncho", Payamino, Est. INIAP-Napo, 0°30'S, 77°01W, 250 m, *Cerón 2407*; Río Aguarico, confluence of Río Pavayacu, *Bravo & Gomez 236*. MORONA-SANTIAGO: Pumpuentza, WNW of village, 250 m, *Brandbyge & Asanza 32333* (AAU); Pumpuentza, SSW of village, *Brandbyge & Asanza 32431* (AAU); Taisha, 77°30'W, 2°23'S, 450 m, 15 June 1980, *Brandbyge & Asanza 31879* (AAU, MO); Gualaquiza, Misión Bomboiza Salesiana, 700–800 m, *Sparre 19139* (S). ZAMORA-CHINCHIPE: Nangaritza, Cordillera del Condor, Shaime, en la unión de los Ríos Nangaritza y Numpatakaime, 1000 m, 4°20'S, 78°40'W, 7 Dec. 1990, *Palacios 6611* (MO, QCNE). PERU. AMAZONAS: Bagua, Imaza, Kampaensa, 320 m, 4°55'S, 78°19'W, 20 Oct. 1995, *Vasquez et al. 20344* (MO); 320 m, 4°55'S, 78°19'W, 22 Oct. 1995, *Vasquez et al. 20395* (MO, NY); Condorcanqui, El Cenepa, Mamayaque, Río Cenepa, Sáasa, 400 m, 4°37'08"S, 78°13'46"W, 6 Feb. 1997, *Vásquez et al. 22384* (MO); Río Cenepa, Bashuchunuk, Monte y chacra al lado Huampami, 17 Jan. 1973, *Kayap 139* (MO); Alrededor Kusu, Río Numpatkin, Monte y chacra al lado de Kusu, 335–400 m, 10 Mar. 1973, *Kayap 515* (MO, US); vic. Kusu, Río Numpatkin, 1100–1300 m, *Ancuash 74* (MO); Río Santiago valley, ca. 65 km N de Pinglo, 2–3 km behind Caterpiza, 200 m, 29 Jan. 1980, *Huashikat 1867* (MO); Huampami, 5 km E of Chavéz Valdivia, 78°30'S, 4°30'S, 200–250 m, front of Chigkan entsa, *Ancuash 1308* (MO), 200–300 m, *Ancuash 1288* (MO), 240–260 m, *Kayap 1359* (MO); "La Banda", *Berlin 185* (MO); S of Huampami trail to house of Theodora, S of Río Cenepa, 800–850 m, *Berlin 1665* (MO); trail N of Cenepa toward headwaters of Kayamas Creek, 180–240 m, *Berlin 1744* (MO); Q Shimpunts, 180–300 m, *Ancuash 13* (MO); Wampusik entsa, 180–300 m, *Ancuash 725* (MO).

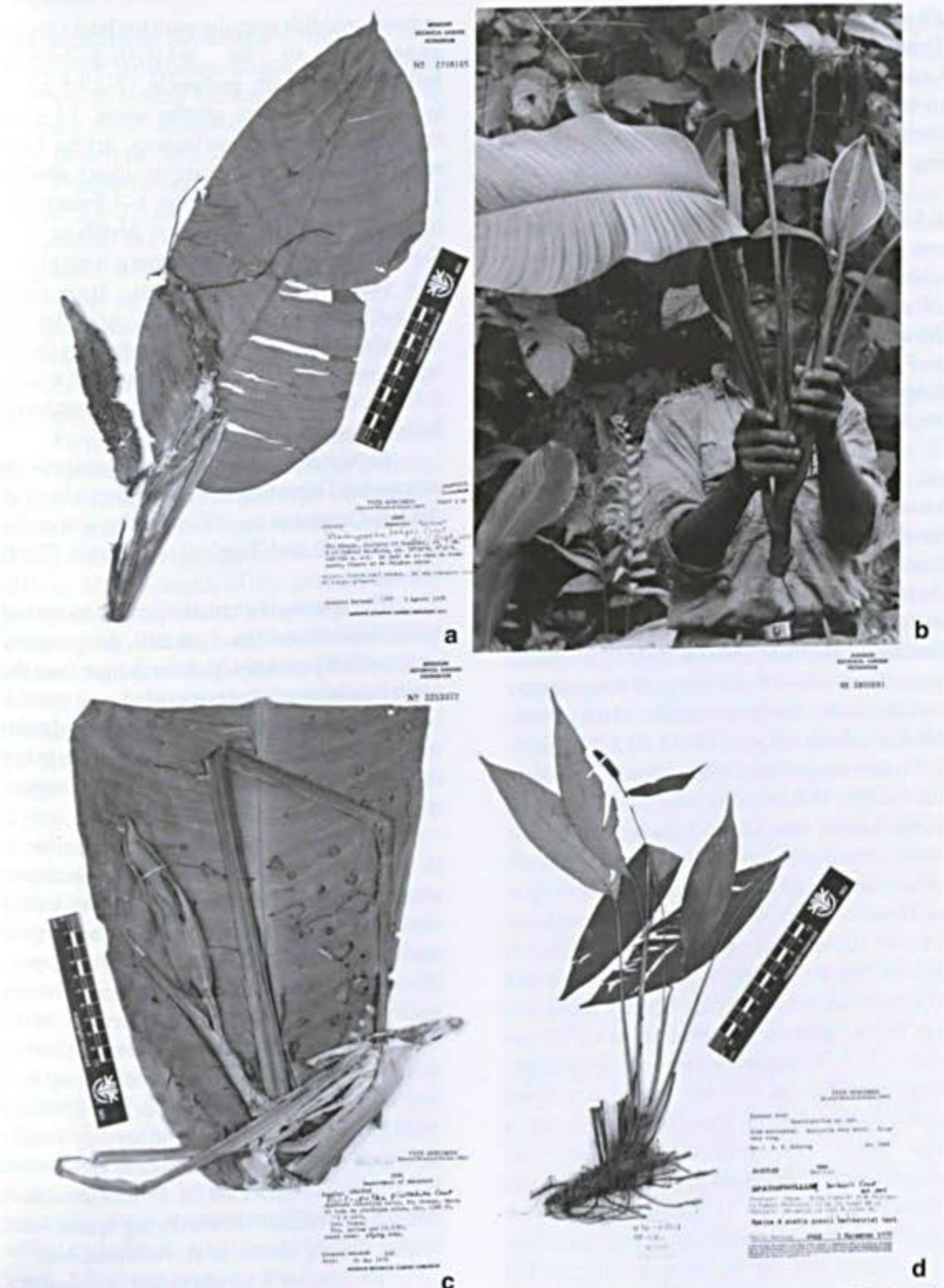


Figure 12 - a, b. *Rhodospatha katipas* Croat. a. type specimen. (*Ancuash 1308*); b. live plant showing leaf blade and inflorescence (*Plowman 2057*); c. *Rhodospatha piushaduka* Croat. Type specimen. (*Ancuash 430*); d. *Spathiphyllum barbourii* Croat. Type specimen. (*Barbour 4460*)

Rhodospatha piushaduka Croat, sp. nov. **Type**: Perú. Amazonas: Condorcanqui, Río Cenepa, Quebrada Chichijam entsa, Chacramonte, 400 m, 24 May 1973, *E. Ancuash 430* (holotype, MO-2253372; isotypes K, USM). Fig. 12c.

Planta terrestris, ad 1 m; internodia ca. 1.5 cm longa, 1.5 cm diam.; petioli 58–68.5 cm longi, vaginati 12–19 cm; laminae oblongo-ellipticae, 49–63 cm longae, 22–28 cm latae; nervis primariis lateralibus ca. 20 utroque; pedunculus 17–19.5 cm longus, 6–7 mm diam.; spatha alba, 14–15.5 cm longa; spadice 11.5–14.5 cm longus, 1–1.5 cm latus; pistilla 1.1–1.5 mm diam.

Terrestrial herb to 1 m tall; **internodes** ca. 1.5 × 1.5 cm, drying tan, moderately smooth. **Petioles** 58–68.5 cm long, 1.2 times longer than the blade, grayish green, drying finely, regularly and conspicuously ridged, densely speckled with pale, short-lineate raphide cells, finely granular on magnification, sheathed 12–19 cm from the base of the blade; geniculum 3.2–4.5 cm long, drying sharply sulcate, darker the the remainder of the petiole; **blades** oblong-elliptic, 49–63 × 22–28 cm, 2–2.5 times longer than wide, broadest at about the middle, 0.8 times as long as the petioles, inequilateral, one side 2–3 cm wider than the other, obtuse to rounded and acuminate at apex, obtuse and weakly attenuate at base, both apex and base +/- equal, +/- matte above, semiglossy below, drying gray-green above, reddish brown below; **midrib** narrowly sunken and concolorous above, drying bluntly acute and tan below; **primary lateral veins** ca. 20 per side, 1.7–3.3 cm apart, arising at an acute angle, then spreading at 65°–80° angle in a broad curve to the margin, then broadly curved in the outer 1/3, minutely granular on magnification; interprimary veins usually not present, sometimes 1; minor veins 10–14, nearly identical, sometimes drying undulate; crossveins straight or oblique, obscure but dense, +/- evenly scattered across the blade; upper surface densely granular on magnification, the lower surface densely and minutely reddish granular with the background appearing to be whitish-punctate; Inflorescence erect; **peduncle** 17–19.5 cm × 6–7 mm, drying tan; **spathe** white, 14–15.5 cm long, moderately coriaceous, drying light reddish brown, acuminate at apex; **spadix** 11.5–14.5 cm long at anthesis, 1–1.5 cm wide, to 16 cm long post-anthesis; **pistils** at first 4-sided and rhombic, becoming irregularly 5–6 sided, 1.1–1.5 mm diam.; style light brown, densely and minutely granular on magnification; stigma elliptic, moderately raised with a narrow brown margin, 0.8–0.9 × 0.3–0.4 mm, drying dark brown, sulcate medially. Infructescence not seen.

Rhodospatha piushaduka is endemic to Amazonas Department, Perú in the vicinity of the Río Cenepa at ca. 400 m in Tropical moist forest (T-mf) and Tropical wet forest (T-wf) life zones.

The species is characterized by terrestrial habit, low stature (ca. 1 m tall), prominently striate dried petioles which are longer than the blades and densely pale-speckled, and reddish brown-drying blades with widely spaced pale-drying primary lateral veins appearing disconnected to the midrib. The reddish brown-drying spathe is also characteristic.

Rhodospatha piushaduka is similar to *R. mukuntachia* Croat in that they both are terrestrial with short internodes often totally obscured by the petiole bases, and petiole sheathes that do not extend to the apex. However, *R. piushaduka* has stems that dry pale creamy yellow (dark brown in *R. mukuntachia*), petioles that are weakly fibrous along the margins, never deciduous, drying light yellow-green and densely speckled (petioles markedly weathering into fibers or totally decidous, drying mostly medium to dark brown, not obviously speckled in *R. mukuntachia*), and a light reddish brown-drying spathe (dark brown drying spathe in *R. mukuntachia*).

The species is locally called "piushaduka" (hence the epithet) by the local Aguaruna Indians.

Spathiphyllum barbourii Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, along rd. from Chiriaco to Puente Venezuela, 43 km NE of Chiriaco, 320–730 m, 5 Nov. 1978, *P. Barbour 4460* (holotype, MO-2800691). Fig. 12d.

Planta terrestris; internodia brevia; petioli 12–21 cm longi; laminae anguste lanceolatae vel oblanceolatae vel oblonga-ellipticae, 10–17 cm longae, 2.1–4.1 cm latae; nervis primariis lateralibus 6–9 utroque; pedunculus 20–32 cm longus; spatha viridis vel alba, 5–7.2 cm longa; spadice viridis vel albus, 1.8–3 cm longus, stipitatus 1–1.8 cm.

Terrestrial; **internodes** short; Leaves erect-spreading with **petioles** 12–21 cm long, drying 1–2 mm diam., narrowly and deeply sulcate at and below geniculum, sheathed, drying medium to light brown; sheath extending 4/10 to 2/3 the length of the petiole, usually prominently decurrent, margins sometimes breaking off; **blades** narrowly lanceolate to oblanceolate or oblong-elliptic, 10–17 × 2.1–4.1 cm, sometimes inequilateral (one side up to 6 mm wider), gradually acuminate, (acumen 1.5–2.5 cm long), cuneate (often times one margin of the blade becomes folded under on drying, making the base appear inequilateral); upper surface drying dark brown, sometimes tinged with gray; lower surface drying pale yellow-brown, obscurely pale punctate at higher magnifications; **midrib** flat to broadly convex above, concolorous, rounded, sometimes narrowly rounded, concolorous to slightly darker below; **primary lateral veins** 6–9 per side, scarcely more conspicuous than interprimary veins. Inflorescence with **peduncle** 20–32 cm long; **spathe** reflexed-spreading to spreading, green or white, lanceolate, 5–7.2 cm long, drying 1–1.7 cm diam. at widest point in lower 1/3, apex gradually long-acuminate; **spadix** green to white, cylindrical, stipitate (stipe 1.0–1.8 cm long), 1.8–3 cm long, drying 4–5 mm diam. Flowers 2.5–3 × 2.7–2.8 mm; lateral tepals 1.1–1.8 mm wide.

Spathiphyllum barbourii ranges from southern Ecuador (Zamora-Chinchipe) to northern Peru (Amazonas Department, Bagua Province) at 730–900 m in Tropical rain forest (T-rf) to Tropical wet forest (T-wf) life zones. It is characterized by narrowly lanceolate to oblong-elliptic to narrowly oblanceolate blades drying dark brown above and yellowish brown below, as well as by a narrowly lanceolate white to green, long-acuminate spathe and stipitate white to green spadix. It is most closely related *S. minor* Bunting which shares similarly shaped blades and a slenderly stipitate spadix. That species differs in having blades that are more broadly elliptic and dry dark olive-green to gray-green on the upper surface and grayish yellow-green on lower surface. In addition, *S. minor* has a purple-brown spadix, while *S. barbourii* has a spadix that is initially white, then turning to green.

The species is named in honor of Philip Barbour, formerly a student at the Missouri Botanical Garden, who collected the type specimen during his work in the La Peca region east of Bagua. Barbour is finishing a Ph.D program at Mississippi State University.

Paratypes: ECUADOR. ZAMORA-CHINCHIPE: Cordillera del Condor, hills behind Campamento Miazi along Río Nangaritza, 4°16'S, 78°40'W, 900–1200 m, 18 Feb. 1994, *van der Werff et al. 13247* (MO); Nangaritza, Miazi, behind military camp, 4°16'S, 78°42'W, 900–1000 m, 21 Oct. 1991, *Palacios et al. 8576* (CAS, COL, MO, QCNE, US). PERU. AMAZONAS: El Almendro, along creek and on sandstone, 5°14'40"S, 78°21'24"W, 430 m, 9 Mar. 1998, *van der Werff et al. 14543* (IBE, K, MO); Bagua, Imaza, Putuim-Shimutaz, 5°03'20"S, 78°20'23"W, 550 m, 21 June 1996, *Vásquez et al. 21317* (AAU, F, MO); Tayu Mujaji, Wawas, 5°15'25"S, 78°21'41"W, 800 m, 23 Oct. 1997, *Rojas et al. 382* (MO, WU); 40–43 km NE of Chiriaco, 5 Nov. 1978, *Barbour 4460* (MO); Yamayakat, Imaza, Aguaruna de Putuim (CAMPOU), anexo Yamayakat, 450 m, 25 Aug. 1994, *Díaz et al. 6998* (K, MO, US).

Spathiphyllum brent-berlinii Croat, sp. nov. **Type**: Perú. Amazonas: S of Río Cenepa, SE of Quebrada Kayamas, 800–900 m, 28 Dec. 1986, *B. Berlin 741* (holotype, MO-2253396; isotypes IBE, K, USM). Fig. 13a.

Planta terrestris, 40–100(200) cm; internodia 1.5–2.5 cm diam.; petioli 25–86 cm longi, vaginati 19.3–36.5 cm; laminae anguste ovatae vel ovatae-ellipticae, (18)28–43 cm longae, (7.5)12–24 cm latae; nervis primariis lateralibus 14–20 utroque; pedunculus 46–63 cm longus; spatha alba vel viridis, 8–13.2 cm longa, 2.7–3.5 cm lata; spadice luteus vel aurantiacus, (4.2)5.2–6.7 cm longus, stipitatus 6–10 mm, pistila 3-locularia; ovulis 2 per loculum; bacca alba.

Terrestrial herb (30)50–100(200) cm tall; rhizomes short, creeping; **internodes** short, 1.5–2.5 cm diam. **Petioles** 25–86 cm long, sheathed 19.3–36.5 cm, 0.42–0.67 its length, about as long at the blades or to 2 times longer than blade, drying dark brown to light yellow-brown, weakly glossy; geniculum 1.5–2.7 cm long, drying darker than the the petiole shaft; **blades** narrowly ovate to ovate-elliptic, (18)28.7–43 × (7.5)12–24 cm, 1.4–2.1 times longer than wide, equalling or up to 1.8 times longer than the peduncle, one side 0.8–2.3 cm wider than the other side, abruptly acuminate at apex, acute to rounded and attenuate at the base, drying gray above, moderately paler and yellow-brown below; **midrib** weakly sunken and concolorous above on drying, convex to obtusely angular or quadrangular and slightly darker, finely ribbed below; **primary lateral veins** 14–20 per side, arising at an acute angle then spreading at 45–70° angle, drying scarcely distinguishable on the upper surface, narrowly raised and darker or rarely paler than surface below, moderately more conspicuous than the interprimary veins, the latter 1–2 between each pair of primary lateral veins, alternating with an increasingly fainter series of minor veins; minor veins close, weakly raised, paler than the surface; Inflorescence with **peduncle** 46–63 cm long; **spathe** white becoming lime-green, 8–13.2 × 2.7–3.5 cm, 2.2–5.2 times longer than wide, caudate-acuminate at apex; **spadix** yellow to light orange or coral-colored, or golden-yellow, eventually green, (4.2)5.2–6.7 cm long, drying 0.8 cm diam., 5–10 times longer than wide, stipitate 6–10 mm; **pistils** 2.6 mm long, ovary 2.4 × 1.5–1.8 mm; style 0.8–1 mm diam., drying blackened; stigma protruding to 0.6 mm above style on drying, 0.5 mm diam.; locules 3 per ovary; ovules basal, 2 per locule; ovules 0.3 × 0.4 mm; funicle 0.6 mm long; **berries** white.

Local Aguaruna names: diusha, nunkaña katípas, puisha duka, piúsa, shitapach mukuntach.

The species is known only from Amazonas Department, Peru, ranging from 213–850 m elevation in Tropical wet forest (T-wf) and Premontane wet forest (P-wf) life zones.

Spathiphyllum brent-berlinii is recognized by yellowish drying petioles, more or less ovate, yellowish-brown drying blades on the lower surface, the prominent, close primary lateral veins, the usually yellow to orange spadix, white spathe, and white fruits.

Spathiphyllum brent-berlinii is closest to *S. juninense* K. Krause, but differs from that species having blades that dry yellow-brown on the lower surface, and more prominent primary lateral veins, as well as considerably narrower pistils. The dried material of the pistils of *S. brent-berlinii*, like *S. juninense*, has ovaries that are densely packed on the entire outer portion with a dense layer of trichoschlereids, most likely to prevent predation of the berries.

Some collections (*Rodriguez & Rodriguez 898*, *Diaz et al. 6975*, *7105*, *7705*, *Vasquez et al. 19571*, *21427*, *21571*, and *Kayap 302*) differ from typical specimens of of *S. brent-berlinii* in having the lower blade surface darker brown or more green, but otherwise probably belong with this species as well.

The species is named in honor of Dr. Brent Berlin, University of Georgia, who collected the type specimen during his anthropological studies with the Aguaruna Indian tribe in the Río Cenepa and Río Santiago

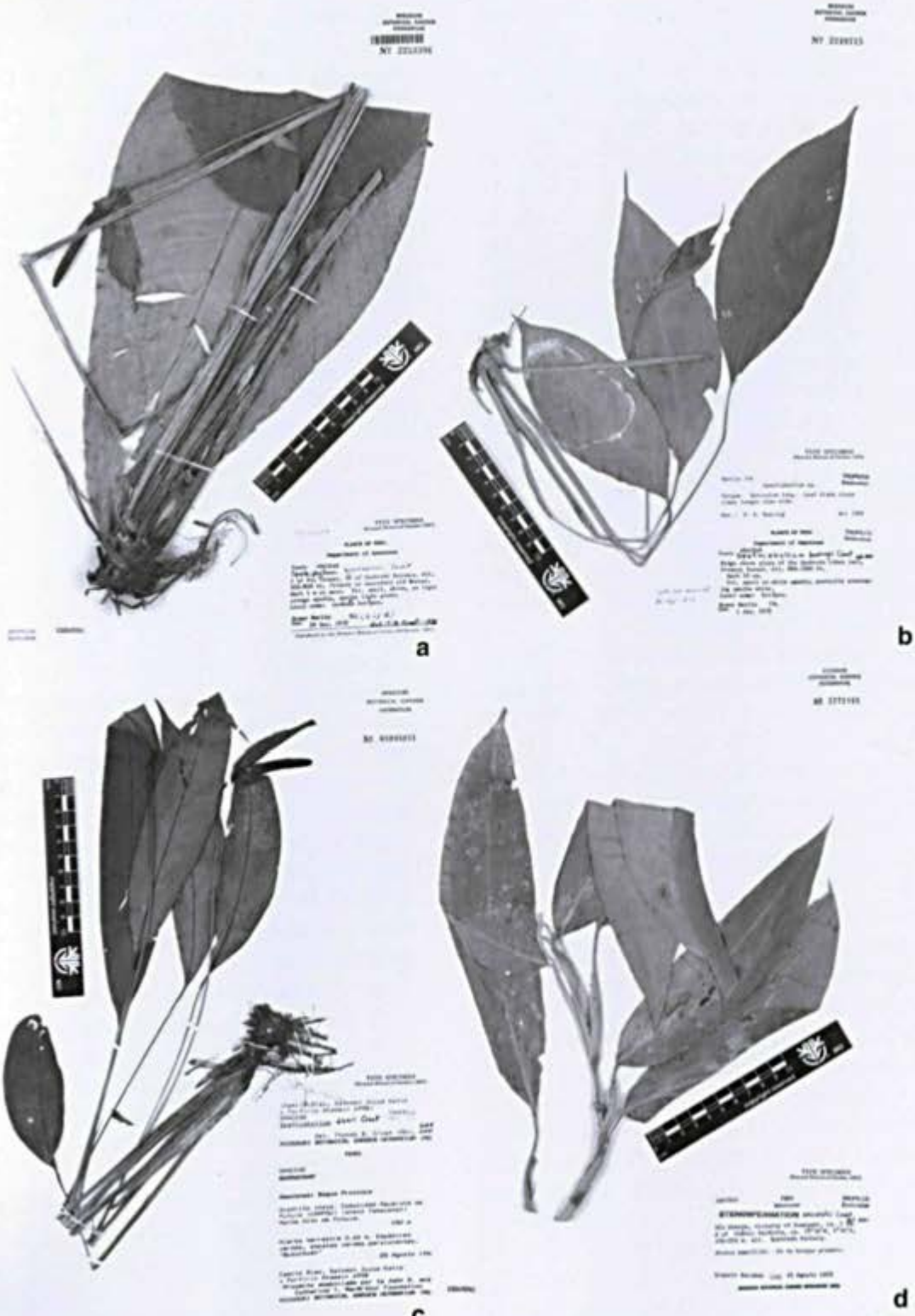


Figure 13 - a. *Spathiphyllum brent-berlinii* Croat. Type specimen. (*Berlin 741*); b. *Spathiphyllum buntingianum* Croat. Type specimen. (*Berlin 774*); c. *Spathiphyllum diazii* Croat. Type specimen. (*Díaz et al. 6998*); d. *Stenospermation ancuashii* Croat. Type specimen. (*Ancuash 1491*)

700–750 m elevation in the Premontane wet forest (P-wf) life zone.

One collection (*van der Werff et al. 14543*) from Amazonas at Quebrada El Almendro, 430 m elevation, may also be this species, but it has proportionately smaller and broader leaf blades and spathes.

Spathiphyllum diazii is most similar to *S. gracilis* Bunting in that they both have longer than broad blades more than 17 cm long. However, *S. diazii* has weakly bicolorous blades drying dark yellow-brown on the lower surface (prominently bicolorous drying pale yellow-brown on the lower surface in *S. gracilis*), and petioles sheathed below the middle, usually in the lower 1/3 of the blade (petioles sheathed to above the middle in *S. gracilis*).

The species is named in honor of Camilo Diaz, Peruvian botanist, who collected extensively in the Río Cenepa region and collected the type specimen.

Paratypes: PERU. AMAZONAS: Bagua, Imaza, Aguaruna Putuim, anexo Yamayakat, 240° SW of Putùim, 700 m, 22 Sep. 1994, *Diaz et al. 7198* (MO, USM); 285° SW of Yamaykat, 700–750 m, 23 Jan. 1996, *Diaz et al. 7773A* (MO, USM); trail from Putuim to Shimutaz, 5°03'20"S, 78°20'23"W, 550 m, 21 June 1996, *Vasquez et al. 21317* (MO).

Stenospermation ancuashii Croat, sp. nov. **Type**: Perú. Amazonas: Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdivia, Quebrada Kachaig, ca. 78°30'W, 4°30'S, 200–250 m, 15 Aug. 1978, *E. Ancuash 1491* (holotype, MO-2772155). Fig. 13d.

Planta terrestris; internodia 1–2.6 cm longa, 5–9 mm diam. in sicco, petiolus 5–8.8 cm long, lamina lanceolata ad anguste oblonga-elliptica ad anguste oblanceolata, 18–27 cm longa, 3.1–6.5 cm lata, nervis primaries lateralibus obscures; pedunculus 8.5–9.5 cm longa, 1.5 mm diam. in sicco; spadice stipitis 5–6 mm, 2.6–3.2 cm longa, 3–5 mm lata.

Apparently a terrestrial herb; **internodes** 1–2.6 cm long, drying 5–9 mm diam., pale yellow-brown, semiglossy, finely, deeply and acutely ridged. **Petioles** 5–8.8 cm long, sheathed 0.58–0.76 times its length, drying pale yellow-brown, finely striate-ridged, the sheath 4–7 mm wide, erect, ending acute to weakly rounded at apex, not markedly free-ending, free portion of petiole 0.6–2.6 cm long, drying deeply sulcate; **blades** lanceolate to narrowly oblong-elliptic to narrowly oblanceolate, 18–27 × 3.1–6.5 cm, 3.9–4.6 times longer than wide, 3.2–3.6 times longer than petioles; **midrib** weakly raised and concolorous above, weakly raised, broad and more brown, slightly darker below; **primary lateral veins** not obvious or not present; upper surface with the veins 3–4.5 mm apart, weakly raised, the interveinal areas relatively featureless at magnifications of 15×, but densely short pale-lineate with cellular inclusions of differing lengths; lower surface with minor veins equally distant, weakly raised on magnification, the intervening area with fine, irregular ridges (presumably visible trichoschlereids) and sometimes also granuliforme to warty-granular with few linear short whitish cellular inclusions. Inflorescence short, held well below the leaves; **peduncle** 8.5–9.5 cm long, drying 1.5 mm diam., yellow-brown; **spadix** stipitate 5–6 mm (stipe 1–1.5 mm diam on drying), 2.6–3.2 cm long (excluding stipe), 3–5 mm diam. Flowers irregularly 4–6 sided, drying light yellow-brown, matte; stigma 0.15–0.35 × 0.1–0.15 mm, medially sunken.

Local Aguaruna name: kuwish.

This species is named in honor of Ernesto Ancuash, an Aguaruna Indian plant collector who collected the type specimen as part of Brent Berlin's ethnobotanical research expeditions to the Alto Marañón river region of northern Perú.

Paratype: PERU. AMAZONAS: Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdivia, Quebrada Aintami, al lado de Chigkan entsa, ca. 78°30'W, 4°30'S, 200–250 m, 17 Aug. 1978, *Kujikat 430* (MO).

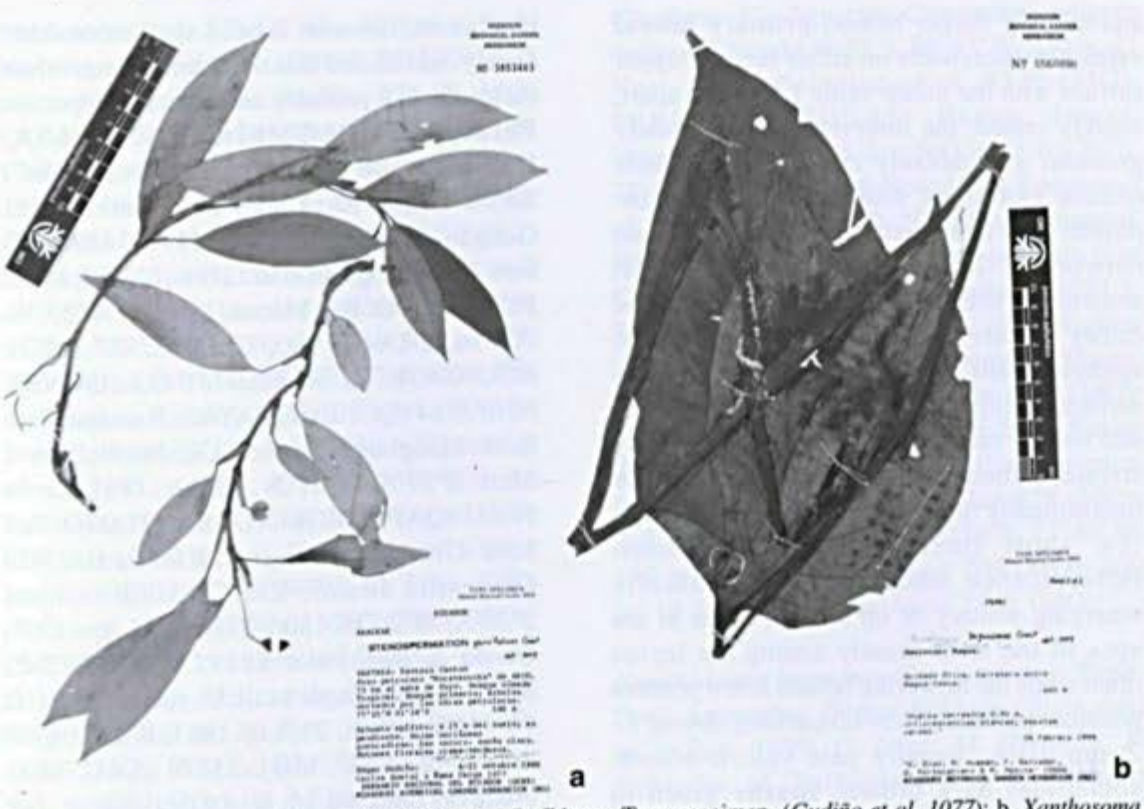


Figure 14 - a. *Stenospermation parvum* Croat & A.P. Gómez. Type specimen. (*Gudiño et al. 1077*); b. *Xanthosoma baguense* Croat. Type specimen. (*Díaz et al. 10606*)

Stenospermation parvum Croat & A. P. Gómez, sp. nov. **Type**: Pozo petrolero "Moretecocha" de ARCO, 75 km al E de Puyo, árboles cortados por las obras petroleras, 1°34'S, 77°25'W, 580 m, 4–21 Oct. 1990, *E. Gudiño, C. Quelal & N. Caiga 1077* (holotype, MO-3853463; isotypes, CAS, CM, COL, K, MEXU, QCNE). Fig. 14a.

Planta epiphytica, scandens; internodia 0.8–5.5 cm longa; petioli (1)2.3–3.6(4.5) cm longi; laminae ellipticae vel oblongo-ellipticae vel anguste oblanceolatae, 5–12.5 cm longae, 2.1–4.7 cm latae; nervis primariis lateralibus obscuris; pedunculus 3.5–7.3 cm longus, 1–2 mm diam. in sicco; spatha 2–3.6 cm longa; spadice albus, 1.5–3 cm longus, stipitatus 5–7 mm, fructus aurantiacus.

Epiphytic vine to 3–20 m; stems highly branched, sometimes completely festooning tree, branches pendent; **internodes** 0.8–5.5 cm long, drying 3–5 mm diam., matte to semiglossy, initially light yellow-brown, later often purple brown, ridges moderately well spaced with a series of smaller ridges in between major ridges. **Petioles** (1)2.3–3.6(4.5) cm long, drying light to dark yellow-brown, finely ridged, sheathed 0.6–0.8 times its length; sheath erect, rounded to weakly free-ending at apex; free portion sulcate on drying; **blades** elliptic to oblong-elliptic to lanceolate or broadly oblanceolate, 5–12.5 × 2.1–4.7 cm, 2.9–4.2 times longer than wide, 1.8–4.5 times longer than petiole, slightly inequilateral (one side 1–4 mm wider), gradually to abruptly acuminate at apex, acute to rounded and inequilateral at base, moderately coriaceous and brittle, dark green above, moderately paler below, drying dark brown to grayish yellow or grayish brown above, moderately paler and grayish yellow or yellow-brown to grayish green below; **midrib** drying moderately obscure on both surfaces, broadly raised and +/- concolorous above, more narrowly raised

and slightly darker below; **primary lateral veins** not discernable on either surface; upper surface with the minor veins 1.5–4 mm apart, weakly raised, the intervenal area minutely granular and densely covered with white cellular inclusions, sometimes with slender, minute erect ribs alternating with an alveolate network of 2–3 rows of epidermal cells, sometimes with few cellular inclusions and rather featureless except for the rows of epidermal cells at highest magnification; lower surface drying with minor veins concolorous and weakly raised, then intervenal area finely striate-ribbed and minutely granular or intermittently minutely ridged-rugulose with a few short linear cellular inclusions. Inflorescence moderately short, usually emerging solitary or up to two, borne at the apex of the stem usually among the leaves often while the flowering branch is in a pendent position; **peduncle** 3.5–7.3 cm long, drying 1–2 mm diam., usually pale yellow-brown, sometimes dark brown; **spathe** green to greenish white, white or cream, turning yellowish, 2–3.6 cm long, slender and acutely pointed in bud, drying dark brown; **spadix** white, turning green, 1.5–3 cm long, stipitate 5–7 mm, drying dark yellow-green, to 1 cm diam and orange in fruit.

Stenospermation parvum ranges from southern Colombia, Ecuador and Peru (Amazonas) at 190–900 (1700) m elevation in the Tropical wet forest (T-wf), Tropical moist forest (T-mf), Premontane moist forest (P-mf), and Premontane rain forest (P-rf) life zones.

The species is distinguished as one of the smallest species of *Stenospermation* (hence the epithet "parvum" meaning small). It is also characterized by its scandent, branching, pendent habit. There is no described species with which it could be easily confused.

Holm-Nielssen et al. 21273 is reported as having a pink to bright red spadix, but otherwise matches this species. Another collection, *Schwerdtfegger 9831907* from Alto Tambo in Lita on the Pacific slope in Esmeraldas Province is also similar in having tiny leaves, however it has a spathe that dries faintly reddish and that is 3.8 times longer than the spadix. It is probably an undescribed species.

Paratypes. COLOMBIA. ANTIOQUIA: Urrao, Parque Nacional "Las Orquideas", Sector Calles, Rio Calles and Quebrada "El Guaguo", 6°32'N, 76°19'W, 1390–1420 m, 12 Feb. 1989, *Cogollo et al. 3904* (JAUM, MO). PUTUMAYO: Río Macoa, 1°10'N, 76°33'W, 700 m, 2 Dec. 1980, *Croat 51757* (MO). ECUADOR. *G. Webster 30433* (QCNE); *Neill 5784* (QCNE). GUAYAS: Naranjal, Res. Ecol. Manglares-Churute. Cumbre del Cerro Mate. 2°27'S, 79°37'W, 28 Dec. 1991, *Cerón 17815* (QAP). MORONA-SANTIAGO: San José Grande, valley of Río Paute, Río Cardenillo Grande-Río Cardenillo Chico, 2°36'S, 78°26'W, 1300–1350 m, 16 Apr. 1991, *Cerón & Benavides 14193* (QAP, QCNE, MO). NAPO: Lagunas de Cuyabeno, 0°01'S, 76°11'W, 300 m, 23 Aug. 1981, *Brandbyge et al. 36002* (AAU, MO); *33870* (AAU, MO); Auca oil field, 60 km S of Coca, 300 m, Jan. 1979, *Besse et al. 37* (SEL); Cantón Tena, Est. Biol. Jatun Sacha, 10 km W on rd. to Tena, 1°03'S, 77°40'W, 500 m, 20 Sep. 1989, *Palacios & Iguago 4442* (MO); Res. Ecol. Antisana, Shamato, entrada por km 21 Shamato, Camino Sardinas-Shamato, 0°44'S, 77°48'W, 1700 m, 27 Apr. 1998, *Clark et al. 5271* (MO, QCNE, SEL). Archidona, Sumaco, Sumaco Napo-Galeras NP, Cumbre de la Cordillera, 0°49'57"S 77°31'33"W, 1720 m, 9 Mar. 2003, *Altamirano 236* (MO, QCNE). ORELLANA: Yasuni, Res. Etnica Huaorani, Maxus rd. and pipeline construction project, kms 99–100, 0°56'S, 76°13'W, 250 m, 9 July 1994, *Pitman 507* (CM, MO, QCNE); Lagunas de Garza Cocha, 1°01'S, 75°47'W, 200 m, 22 Sep. 1988, *Cerón & Gallo 4948* (MO); Río Lagarto Cocha, near Redondo Cocha and Imuya Cocha, 2 hrs. in canoe from Río Aguarico, 0°35'S, 75°15'W, 190 m, 11–12 June 1983, *Laessoe 44284* (AAU, MO); Río Napo, 20 km downstream from Coca at Laguna Taracoa, 250 m, 1 Dec. 1983, *Besse 1967* (SEL). PASTAZA: Pozo petrolero

"Masaramu" de UNOCAL, 40 km al nor-nororiente de Montalvo, 1°44'S, 76°52'W, 400 m, 1–16 May 1990, *Gudiño 374* (F, MO, QCNE, WIS); Pozo Petrolero "Corrientes" de UNOCAL, 35 km al sur-sureste de Curaray, 1°43'S, 76°49'W, 300 m, 1–13 Sep. 1990, *Gudiño 776* (MO, QCNE, RSA, SEL); Parroquia Curaray, Pozo Petrolero Villano 2 de ARCO, entre los ríos Iquino y Villano, 1°29'S, 77°27'W, 350 m, 4–19 Aug. 1993, *Tirado et al. 57* (MO, QCNE); Pichincha, Río Bobonaza, Cachitama-Río Bufeo, 300 m, 2°20'S, 76°40'W, 19 July 1980, *Ollgaard et al. 34728* (AAU); Quito, 650–800 m, Parroquia Puerto Quito, Res. Forestal de ENDESA, 10 km al N de Alvaro Pérez Intriago, 0°03'N, 79°07'W, 11 June 1990, *Cerón & Ayala 10094* (MO). ZAMORA-CHINCHIPE: Cordillera del Condor, ca. del Destacamento Militar de Miasi, 4°20'S, 78°40'W, 900 m, 20 Oct. 1991, *Jaramillo 14168* (MO); Valle del Río Nangaritza, Miazi, Sendero al Hito de Miazi, al este del campamento military, sobre rocas calcáreas. 4°18'S, 78°40'W, 1000–1100 m, 11 Dec. 1990, *Palacios & Neill 6770* (MO); Orellana, Tiputini Biodiv. Sta., 0°38'S, 76°09'W, 200 m, 7 Feb. 2002, *Koster et al. 274* (MO); Pachicutza, sendero hacia el Hito, 1991, *Jaramillo 13944* (NY); Nangaritza, Río Nangaritza, Pachicutza, 4°07'S, 78°37'W, 900–1200 m, 3 Dec. 1990, *Palacios & Neill 6484* (AAU, CAS, MO, QCNE); Parroquia Guayzimi, Camino al Hito de Pachicutza desde el Campamento Militar, transect 50 x 2 m x 10 (0.1 Ha.), Est. Financiado Bazo el Tratado de Cooperación Amazónica, 4°07'S 78°37'W, 1050–1100 m, 19 Oct. 1991, *Cerón et al. 16815* (MO); 4°16'S, 78°42'W, 21 Oct. 1991, *Cerón et al. 16871* (MO); Pachicutza, Camino al Hito, 4°07'S, 78°37'W, 900 m, 18 Oct. 1991, *Palacios et al. 9534* (BR, CM, F, MEXU, MO, QCNE). SUCUMBIOS: 8 km W of Lumbaque on Quito-Lago Agrio rd, 5 km N of hwy, edge of Cayambe-Coca NP, 0°02'S, 77°25'W, 500 m, 21 July 1986, *Gentry & Miller 54945* (MO); Lago Agrio, Res. Cuyabeno, Río Aguarico, Comunidad indígena cofán del Zábalo, 0°22'S, 75°45'W, 230 m, 21 Nov. 1991, *Palacios et al. 9520* (MO). PERU. AMAZONAS: Bagua, Imaza, Yamayakat, transect 2 x 500 m, 5°03'20"S, 78°20'23"W, 480 m, 9 Nov. 1996, *Vásquez et al. 21692* (B, CM, MO, NY); Condorcanqui, Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdivia, Al lado de Kachaim, 4°30'S, 78°30'W, 200–250 m, 15 Aug. 1978, *Kujikat 382* (MO); trail E of Huampami to Shaim, 180–530 m, 1 Aug. 1974, *Berlin 1904* (MO); Monte al lado de Cenepa, 13 Feb. 1973, *Kayap 338* (MO); Río Santiago, 800 m E of Caterpiza, 200 m, 8 Sep. 1979, *Huashikat 479* (MO); 2–3 km behind Caterpiza, 3°50'S, 77°40'W, 180 m, 1 Feb. 1980, *Tunqui 703* (MO); 200 m, 18 Jan. 1980, *Huashikat 1840* (MO).

Xanthosoma baguense Croat, sp. nov. **Type**: Perú. Amazonas: Bagua, Soldado Olivia, 660 m, 6 Feb. 1999, *C. Diaz, M. Huamán, F. Salvador, O. Portocarrero & M. Medina 10606* (holotype, MO-5560089–90). Fig. 14b.

Planta terrestris, ad 90 cm alta; internodia brevia, 2 cm diam. in sicco; petioli ad 85 cm longi, subteres; lamina profunde 3-lobulata; lobus anticus 30.5–32 cm longus, 12.5–15 cm latus; lobuli 25.5–27 cm longi, 7.7–9 cm lati; nervis primariis lateralibus 3–4 utroque; pedunculus ad 23 cm longus; spatha ad 11 cm longa; tubo 1.5 cm diam.; pars spadicis pistillata 1.6 cm longa, 0.6 cm diam.; pars staminata sterilis 2.6 cm longa.

Terrestrial herb to 90 cm tall; **internodes** short, drying to 2 cm diam.; old **cataphyll** fibers persisting on stem. **Petioles** to 85 cm long, subterete, ca. 1 cm diam. midway, drying to 3 m diam. near base of blade, dark blackish brown, matte; **blades** deeply 3-lobed, thinly coriaceous, drying dark greenish brown on the upper surface, slightly paler and yellowish brown on the lower surface; medial lobe 30.5–32 × 12.5–15 cm, narrowly long-acuminate at apex, broadly confluent with the lateral lobes, divided to within 2.7–3.2 cm of the base; lateral

lobes erect-spreading, 25.5–27 × 7.7–9.0 cm (broadest at ca. 3/5 its length), narrowly long-acuminate at apex, auriculate and wider on the outer margin, 5–5.7 cm wide, tapered toward the base on the inner margin and 1.5–1.8 cm wide near the constricted portion; principal collective veins 9–11 mm from margin; **midrib** sunken and concolorous above, raised and weakly ribbed below; **primary lateral veins** 3–4 per side on medial lobe, 5–6 on the outer margin of the lateral lobes, 2–3 on the inner margin of the lateral lobe, obscure and concolorous on upper surface, narrowly raised on the lower surface. Inflorescence with **peduncle** to 23 cm long, drying blackened, weakly glossy to matte; **spathe** partially lost, probably to 11 cm long; spathe tube 1.5 cm diam., purplish brown or green; spathe blade lost; **spadix** white, pistillate portion 1.6 × 0.6 cm; sterile staminate portion of spadix 2.6 cm long; sterile flowers 3 × 0.5–0.8 mm.

Xanthosoma baguense is endemic to Perú, known only from the type locality in the Province of Bagua (hence the epithet "baguense") at 660 m in Premontane wet forest (P-wf) life zone. The species is distinguished by its deeply 3-lobed, blackish drying blades with lateral lobes directed toward the apex and long-acuminate apex.

Paratypes. PERU. PASCO: Oxapampa, Palcazu, Río Alto Iscozacin, Ozuz to Río Pescado, 75°16'W, 10°19'S, 400–500 m, *Foster & d'Achille 10127* (F); Condorcanqui, trocha hacia N. O. del PV-22 (Falso Paquisha), Cordillera del Condor, 830–900 m, 24 Oct. 1987, *Baldeón 543* (USM).

Acknowledgements

The authors wish to thank Dr. Brent Berlin of the University of Georgia for comments on the manuscript, specifically regarding specimen collector information, as well as Mike Grayum of the Missouri Botanical Garden for guidance on nomenclatural issues. We also wish to thank Fred Keusenkothen (MO) and Brigham Fisher (MO) for image scanning and editing.

Literature cited

Croat, T. B., E. D. Yates & A. Swart. Araceae. *In:* R. Vasquez (ed.). Flora del Cenepa y Areas Adyacentes Amazonas Peru, in press.

Holdridge, L. R., W. C. Grenke, W. H. Hatheway, T. Liang & J. A. Tosi, Jr. 1971. Forest Environments in Tropical Zones. Pergamon Press, Oxford.

Araceae da Reserva Biológica da Represa do Grama – Descoberto, Minas Gerais, Brasil

Valquíria Rezende Almeida[1], *Lívia Godinho Temponi*[2] & *Rafaela Campostrini Forzza*[3]

Resumo

(Araceae da Reserva Biológica da Represa do Grama - Descoberto, Minas Gerais, Brasil) A Reserva está localizada em Descoberto, Minas Gerais, e abrange uma área de 263,8 hectares de floresta estacional semidecídua. Foram encontrados oito gêneros e 17 espécies que ocorrem preferencialmente próximas dos cursos d'água e raramente formam grandes populações, sendo que a maioria das espécies está representada na área por poucos indivíduos. São apresentadas chave de identificação das espécies, descrições, informações sobre floração e frutificação, distribuição geográfica e habitat, e ilustrações.

Palavras-chave: Zona da Mata de Minas Gerais, taxonomia, floresta atlântica, flora.

Abstract

(Araceae of the Reserva Biológica da Represa do Grama - Descoberto, Minas Gerais, Brazil). The Reserva Biológica da Represa do Grama is situated in Descoberto, Minas Gerais, and consists of 263,8 hectares of seasonal forest. Eight genera and 17 species of Araceae have been recorded from the Reserve. The species occur commonly close to the river margins and rarely form large populations, the great majority of the species is represented by few individuals. A key for the identification of the species, descriptions, illustrations, information about flowering and fruiting, geographical distribution and habitats of each species are presented.

Key-words: Zona da Mata of the Minas Gerais, taxonomy, atlantic forest, flora.

Introdução

Araceae compreende cerca de 106 gêneros e 2.823 espécies, que ocorrem naturalmente todos os continentes (Govaerts *et al.* 2002). Sua maior diversidade é verificada nas regiões tropicais, especialmente nas florestas úmidas (Mayo *et al.* 1997). O maior número de gêneros ocorre no Velho Mundo e apenas 10 são cosmopolitas. O continente americano é considerado o centro de diversidade da família, com cerca de 1500 espécies e 36 gêneros restritos (Croat 1979). No Brasil, são encontradas aproximadamente 400 espécies distribuídas em 36 gêneros (Mayo *et al.* 1997; Sakuragui 2000) sendo a floresta atlântica considerada o centro secundário de diversidade (Mayo 1990). Este trabalho apresenta as espécies de Araceae da Reserva Biológica da Represa do Grama, um dos poucos remanescentes de mata atlântica de Minas Gerais.

Material e métodos

A Reserva Biológica da Represa do Grama localiza-se na Zona da Mata de Minas Gerais, no município de Descoberto (21°25'S - 42°56'W), cerca de 100 km ao nordeste de Juiz de Fora, tendo sido a primeira Reserva Biológica criada no estado em 1971. Abrange uma área de 263,8 hectares de floresta estacional semidecídua e abriga seis nascentes que desembocam em dois córregos, dos quais ocorre captação de água para abastecimento parcial dos municípios de Descoberto e São João Nepomuceno. Para o desenvolvimento do presente estudo foram realizadas coletas entre agosto de 1999 a novembro de 2004 e as exsicatas foram incorporadas aos herbários CESJ, RB e SPF (siglas conforme Holmgren *et al.* 1990). As descrições e ilustrações foram elaboradas a partir dos materiais coletados na Reserva. A terminologia morfológica segue

Artigo recebido em 07/2005. Aceito para publicação em 11/2005.

[1]Departamento de Botânica, Universidade Federal de Juiz de Fora/Bolsista PIBIC/CNPq. Endereço atual: Mestranda do Museu Nacional/UFRJ.

[2]Doutoranda do Departamento de Botânica, Instituto de Biociências, Universidade de São Paulo.

[3]Jardim Botânico do Rio de Janeiro, Pacheco Leão 915, CEP 22460-030, Rio de Janeiro, RJ, Brasil. rafaela@jbrj.gov.br

Madison (1977), Radford *et al.* (1979), Mayo (1991) e Mayo *et al.* (1997). São apresentadas chave de identificação das espécies, descrições, ilustrações, informações sobre floração e frutificação, distribuição geográfica e hábitats de ocorrência.

Resultados e discussão

Na Reserva Biológica da Represa do Grama, Araceae está representada por oito gêneros e 17 espécies que ocorrem preferencialmente próximas dos cursos d'água e raramente formam grandes populações, sendo que a maioria das espécies está representada na área por poucos indivíduos. Este fato pode estar relacionado ao uso da floresta durante anos para o plantio de café e a extração de madeira, bem como a drástica fragmentação florestal que vem sofrendo a Zona da Mata de Minas Gerais ao longo dos últimos dois séculos.

Parte das espécies de Araceae encontradas na Reserva apresenta ampla distribuição geográfica (*Anthurium pentaphyllum, A. scandens* e *Philodendron propinquum*) e/ou são características de florestas estacionais semidecíduas (*Asterostigma lombardii, Monstera adansonii, Philodendron speciosum, Heteropsis salicifolia*). Porém, mesmo tratando-se de uma floresta estacional semidecídua, a flora da Reserva do Grama inclui espécies típicas da floresta ombrófila densa como *Anthurium comtum, A. solitarium, Philodendron appendiculatum* e *P. curvilobum*, sendo esta última observada pela primeira vez em Minas Gerais. A área também abriga espécies que ocorrem tanto em florestas semidecíduas quanto em floresta ombrófila densa como *Philodendron hastatum* e *P. ornatum*. Oliveira-Filho & Fontes (2000) e Oliveira-Filho *et al.* (2005), demonstraram que as florestas estacionais semidecíduas, além de apresentarem um conjunto florístico próprio, abrigam também espécies da floresta ombrófila que toleram maior sazonalidade climática. As Araceae da Reserva do Grama sugerem que o observado por estes autores para espécies arbóreas ocorre também para ervas.

Chave para identificação das espécies

1. Pecíolo não geniculado; espádice com zona estaminada, estaminada estéril e pistilada (heterogêneo).
   2. Geófitas ou helófitas; lâmina membranácea, nervuras laterais secundárias reticuladas ou colocasióides.
      3. Lâmina sectada; espata não constricta; espádice com zona estaminada vinácea; presença de estaminódios circundando a flor feminina, estigma astericiforme ..... 6. *Asterostigma lombardii*
      3'. Lâmina sagitada a ovado-sagitada; espata constricta; espádice com zona estaminada alva; ausência de estaminódios nas flores femininas, estigma globoso a papiloso.
         4. Lâmina maior que 40 cm compr., verde nítido; bainha se estendendo até a metade do comprimento do pecíolo ..... 17. *Xanthosoma maximiliani*
         4'. Lâmina até 30 cm compr., verde-clara com nervuras vináceas e máculas alvas; bainha nunca atingindo a metade do comprimento do pecíolo .. 7. *Caladium bicolor*
   2'. Hemi-epífita; lâmina cartácea a coriácea; nervuras laterais secundárias peniparalelinérvias.
      5. Pecíolo alado; lâmina oval ..... *Philodendron propinquum*
      5'. Pecíolo não alado; lâmina sagitada.
         6. Hemi-epífita arborescente; lâmina coriácea; espádice com zona estaminada quase igual ou mais curta que a zona estéril; estame pelo menos 3 vezes mais longo que largo; gineceu com mais de 15 lóculos .....15. *Philodendron speciosum*
         6'. Hemi-epífita herbácea; lâmina cartácea ou levemente cartácea; espádice com zona estaminada sempre mais longa que a zona estaminada estéril; estame menor que a razão 3:1; gineceu com até 10 lóculos.

7. Pecíolo verrucoso; 9-11 pares de nervuras laterais primárias; nervuras interprimárias marcadamente visíveis na face adaxial; placentação axial, muitos óvulos por lóculo ..... 13. *Philodendron ornatum*

7'. Pecíolo liso; 4-7 pares de nervuras laterais primárias; nervuras interprimárias ausentes, ou quando visíveis, apenas na face abaxial; placentação axial-basal; 2-5 óvulos por lóculo.

8. Espádice com zona estaminada estéril apical ..... *Philodendron appendiculatum*

8'. Espádice com zona estaminada fértil até o ápice.

9. Lâmina maior que 50 cm compr., lobos posteriores retos, ápice cuspidado; pecíolo, nervura principal e espata esverdeadas com máculas vináceas esparsas ....11. *Philodendron curvilobum*

9'. Lâmina até 40 cm compr., lobos posteriores abertos, ápice agudo; pecíolo, nervura principal e espata sem máculas vináceas ou avermelhadas .... 12. *Philodendron hastatum*

1'. Pecíolo geniculado; espádice não diferenciado em zonas (homogêneo).

10. Nervuras laterais secundárias paralelas às nervuras laterais primárias (peniparalelinérvias); estípete ca. 2 cm compr. ..... 16. *Rhodosphata latifolia*

10'. Nervuras laterais secundárias reticuladas; estípete até 5 mm compr.

11. Perigônio presente.

12. Hemi-epífita; lâmina palmada; pedúnculo nunca atingindo a metade do comprimento do pecíolo ..... 2. *Anthurium pentaphyllum*

12'. Epífita ou rupícola; lâmina inteira; pedúnculo igual ou maior que o comprimento do pecíolo.

13. Profilo persistente, envolvendo toda a extensão do caule, formando uma rede fibrosa; lâmina foliar menor que 12 cm de compr., com pontuações negras pelo menos na face abaxial; 2 óvulos por lóculo ..... 3. *Anthurium scandens*

13'. Profilo decíduo, se persistente desmanchando em fibras apenas no ápice do caule; lâmina foliar maior que 20 cm compr., sem pontuações negras; 1 óvulo por lóculo.

14. Lâmina coriácea com 8-10 pares de nervuras laterais primárias, nervuras interprimárias não evidentes; pedúnculo pêndulo; espata decurrente .... 4. *Anthurium solitarium*

14'. Lâmina cartácea a membranácea com mais de 20 pares de nervuras laterais primárias, nervuras interprimárias evidentes; pedúnculo ereto; espata não decurrente.

15. Lâmina discolor, verde-amarelada abaxialmente; bainha geralmente atingindo a metade do comprimento do pecíolo; espata freqüentemente decídua; espádice curto-espitado .... 1. *Anthurium comtum*

15'. Lâmina levemente discolor, nunca verde-amarelada abaxialmente; bainha até 2 cm compr.; espata persistente; espádice séssil .... 5. *Anthurium* sp.

11'. Perigônio ausente.

16. Caule com crescimento monopodial; pecíolo até 2 cm; espádice curto-estipitado ..... 8. *Heteropsis salicifolia*

16'. Caule com crescimento simpodial; pecíolo maior que 20 cm compr.; espádice séssil ..... 9. *Monstera adansonii*

1. *Anthurium comtum* Schott, Bonplandia 10: 87.1862. Fig. 1 a-b

Epífita. Caule ca. 1 cm diâm.; entrenó 2–6 mm; profilo não visto. Folha com pecíolo 6–13,5 × 0,3–0,4 cm, esverdeado, arredondado abaxialmente e aplanado ou canaliculado adaxialmente, geniculado apicalmente, genículo 0,5–1 × 0,3–0,5 cm, bainha geralmente atingindo a metade do comprimento do pecíolo, 3,8–4,5 cm compr., castanha, fibrosa; lâmina 28,3–48 × 4,6–7,4 cm, verde discolor, verde-amarelada abaxialmente, lanceolada a oblanceolada, ápice agudo a acuminado, base cuneada, margem inteira, cartácea-membranácea; nervura central cilíndrica, levemente quilhada na região distal da face adaxial, nervuras laterais primárias mais de 20 pares, nervuras laterais primárias e interprimárias levemente salientes na face abaxial e impressas na adaxial, nervuras laterais secundárias reticuladas. Inflorescência 1 por axila foliar; pedúnculo 36,5–41 × 0,2 cm, verde, ereto; espata decídua, não vista; espádice homogêneo, curto-estipitado, ca. 10,2 × 0,2 cm, roxo, estípete 3–4 × 2–4 mm. Flores monoclinas, homoclamídeas; tépalas-4, ca. 1,5 × 1,5 mm, roxas apicalmente, creme-esverdeadas com pontuações avermelhadas lateralmente, cuculadas, triangulares; estames ca. 1 × 0,5 mm, anteras rimosas; gineceu ca. 9 × 5 mm, 2-locular, placentação axial-apical, 1 óvulo por lóculo, estigma fendido no centro, região estilar pouco mais larga que o ovário. Infrutescência imatura ca. 8,8 × 0,5 cm; pedúnculo 36–40 × 0,2 cm, verde, ereto. Frutos imaturos ca. 1,5 × 1 mm, castanho-claros, subprismáticos, tépalas persistentes.

Material examinado: 23.I.2001, fr., *R. C. Forzza et al. 1750* (CESJ); 31.X.2001, fl. e fr., *V. R. Almeida et al. 15* (CESJ).

Anthurium comtum possui raízes emaranhadas e numerosas folhas formando uma roseta, o que a distingue das demais espécies encontradas na Reserva. Esta espécie é exclusiva do Brasil, ocorrendo desde as matas do sul da Bahia até o Paraná (Coelho 2004). Na Reserva, *A. comtum* é rara, ocorrendo somente no interior da mata em local úmido e sombreado.

2. *Anthurium pentaphyllum* (Aubl.) G. Don, Hort. Brit. 3: 633. 1839. Fig. 1 c-d

Hemi-epífita. Caule 0,8–1,7 cm diâm.; entrenó ca. 1–2,3 cm; profilo 2,5–5,2 × 1,3 cm, verde passando a castanho, desmanchando em fibras, bicarenado. Folha com pecíolo 29–54 × 0,3 cm, esverdeado, cilíndrico, levemente sulcado, geniculado apicalmente, genículo 0,7–1,5 × 0,5–1 cm; bainha 1,8–4,3 cm compr.; lâmina palmada, peciólulos 0,7–2,2 cm compr., 7–11 segmentos 21–24,5 × 4,5–6 cm, verde discolor, oblanceolado, ápice acuminado a longo-acuminado, base cuneada às vezes assimétrica, margem inteira a levemente ondulada, cartácea; nervura central levemente quilhada em ambas as faces, amareladas; nervuras laterais primárias 9–14 pares, nervuras laterais primárias e interprimárias levemente salientes em ambas as faces, nervuras laterais secundárias reticuladas. Inflorescência 1 por axila foliar; pedúnculo 3–7,5 × 0,3 cm, verde, ereto; espata 2,5–6 × 0,9–1,7 cm, não decurrente, não constricta, sem diferenciação entre lâmina e tubo, verde em ambas as faces, lanceolada, ápice agudo, reflexa, persistente; espádice homogêneo, séssil, 5,4–8,5 × 0,4–0,8 cm, verde à vináceo. Flores monoclinas, homoclamídeas; tépalas-4, ca. 2,5 × 1 cm, cuculadas, triangulares; estames ca. 2 × 1 mm, anteras rimosas; gineceu ca. 1,5 × 1 mm, 2-locular, placentação axial-apical, 1 óvulo por lóculo, estigma fendido no centro, região estilar da mesma largura do ovário. Infrutescência ca. 9–10,5 × 2 cm, pedúnculo 2,5–7,5 × 0,6 cm, verde, ereto. Frutos ca. 6 × 7 mm., vináceos, cônicos, tépalas persistentes.

Material examinado: 26.XI.2000, fl., *R. C. Forzza & L .D. Meireles 1729* (CESJ); 10.II.2001, fl., *R. M. Castro et al. 84* (CESJ); 8.VI.2001, fr., *R. M. Castro 458* (CESJ); 5.X.2001, fr. *A. V. Lopes & V. R. Scalon 32* (CESJ); 12.I.2002, fl., *V. R. Almeida et al. 33* (CESJ, RB); 8.III.2003, fl., *V. R. Almeida et al. 35* (CESJ).

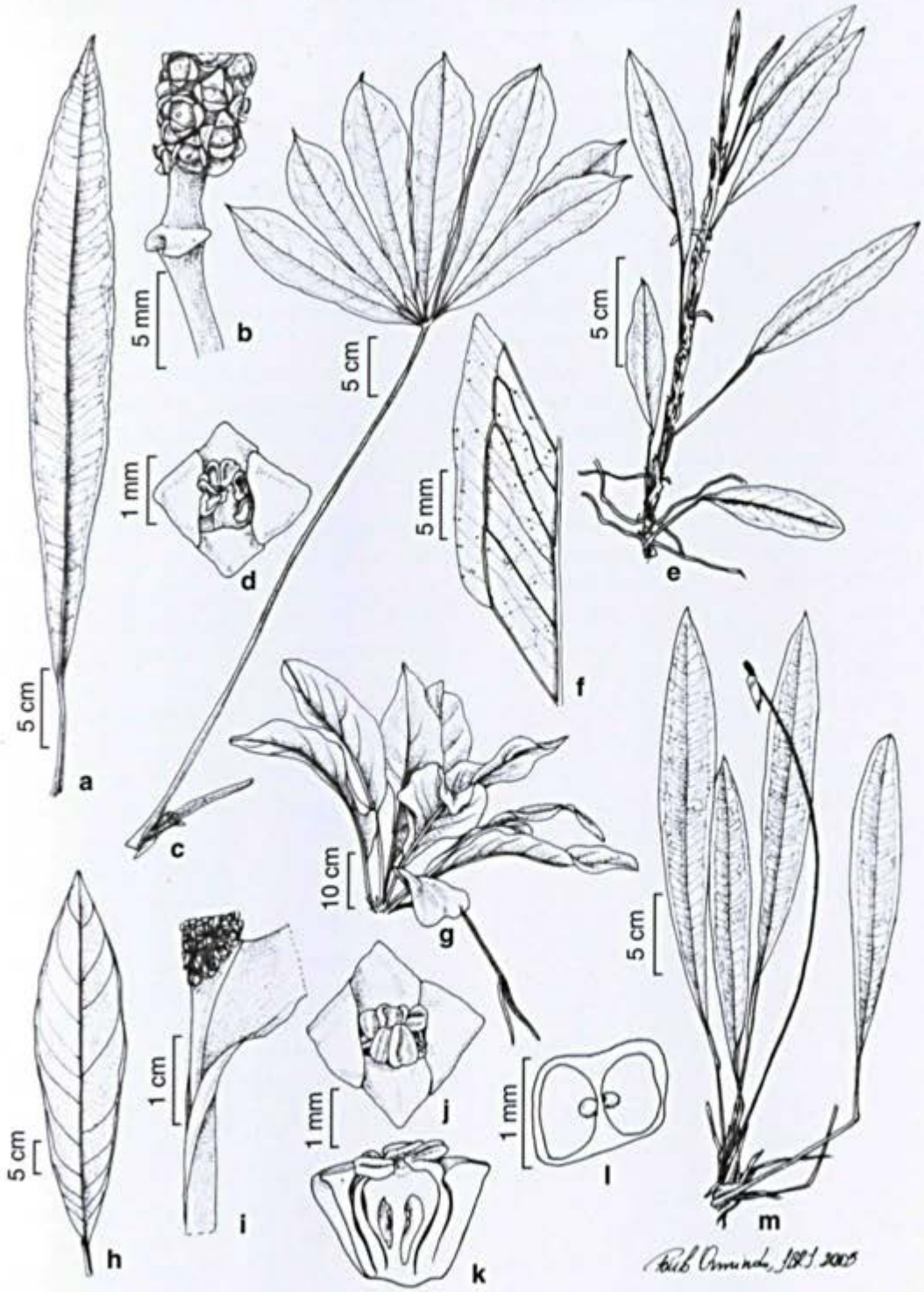


Figura 1 - a-b *Anthurium comtum*: a. pecíolo e lâmina evidenciando as nervuras laterais primárias; b. região proximal do espádice curto-estipitado. c-d *A. pentaphyllum*: c. pecíolo, lâmina e inflorescência; d. flor em vista frontal. e-f *A. scandens*: e. aspecto geral do ramo, evidenciando os profilos persistentes e inflorescência; f. detalhe da lâmina foliar com pontuações glandulares e nervuras laterais secundárias reticuladas; g-l *A. solitarium*: g. hábito e inflorescência; h. lâmina evidenciando 8-10 pares de nervuras laterais primárias; i. espata decurrente; j. flor em vista frontal; k. flor em corte longitudinal; l. ovário em corte transversal. m. *Anthurium* sp. hábito e parte da inflorescência.

impressas na face adaxial e salientes na abaxial, nervuras laterais primárias 7–9 pares, nervuras laterais secundárias reticuladas; divisões posteriores 8–20 × 14,5–26 cm, porção acroscópica com 1 lobo e porção basioscópica com 2 a 4 lobos, porção desnuda das nervuras basais ca. 1,5 cm compr.; base, ápice, margem e número de nervuras similares aos da divisão anterior. Inflorescência 1 por axila foliar; pedúnculo 42–62 × 1 cm, concolor com o pecíolo, ereto; espata 10–16 × 2,4–3,5 cm, alva, vinácea na face interna da porção estaminada do espádice, não constricta, sem diferenciação em lâmina e tubo, lanceolada, ápice agudo, persistente; espádice heterogêneo, séssil, 8,5–12,5 cm compr.; zona estaminada 5–8 × 0,4 cm, vinácea; zona pistilada 3,5–6 × 0,5 cm, creme esverdeada. Flores diclinas, aclamídeas; flor masculina em sinândrio, ca. 3 × 2 mm, vinácea, anteras com deiscência transversal; flor feminina ca. 2 × 1,5 mm, verde-clara, ovário globoso, 4–5 locular, 1 óvulo por lóculo, placentação axial, região estilar menor que o ovário, estigma estrelado, com 5 lobos agudos, amarelo-esverdeado, estaminódios unidos formando um sinândrio, róseos. Infrutescência: pedúnculo e espata como na inflorescência. Frutos imaturos, verde-amarelados, globosos, sulcados.

Material examinado: 26.XI.2000, fr., *R. C. Forzza & L. D. Meireles 1709* (CESJ, SPF); 3.XI.2002, fl., *L. C. S. Assis et al. 615* (CESJ).

Asterostigma lombardii é facilmente reconhecida dentre as espécies da Reserva, por ser a única a apresentar lâmina sectada (Fig. 2a), pecíolo e pedúnculos com máculas formando rajas características, estigma estrelado e estaminódios unidos circundando o gineceu (Fig. 2 c-d). Esta espécie é semelhante a *A. riedelianum* (Schott) O. Kuntze, pelo fato de ambas possuírem estaminódios conatos em forma de uma urcéola naviforme, alongada no sentido do espádice (Gonçalves 1999, 2002). As duas espécies, no entanto, podem ser diferenciadas pela forma dos lobos do estigma. *A. lombardii* ocorre nas florestas semidecíduas do leste de Minas Gerais e Espírito Santo (Gonçalves 2002), enquanto *A. riedelianum* ocorre na Bahia. Na Reserva, são encontrados indivíduos esparsos de *A. lombardii*, preferencialmente em áreas constantemente alagadas.

7. *Caladium bicolor* (Aiton) Vent., Mag. Encycl. 4 (16): 464-471. 1801. Fig. 2e

Geófita. Caule tuberoso, globoso; entrenó inconspícuo; profilo 4–7 × 1,3–1,8 cm, alvo a castanho, bicarenado, membranáceo. Folha com pecíolo 12,5–44 × 0,2–0,5 cm, verde a castanho, levemente rajado, mais claro na face abaxial e lateralmente, cilíndrico, não geniculado apicalmente; bainha 7–12 cm compr.; lâmina 20–29 × 13,3–18,8 cm, verde discolor, com máculas alvas, ovado-sagitada, ápice acuminado, margem inteira, membranácea; divisão anterior 8,8–18,5 × 8,3–15,7 cm, nervura central cilíndrica, saliente em ambas as faces, nervuras laterais primárias 3–4 pares, levemente salientes e vináceas na face abaxial, aplanadas e fortemente vináceas na face adaxial, nervuras interprimárias pouco visíveis na face abaxial, nervuras laterais secundárias reticuladas; divisões posteriores 4,3–10,3 × 3–9 cm, nervuras acroscópicas 2–3 por lado, nervura basioscópica 2 por lado, porção desnuda das nervuras basais ausente, nervura basal levemente quilhada. Inflorescência 1 por axila foliar; pedúnculo 15,5–30 × 0,4 cm, verde até castanho, ereto; espata 8,1–10,1 cm compr., constricta, com diferenciação entre lâmina e tubo, tubo 2,5–3 × 6 cm, lâmina 6–7,5 × 5,5 cm, creme-esverdeada, persistente; espádice heterogêneo, estipitado, 4,9–7,2 cm compr., alvo até creme, estípete ca. 3 mm compr., zona estaminada 3–4,1 × 0,5–0,7 cm, zona estaminada estéril 0,8–1,7 × 0,3–0,5 cm, zona pistilada 0,9–1,3 × 0,5–0,6 cm. Flores diclinas, aclamídeas; flor masculina em sinândrio, estames 2–2,5 × 2 mm, anteras poricidas; flor masculina estéril ca. 1 × 3 mm; flor feminina ca. 2 × 1 mm, ovário 2-locular, placentação axial, 3–4 óvulos por lóculo, estigma globoso, região estilar da mesma largura do ovário. Infrutescência não vista.

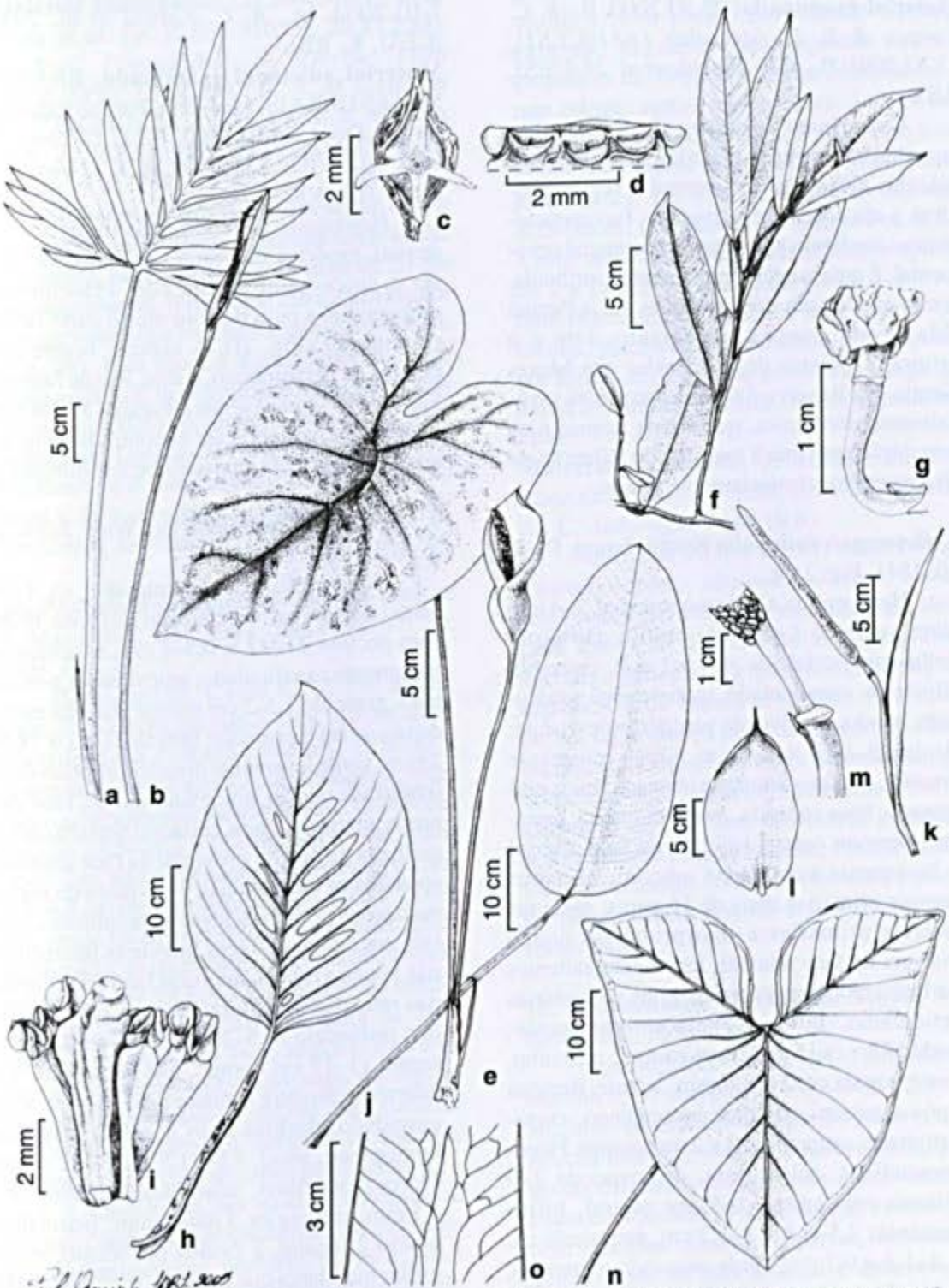


Figura 2 - a-d *Asterostigma lombardii*: a. lâmina e pecíolo; b. inflorescência; c. flor em vista frontal; d. sinândrio em vista longitudinal. e. *Caladium bicolor*: lâmina e inflorescência. f-g *Heteropsis salicifolia*: f. aspecto geral do ramo; g. região proximal do espádice curto-estipitado. h-i *Monstera adansonii*: h. lâmina fenestrada e pecíolo; i. flor monoclina. j-m *Rhodospatha latifolia*: j. lâmina e pecíolo; k. inflorescência; l. espata; m região proximal do espádice estipitado. n-o *Xanthosoma maximiliani*: n. lâmina foliar e parte do pecíolo; o. detalhe das nervuras laterais secundárias colocasióides.

Material examinado: 25.XI.2000, fl., *R. C. Forzza & L. D. Meireles 1681*(CESJ); 11.XI.2001, fl., *V. R. Almeida et al. 25* (CESJ, RB).

Caladium bicolor é facilmente reconhecida por apresentar lâmina foliar com máculas alvas, nervura central e região próxima a ela rósea até vermelha. Tais características conferem à espécie um potencial ornamental. É uma espécie amplamente distribuída, sendo encontrada do Amazonas até o Paraná (Mayo com. pess.), no entanto, este é o primeiro registro de *C. bicolor* em Minas Gerais. Na Reserva é uma das espécies sazonalmente dormentes, que forma apenas uma população próxima à margem do Ribeirão do Grama em local ensolarado e úmido.

8. *Heteropsis salicifolia* Kunth, Enum. Pl. 3: 60. 1841. Fig. 2 f-g

Hemi-epífita. Caule monopodial, 2–4 mm diâm.; entrenó 2–4,5 cm; profilo não visto. Folha com pecíolo ca. 4–7 × 1 mm, castanho, cilíndrico, canaliculado, inteiramente geniculado; bainha envolvendo parcialmente o caule; lâmina 8–17,8 × 2–6 cm, verde levemente discolor, elíptico-oblonga a obovada, ápice acuminado, base cuneada, margem inteira, cartácea; nervura central saliente na face abaxial e levemente sulcada na adaxial, nervuras laterais primárias mais de 15 pares; nervuras laterais primárias e interprimárias pouco visíveis na face adaxial, levemente salientes na face abaxial, nervuras laterais secundárias reticuladas. Inflorescência em pré-antese; pedúnculo ca. 5 × 1 mm compr., castanho, ereto; espata ca. 2 cm compr., creme, decídua após a antese; espádice homogêneo, curto-estipitado, estípete ca. 3 × 2 mm compr. Flores monoclinas, aclamídeas, dispostas de 7–9 fileiras em espiral, 4–5 por espiral. Infrutescência 2,5–3,3 × 1–1,2 cm, pedúnculo ca. 1,1–1,3 × 0,1 cm, verde passando a marrom, ereto. Frutos imaturos 6-8 mm diâm., verdes, subprismáticos.

Material examinado: 26.IX.2000, fr., *R. C. Forzza & L. D. Meireles 1697* (CESJ); 7.III.2004, bt., *R. C. Forzza et al. 2981* (CESJ, K, RB).

Material adicional examinado. BRASIL. MINAS GERAIS: Marliéria, Parque Estadual do Rio Doce, 24.III.2000, fl., *L. G. Temponi et al. 102* (VIC); 7.IV.2000, fr., *L. G. Temponi et al. 110* (VIC).

Heteropsis salicifolia distingue-se das demais espécies ocorrentes na Reserva, por ser a única hemi-epífita com crescimento monopodial e pelo pecíolo muito curto (até 2 cm compr.) (Fig. 2f). A espécie ocorre nos estados de Pernambuco, Bahia, Rio de Janeiro, São Paulo, Minas Gerais e Paraná. Muito rara na Reserva, podendo ser encontrada somente no interior da mata em locais bem sombreados.

9. *Monstera adansonii* Schott, Wien. Zeitschr. 4: 1028. 1830. Fig. 2 h-i

Hemi-epífita. Caule simpodial, ca. 1 cm diâm.; entrenó ca. 3 cm; profilo não visto. Folha com pecíolo 21–42 × 0,5–1 cm, esverdeado, fortemente canaliculado, apicalmente geniculado, genículo 1,5-2 cm compr.; bainha estendendo-se até o genículo; lâmina 31–51 × 18,5–29 cm, verde levemente discolor, elíptico-oval, fenestrada ou não, ápice acuminado, base atenuada, margem inteira, coriácea; nervura central quilhada na porção proximal da face abaxial e aplanada na face adaxial, 9–16 pares de nervuras laterais primárias, levemente salientes, visíveis em ambas as faces, nervuras interprimárias pouco visíveis, nervuras laterais secundárias reticuladas. Inflorescência 1 por axila foliar; pedúnculo 10,5–20 × 0,5 cm, verde, ereto; espata 11–17 cm compr., não constricta, sem diferenciação entre lâmina e tubo, elíptica, ápice cuspidado, decídua após a antese; espádice homogêneo, séssil, 7,5–11,5 × 1,5 cm, creme. Flores monoclinas, aclamídeas; estames ca. 3 × 1 mm; gineceu ca. 3 mm compr., prismático, ovário 2-locular, 2 óvulos por lóculo, região estilar mais larga que o ovário, estigma fendido no centro, alaranjado. Infrutescência imatura 10–17 × 2–2,5 cm, alva; pedúnculo 16–20 × 0,5 cm, verde, ereto. Frutos 1,5–1,8 × 0,7 cm, verde-amarelados, subprismáticos.

Material examinado: 2.II.2000, fl., *P. C. L. Faria et al. s.n.* (CESJ 31035); 26.XI.2000, fr., *R. C. Forzza & L. D. Meireles 1696* (CESJ, SPF); 21.IV.2001, fl., *R. M. Castro et al. 273* (CESJ); 31.X.2001, fr., *V. R. Almeida et al. 12* (CESJ, RB); 20.IV.2002, fl., *R. C. Forzza et al. 2181* (CESJ).

Monstera adansonii apresenta como características marcantes a lâmina foliar adulta fenestrada, pecíolo longo com mais de 20 cm de comprimento, fortemente canaliculado com alas persistentes e bainha longa até o genículo (Fig. 2h). Esta espécie é amplamente distribuída no Brasil, ocorrendo em todas as regiões (Temponi 2001). É também registrada para Venezuela, Guianas e Peru (Madison 1977). Na Reserva é amplamente distribuída pelo interior da mata sendo uma das espécies mais freqüentes de Araceae.

10. *Philodendron appendiculatum* Nadruz & Mayo, Bol. Bot. Univ. São Paulo 17: 50. 1998. Fig. 3a

Hemi-epífita. Caule 0,7–1 cm diâm.; entrenó 2–3,4 cm; profilo 7–19 × 1–2 cm, alvo-esverdeado a castanho escuro, elíptico a lanceolado, ápice agudo a arredondado, carenado ou bicarenado, membranáceo. Folha com pecíolo 22,5–28,2 × 0,3–0,4 cm, verde, cilíndrico, liso, não geniculado apicalmente; bainha 2,3–4,2 cm compr.; lâmina 35,7–39,6 × 12–15 cm, verde levemente discolor, sagitada, ápice acuminado, margem inteira, cartácea; divisão anterior 27–29,5 × 8,3–13,3 cm, nervura central saliente, levemente arredondada na face abaxial, aplanada na face adaxial, nervuras laterais primárias 4-(5) pares, mais visíveis na face abaxial, aplanadas; nervuras interprimárias visíveis na face abaxial; nervuras secundárias peniparalelinérvias; divisões posteriores 8,7–10,1 × 4,8–6,9 cm, nervuras acroscópicas 2 por lado, nervuras basioscópicas 1–2 por lado, porção desnuda das nervuras basais 1,3–2,5 cm. Inflorescência 1 por axila foliar; pedúnculo ca. 2,3–3,2 × 0,3 cm, verde, ereto; espata ca. 7,2–7,9 cm compr., constricta, com diferenciação entre lâmina e tubo, tubo ca. 3 × 2,3 cm, lâmina ca. 4,3–5 × 2,3 cm, lâmina e tubo alvos sendo o tubo pouco esverdeado na face externa; espádice heterogêneo, curto-estipitado, ca. 8–8,3 cm compr., estípete ca. 3 mm compr., zona estaminada ca. 3 × 0,4 cm; zona estaminada estéril ca. 1 × 0,7 cm; zona estaminada estéril apical 1,9 × 0,6 cm; zona pistilada ca. 2,2 × 0,7 cm. Flores diclinas, aclamídeas; flor masculina: estames ca. 1,5 × 1 mm, anteras rimosas; estaminódios apicais ca. 2 × 1 mm; flor masculina estéril 2–3 × 1–2 mm; flor feminina ca. 2 × 1 mm, ovário 7-8-locular, placentação axial-basal, 3-(4) óvulos por lóculo, região estilar pouco mais larga que o ovário, estigma discóide. Infrutescência não vista.

Material examinado: 31.X.2001, fl., *V. R. Almeida et al. 13* (CESJ, RB); 26.XI.2004, fl., *C. Sakuragui 1640* (RB).

Nadruz & Mayo (1998) descreveram *Philodendron appendiculatum* como semelhante a *P. inops* Schott, diferindo desta pela forma da lâmina foliar e pelo forte estrangulamento na porção mediana do espádice e da espata (Fig. 3a). Seu nome deriva da presença de uma porção de flores estaminadas estéreis no ápice do espádice, que constitui uma característica marcante na espécie (Fig. 3a). Tem ocorrência registrada nos estados da Região Sudeste, Paraná e Santa Catarina (Coelho 2000). Na Reserva é pouco freqüente sendo restrita a locais úmidos e sombreados.

11. *Philodendron curvilobum* Schott, Syn. Aroid. 102. 1856. Fig. 3b

Hemi-epífita. Caule ca. 2 cm diâm.; entrenó 1,5–2 cm; profilo 15,5–34,8 × 2,3–2,7 cm, alvo-esverdeado a castanho escuro, com poucas máculas vináceas, lanceolado, ápice agudo, carenado ou bicarenado, membranáceo. Folha com pecíolo 39–60 × 0,8 cm, esverdeado com máculas vináceas esparsas, levemente arredondado na face abaxial e aplanado na adaxial, liso, não geniculado apicalmente; bainha ca. 6,5 cm compr.; lâmina 58–60 × 18,5–31 cm, verde levemente discolor, sagi-

tada, ápice acuminado, margem inteira, cartácea; divisão anterior 43–44,5 × 15–28 cm, nervura central saliente na face abaxial sendo levemente quilhada na porção proximal, aplanada na face adaxial, nervuras laterais primárias 6–7 pares, levemente salientes e visíveis em ambas as faces, aplanadas, nervuras interprimárias pouco visíveis, nervuras laterais secundárias peniparalelinérvias; divisões posteriores 14–15,5 × 8,4–10 cm, nervuras acroscópicas 2 por lado, nervura basioscópica 1–2 por lado, porção desnuda das nervuras basais ca. 2 cm. Inflorescência 1–2 por axila foliar; pedúnculo 6,5–11,2 × 0,5 cm, verde, ereto; espata 11,5–17,2 cm compr., constricta, com diferenciação entre lâmina e tubo, verde com máculas vináceas na face externa e lâmina alva e tubo com máculas vermelhas na face interna, tubo 5,5–8 × 3–5 cm, lâmina 6,2–9 × 2,6–4,6 cm,; espádice heterogêneo, séssil, ca. 11,5 cm compr.; zona estaminada ca. 5,9 × 1,2 cm; zona estaminada estéril ca. 1,9 × 1,5 cm; zona pistilada 4,3–6 × 1,5 cm. Flores diclinas, aclamídeas; flor masculina: estames ca. 3 × 1 mm, anteras rimosas; flor masculina estéril 2,5–3 × 2–2,5 mm, castanho-escura; flor feminina 3–4 × 1,5–2 mm, ovário 7-8-locular, placentação axial-basal, 3–5 óvulos por lóculo, estigma papiloso, região estilar da mesma largura do ovário. Infrutescência ca.10 × 2,5 cm, pedúnculo 10–10,5 × 0,5 cm, verde, ereto. Frutos verde-claros, sementes amarelas a alaranjadas.

Material examinado: 26.XI.2000, fl., *R. C. Forzza & L. D. Meireles 1698* (CESJ, SPF); 24.I.2001, fr., *R. C. Forzza et al. 1768* (CESJ, SPF); 10.XI. 2001, fl., *V. R. Almeida et al. 19* (CESJ).

Philodendron curvilobum apresenta lâmina foliar sagitada com os lobos posteriores retos (Fig. 3b) e pecíolo, nervura central e espata esverdeados com máculas avermelhadas. Tais características são marcantes e distingue esta espécie das demais do gênero, incluindo *P. hastatum*, uma espécie muito semelhante e que também ocorre na Reserva. *P. curvilobum* foi citado anteriormente apenas para os estados do Rio de Janeiro e São Paulo (Sakuragui 1998) sendo este seu primeiro registro para Minas Gerais. É uma das espécies mais comuns na área, formando grandes populações próximas a cursos d'água no interior e na borda da mata.

12. *Philodendron hastatum* K. Koch & Sellow, Index Sem. 7. 1854. Fig. 3 c-d

Hemi-epífita. Caule ca. 1 cm diâm.; entrenó ca. 6 cm; profilo 7–20,5 × 2–2,5 cm, alvo a castanho-claro, elíptico a lanceolado, ápice agudo, carenado a bicarenado, membranáceo a paleáceo. Folha com pecíolo 23,5–34 × 0,5 cm, verde, cilíndrico, liso, ápice não geniculado; bainha 5,1–6,2 cm compr.; lâmina 25,5–38,3 × 6,3–14 cm, verde levemente discolor, sagitada a hastada, ápice agudo, margem inteira, levemente cartácea; divisão anterior 21–37,5 × 7,1–14,5 cm, nervura central aplanada, levemente arredondada na face abaxial, nervuras laterais primárias 4–5 pares, aplanadas na face adaxial, levemente salientes na face abaxial, visíveis em ambas as faces, nervuras interprimárias ausentes ou pouco visíveis e às vezes visíveis na face abaxial, nervuras laterais secundárias peniparaleli-nérvias; divisões posteriores 7,2–8,3 × 4,1–5,7 cm, nervuras acroscópicas 2–3 por lado, nervuras basioscópicas 1 por lado, porção desnuda das nervuras basais 1,7–2,5 cm. Inflorescência 2-3 por axila foliar; pedúnculo 3,5–5,5 × 0,3–0,4 cm, verde, ereto; espata 8-13,5 cm compr., constricta, com diferenciação entre lâmina e tubo, tubo 3–3,5 × 4,5 cm, creme, lâmina 3,5–8,5 × 3–4,5 cm, alva; espádice heterogêneo, estipitado, 7–10 cm compr., estípete ca. 5 mm compr.; zona estaminada ca. 4,5 × 0,7 cm, zona estaminada estéril ca. 7 × 8 mm, zona pistilada 4,2–4,5 × 0,8–1 cm. Flores diclinas, aclamídeas; flor masculina: estames ca. 1,5 × 1 mm, anteras rimosas; flor masculina estéril ca. 2 × 1 mm; flor feminina ca. 2 × 1 mm, ovário 7–9-locular, placentação axial-basal, 2–3(4) óvulos por lóculo, estigma globoso, região estilar pouco mais larga que o ovário. Infrutescência não vista.

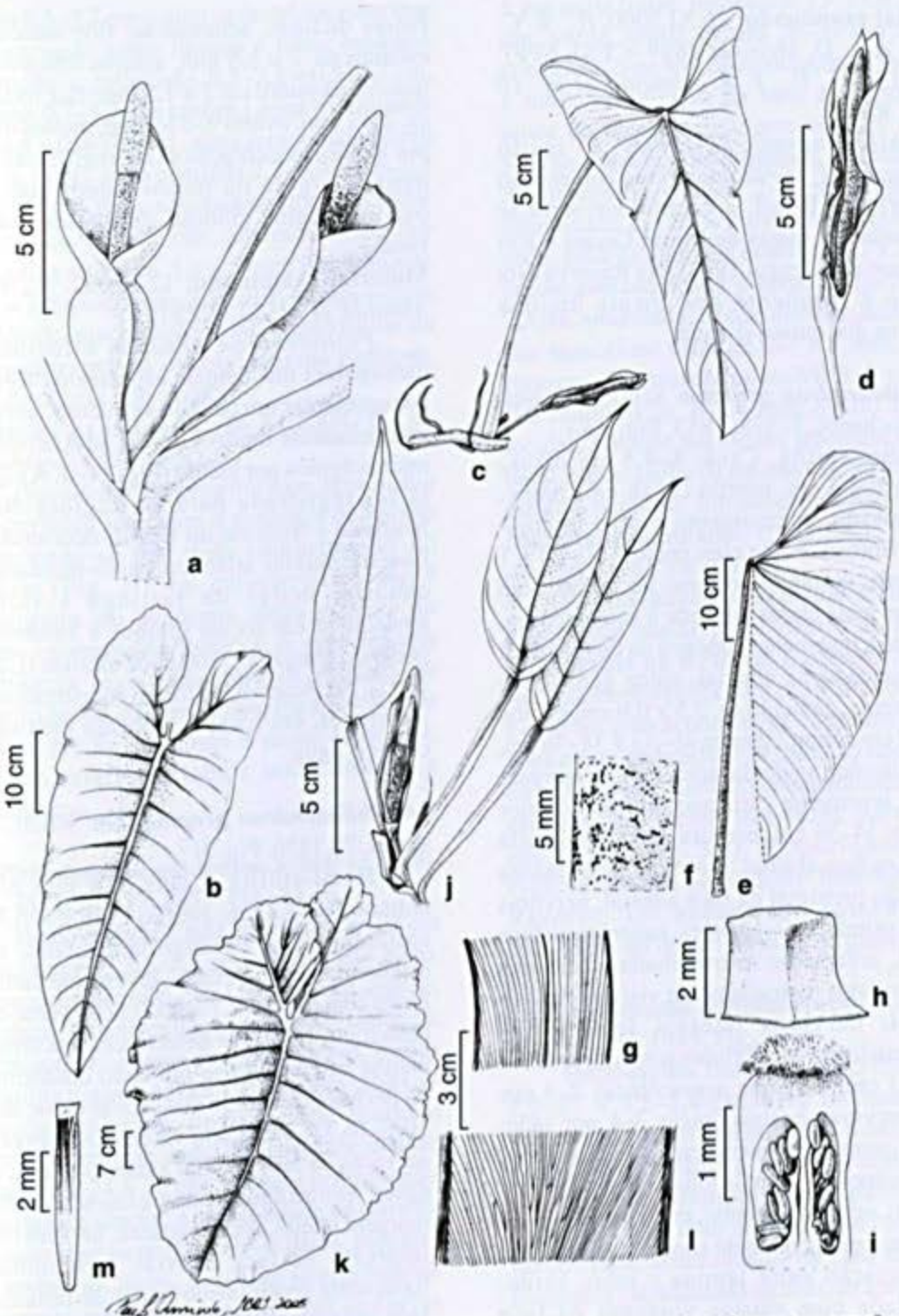


Figura 3 - a *Philodendron appendiculatum*: inflorescência evidenciando a forte constrição da espata e a porção estéril no ápice do espádice. b. *P. curvilobum*: lâmina foliar evidenciando os lobos posteriores retos. c-d *P. hastatum*: c. lâmina foliar evidenciando os lobos posteriores abertos. d. inflorescência com parte da espata seccionada. e-i *P. ornatum*: e. parte da lâmina foliar e pecíolo verrucoso; f. detalhe da ornamentação do pecíolo; g. nervuras laterais primárias com uma interprimária marcadamente visível.; h flor masculina estéril; i. flor feminina em corte longitudinal, evidenciando grande número de óvulos. j. *P. propinquum*: aspecto geral do ramo e inflorescência com parte da espata seccionada. k-m *P. speciosum*: k. lâmina; l. detalhe de nervuras laterais primárias sem interprimária marcadamente visível; m. estame.

Material examinado: 26.XI.2000, fl., *R. C. Forzza & L. D. Meireles 1699* (CESJ, SPF); 31.VIII.2001, fl., *V. R. Almeida et al. 10* (CESJ, RB).

Philodendron hastatum é muito semelhante a *P. curvilobum* (vide comentário anterior). No Brasil, a espécie encontra-se distribuída nas matas de Minas Gerais e Rio de Janeiro (Sakuragui 1998). Na Reserva esta espécie é freqüente nos locais úmidos próximos dos cursos d'água.

13. *Philodendron ornatum* Schott, Oesterr. Bot. Wochenbl. 3: 378. 1853. Fig. 3 e-i

Hemi-epífita. Caule 4–4,5 cm diâm., entrenó 1–3,5 cm; profilo ca. 18 cm compr., verde-rosado externamente e alvo internamente, fibroso. Folha com pecíolo 50–60 × 1 cm, verde, castanho próximo ao limbo, com verrugas mais claras em toda a sua extensão, aplanado a levemente côncavo na face adaxial e arredondado na abaxial, ápice geniculado apicalmente, genículo ca. 3,5 × 0,6 cm, bainha 2,9–3,2 cm compr.; lâmina 46–53 × 34–36 cm, verde discolor, sagitada, ápice agudo, margem inteira, levemente cartácea; divisão anterior 33–40 × 34–36 cm, nervura central aplanada e verde na face abaxial, proeminente e vinácea na porção proximal da face adaxial, nervuras laterais primárias 9–11 pares, salientes na face abaxial, levemente avermelhadas, nervuras interprimárias marcadamente visíveis na face abaxial, nervuras laterais secundárias peniparalelinérvias; divisões posteriores 12,5–16 × 13 cm, nervuras acroscópicas 2–3 por lado, nervuras basioscópicas 3-4 por lado, porção desnuda das nervuras basais ca. 3 cm. Inflorescência 2 por axila foliar; pedúnculo 5,5–7 × 1 cm, verde a castanho, ereto; espata 12,5–16 cm compr., levemente constricta, sem forte diferenciação entre lâmina e tubo, verde-amarelada com estrias vináceas na face externa e alva na face interna; espádice heterogêneo, estipitado, 10,5–12 cm compr., estípete ca. 1 cm; zona estaminada 5–6 × 1,3 cm, alva; zona estaminada estéril ca. 2,5 × 1,5 cm, alva; zona pistilada 3–3,3 × 1,3 cm, verde. Flores diclinas, aclamídeas; flor masculina: estames ca. 2 × 1,5 mm, anteras rimosas; flor masculina estéril ca. 2 × 1,5 mm; flor feminina ca. 2 × 1 mm, ovário 3–5 locular, muitos óvulos por lóculo, placentação axial, região estilar da mesma largura ou pouco menor que a do ovário, estigma globoso. Infrutescência não vista.

Material examinado: 12.I.2002, fl., *V. R. Almeida et al. 32* (CESJ).

Philodendron ornatum é facilmente distinguível das demais espécies da Reserva por apresentar um pecíolo verrucoso, nervuras interprimárias muito visíveis adaxialmente e muitos óvulos por lóculo (Fig. 3 e-i). A espécie já foi registrada para as Regiões Norte, Nordeste e Sudeste do Brasil, ocorrendo em floresta pluvial atlântica baixo-montana, de encosta, matas de restinga e floresta amazônica em locais úmidos e sombreados podendo chegar a 1.100 m de altitude (Coelho 1995). Na Reserva, só foram encontrados dois indivíduos, em local sombreado próximo de curso d'água.

14. *Philodendron propinquum* Schott, Syn. Aroid.:78.1856. Fig. 3j

Hemi-epífita. Caule 3–4 mm diâm.; entrenó 0,6–3,4 cm; profilo ca. 6,2 × 0,7 cm, castanho-claro, oblongo-lanceolado, ápice arredondado, bicarenado, levemente cartáceo. Folha com pecíolo 7,7–12 × 0,1 cm, verde-claro, cilíndrico, liso, não geniculado apicalmente; bainha estendendo-se por todo comprimento do pecíolo, formando alas, verde-clara; lâmina 10,1–16,3 × 3,2–5 cm, verdes discolores com nervuras da face abaxial amarelo-claras, oval, ápice acuminado, base cuneada-oblíqua, margem inteira, membranácea; nervura central impressa na face adaxial, arredondada e fortemente proeminente na porção proximal da face abaxial, nervuras laterais primárias 5–7 pares, pouco visíveis na face adaxial, salientes na face abaxial, nervuras interprimárias ausentes, nervuras laterais secundárias peniparalelinérvias. Inflorescência 1 por axila foliar; pedúnculo 1,4-1,8 × 0,2 cm, verde, ereto;

espata 6,5–7,7 cm compr., constricta, com leve diferenciação entre lâmina e tubo; espádice heterogêneo, estipitado, 6,3–7,3 × 0,5–0,7 cm, estípete 0,7–1,3 cm compr.; zona estaminada 2,5–3,4 × 0,4–0,7 cm , zona estaminada estéril ca. 5 × 7 mm, zona pistilada 2,2–3,4 × 0,6–0,7 cm. Flores diclinas, aclamídeas; flor masculina: estames ca. 1,5 × 1 mm, antera rimosas; flor masculina estéril ca. 1 × 1,5 mm; flor feminina ca. 1 × 1,5 mm, ovário 3-locular, muitos óvulos por lóculo, placentação axial, região estilar da mesma largura do ovário, estigma papiloso. Infrutescência não vista.

Material examinado: 26.XI.2004, fl., *C. Sakuragui 1638* (RB).

Philodendron propinquum tem como característica marcante a presença de bainha estendendo-se por todo comprimento do pecíolo (Fig. 3j), tal característica não é encontrada em nenhuma outra espécie do gênero ocorrente na Reserva. A espécies tem ocorrência registrada para os estados do Espírito Santo, Minas Gerais, Paraná e Rio de Janeiro. Na Reserva, não é muito freqüente, estando restrita a locais mais úmidos e sombreados.

15. *Philodendron speciosum* Schott *ex* Endl., Gen. Pl. 1(3): 237. 1837. Fig. 3 k-m

Hemi-epífita. Caule espesso, ca. 10 cm diâm.; entrenó 2,1–5,5 cm; profilo não visto. Folha com pecíolo ca. 110 × 2 cm, verde, cilíndrico, liso, ápice não geniculado; bainha ca. 15 cm compr.; lâmina ca. 100 × 70 cm, verdes discolores com nervuras da face abaxial vináceas, sagitada, ápice agudo, margem inteira a levemente ondulada, coriácea; divisão anterior ca. 74 × 70 cm, nervura central aplanada na face abaxial e arredondada na adaxial, nervuras laterais primárias 6–8 pares, salientes em ambas as faces, nervuras interprimárias ausentes, nervuras laterais secundárias peniparalelinérvias; divisões posteriores ca. 26 × 29 cm, nervuras acroscópicas 3–4 por lado, nervuras basioscópicas 4–5 por lado, nervura basal quilhada na face adaxial, porção desnuda das nervuras basais ca. 3,5 cm. Inflorescência 1 por axila foliar; pedúnculo 13–15 × 1,2–1,7 cm, verde, ereto; espata 26–39 cm compr., constricta, com leve diferenciação entre lâmina e tubo, verde-clara na base e vermelha no ápice da face externa, atro-vinácea na face interna; espádice heterogêneo, estipitado, ca. 30 cm compr., estípete 2–4 cm compr.; zona estaminada ca. 10 × 2 cm, creme-esbranquiçada, zona estaminada estéril ca. 12 × 2–3 cm, creme-esbranquiçada e zona pistilada 5–6 × 2,3 cm, amarelada,. Flores diclinas, aclamídeas; flor masculina: estames 6–7 × 1 mm, anteras rimosas; flor masculina estéril 5–6 × 2 mm; flor feminina ca. 6 × 4 mm, ovário 16–(20)-locular, 3 óvulos por lóculo, placentação axial-basal, região estilar da mesma largura do ovário, estigma papiloso. Infrutescência não vista.

Material examinado: 10.XI.2001, fl., *V. R. Almeida et al. 18* (CESJ).

Philodendron speciosum trata-se da espécie de maior porte dentre as Araceae encontradas na Reserva. Caracteriza-se por ser uma hemi-epífita com caule muito robusto e com um grande número de cicatrizes foliares, zona estaminada estéril de tamanho equivalente ou mais longa que a zona estaminada fértil e estames pelo menos três vezes mais longos que largos (Fig. 3m). *P. speciosum* é uma espécie restrita ao sudeste brasileiro e na Reserva, foi encontrado somente dois indivíduos no dossel da mata de galeria.

16. *Rhodospatha latifolia* Poepp., Nov. Gen. Sp. Pl. 3: 91. 1845. Fig. 2 j-m

Hemi-epífita. Entrenó 0,8–1,5 cm; profilo 2,2–27 × 1,2–1,4 cm, alvo internamente e verde-claro externamente, oval a lanceolado, ápice arredondado a agudo, carenado ou bicarenado, membranáceo passando a coriáceo. Folha com pecíolo 34–47 × 0,5 cm, verde-claro, arredondado na face abaxial e levemente canaliculado na adaxial, apicalmente geniculado, genículo 2,3–2,8 × 0,4 cm; bainha até o genículo; lâmina 31–45,5 × 15,1–19,5 cm, verde, levemente discolor, elíptica a oblonga, ápice acuminado, base arredondada, margem inteira, cartácea; nervura central arredondada

e fortemente proeminente na face abaxial, sulcada na face adaxial, nervuras laterais primárias mais de 20 pares, salientes na face abaxial e visíveis em ambas as faces, nervuras interprimárias às vezes visíveis; nervuras laterais secundárias peniparalelinérvias. Inflorescência 1 por axila foliar; pedúnculo 14–16 × 0,5 cm, verde-claro, ereto; espata 17,1 × 8,4 cm, não constricta, sem diferenciação entre lâmina e tubo, alva na face interna e verde-clara na face externa, elíptica, ápice agudo, decídua após a antese; espádice homogêneo, estipitado, 14,3–17,2 × 1,2 cm, rosado, estípete 1,4–2,2 cm compr. Flores monoclinas, aclamídeas; estames 3,5–4 × 0,5–1 mm, livres, anteras rimosas; gineceu ca. 4 × 2 mm, prismático, ovário 2-locular, muitos óvulos por lóculo, placentação axial, região estilar da mesma largura do ovário, estigma fendido no centro. Infrutescência imatura, ca. 21 × 1,3 cm, pedúnculo ereto. Frutos imaturos verdes. **Material examinado:** 10.XI.2001, fl. e fr., *V. R. Almeida et al. 17* (CESJ); 9.XII.2001, fl., *V. R. Almeida et al. 29* (CESJ).

Rhodospatha latifolia distingue-se das demais espécies encontradas na Reserva por apresentar lâminas foliares com um padrão de venação peniparalelinérvio muito característico, espádice rosado e estípete bem desenvolvido (ca. 2 cm compr.) (Fig. 2m). É uma espécie comum em matas da Paraíba, sul da Bahia, Espírito Santo e Minas Gerais (Temponi 2001). Na Reserva é freqüente em locais sombreados ou iluminados, sempre próxima a curso d'água.

17. *Xanthosoma maximiliani* Schott, Bonplandia 10: 322. 1882. Fig. 2 n-o

Helófita. Rizoma parcialmente subterrâneo, parte aérea ca. 30 cm; entrenó inconspícuo; profilo não visto. Folha com pecíolo ca. 41,5 × 0,8 cm, verde, canaliculado, não geniculado apicalmente; bainha longa, ca. 36 cm compr.; lâmina 44–68 × 35–45 cm, verdes discolores, sagitada, ápice agudo, margem inteira, membranácea; divisão anterior 30–47 × 31–45 cm, nervura central aplanada, levemente saliente na face abaxial, nervuras laterais primárias 6 pares, aplanadas, nervuras interprimárias visíveis na face abaxial, nervuras laterais secundárias colocasióides; divisões posteriores 13–22 × 19–26 cm, nervuras acroscópicas 3 por lado, nervuras basioscópicas 4 por lado, nervuras basais aplanadas, levemente saliente na face abaxial, porção desnuda das nervuras basais 1,5–4 cm. Inflorescência 1 por axila foliar; pedúnculo ca. 16 × 0,4 cm, verde, ereto; espata constricta, com diferenciação entre lâmina e tubo, tubo 5–6,5 × 4 cm, verde externamente e vináceo internamente, lâmina 13–13,5 × 4,5–5 cm, alva, apenas o tubo persistente; espádice heterogêneo, séssil, 13,3–15,5 cm compr., alvo na zona masculina e alaranjado na feminina, zona estaminada ca. 7 × 0,7–0,8 cm, zona estaminada estéril ca. 2,1 × 0,5 cm, zona pistilada ca. 1,1 × 0,8 cm. Flores diclinas, aclamídeas; flor masculina ca. 2,5 × 3 mm, estames unidos em sinândrio, anteras poricidas; flor masculina estéril 2 × 3,5 mm; flor feminina ca. 2 × 1 mm, ovário 4-locular, muitos óvulos por lóculo, placentação axial, região estilar da mesma largura do ovário, estigma papiloso. Frutos jovens alvos.

Material examinado: 23.I.2001, fl., *R. C. Forzza et al. 1747* (CESJ); 6.III.2004, fl e fr., *R. C. Forzza et al. 2947* (RB).

Material adicional examinado. BRASIL. MINAS GERAIS: Caratinga, Estação Biológica de Caratinga, 21.III.1994, fr., *J. A. Lombardi 536* (BHCB, RB); Marliéria, Parque Estadual do Rio Doce: 22.XII.1999, fl. e fr., *L. G. Temponi et al. 82* (VIC).

Xanthosoma maximiliani pode ser diferenciada das demais espécies da Reserva por possuir um rizoma parcialmente subterrâneo; lâminas foliares com as nervuras laterais secundárias anastomosantes formando uma interprimária (colocasióide) (Fig. 2o), flores femininas alaranjadas e espata fortemente constricta com a região do tubo verde externamente e vináceo internamente. A espécie tem ocorrência registrada para Pernambuco, Bahia, Rio de Janeiro, Minas

Gerais e São Paulo (Lombardi & Gonçalves 2000, Temponi 2001). Trata-se de uma espécie rara na Reserva, tendo sido encontrada em apenas um local constantemente alagado e sombreado no interior da mata.

Agradecimentos

Os autores agradecem a FAPEMIG e ao CNPq pelas bolsas concedidas e a COPASA e a PETROBRAS (convênio JBRJ/BR 610.4.025.02.3) pelo apoio financeiro, à Patrícia Carneiro L. Faria por todo apoio na execução desse trabalho, ao Sr. Luís, mateiro da Reserva, por sua ajuda durante os trabalhos de campo. Aos amigos Marcus Nadruz e Cássia Sakuragui e dois assessores anônimos pelas valiosas contribuições.

Referências bibliográficas

Coelho, M. A. N. 1998. Cinco espécies novas do gênero *Philodendron* Schott (Araceae) para o Brasil. Boletim de Botânica da Universidade de São Paulo 17: 47-60.

Coelho, M. A. N. 2000. *Philodendron* Schott (Araceae): morfologia e taxonomia das espécies da Reserva Ecológica de Macaé de Cima-Nova Friburgo, Rio de Janeiro, Brasil. Rodriguésia 51(78/79): 21-68.

Coelho, M. A. N. 2004. Taxonomia das espécies de *Anthurium* (Araceae) seção *Urospadix* subseção *Flavescentiviridia*. Tese de Doutorado. Universidade Federal do Rio Grande do Sul, RS.

Croat, T. B. 1979. The distribution of Araceae. *In*: K. Larsen & L. B. Holm-Nielson (eds.). Tropical Botany. Academic Press., London. 291-308.

Engler, A. 1905. Araceae – Pothoideae. *In:* Engler, A. (ed.). Das Pflanzenreich, IV 23B (heft 21). Berlin (Wilhelm Engelmann). 330p.

Gonçalves, E. G. 1999. A revised key for the genus *Asterostigma* C. A. Fish & Mey. (Araceae: tribe *Spathicarpeae*) and a new species from Southeastern Brazil. Aroideana 22: 30-33.

Gonçalves, E. G. 2002. Sistemática e evolução da tribo Spathicarpeae (Araceae). Tese de Doutorado. Universidade de São Paulo, São Paulo, SP.

Govaerts, R.; Frodin, D. G.; Bogner, J.; Boyce, P.; Cosgriff, B.; Croat, T. B.; Gonçalves E. G.; Gayum, M.; Hay, A.; Hetterscheid, W.; Landolt E.; Mayo, S. J.; Murata, J.; Nguyen, V. D.; Sakuragui, C. M.; Singh, Y.; Thompson, S. & Zhu, G. 2002. World checklist and bibliography of Araceae (and Acoraceae). Kew: Royal Botanic Garden. 560 p.

Holmgren, P. K.; Holmgren, N. H. & Barnett, L .C. 1990. *Index Herbariorum: The herbaria of the world*. New York Botanical Garden. New York. 693p.

Lombardi, J. & Gonçalves, M. 2000. Composição florística de dois remanescentes de mata atlântica do sudeste de Minas Gerais, Brasil. Revista Brasileira de Botânica 23 (3): 255-282.

Madison, M. T. 1977. A revision of *Monstera* (Araceae). Contribution from the Herbarium Harvard University, 207:1-101.

Mayo, S. J. 1990. Problems of speciation, biogeography and systematics in some Araceae of the Brazilian atlantic forest. *In*: S. Watanabe *et al.* (eds.), Anais do II Simpósio de Ecossistemas de Costa Sul e Sudeste Brasileira, São Paulo, Brasil 2: 235-258.

Mayo, S. J. 1991. A revision of *Philodendron* subg. *Meconostigma* (Araceae). Kew Bulletin 46(4): 601-681.

Mayo, S. J.; Bogner, J. & Boyce, P. C. 1997. The genera of Araceae. Kew: Royal Botanic Garden. 370 p.

Oliveira-Filho, A. T. & Fontes, M. A. L. 2000. Patterns of floristic differentiation among Atlantic forests in south-eastern Brazil and the influence of climate. Biotropica 32(4b): 793-810

Oliveira-Filho, A. T.; Tameirão-Neto, E.; Carvalho, W. A. C.; Werneck, M.; Brina, A. E.; Vidal, C. V.; Rezende, S. C. & Pereira, J. A.A. 2005. Análise florística do compartimento arbóreo de áreas de floresta atlântica *sensu lato* na região das bacias do leste (Bahia, Minas Gerais, Espírito Santo e Rio de Janeiro). Rodriguésia 56(87): 185-235.

Radford, A. E; Dickison, W.C.; Massey, J.R. & Bell, C.R. 1974. Vascular Plant Systematics. Harper & Row, Publishers, Inc., New York. 891p.

Sakuragui, C. M. 1998. Taxonomia e filogenia das espécies de *Philodendron* seção *Calostigma* (Schott) Pfeiffer no Brasil. Tese de Doutorado. Universidade de São Paulo, São Paulo, SP.

_____. 2000. Araceae of campos rupestres from the Espinhaço Range in Minas Gerais State, Brazil. Aroideana 23: 56-81.

Temponi, L. G. 2001. Estudo taxonômico e distribuição das Araceae do Parque Estadual do Rio Doce, Minas Gerais, Brasil. Dissertação de Mestrado. Universidade Federal de Viçosa, Viçosa, MG.

COMPARATIVE ANATOMY OF LEAF AND SPATHE OF NINE SPECIES OF *ANTHURIUM* (SECTION *UROSPADIX*; SUBSECTION *FLAVESCENTIVIRIDIA*) (ARACEAE) AND THEIR DIAGNOSTIC POTENTIAL FOR TAXONOMY

André Mantovani[1] & *Thaís Estefani Pereira*[2]

ABSTRACT

(Comparative anatomy of leaf and spathe of nine species of *Anthurium* (section *Urospadix*; subsection *Flavescentiviridia*) (Araceae) and their diagnostic potential for taxonomy) Leaf and spathe anatomy of seven species and two varieties of the genus *Anthurium* (section *Urospadix;* subsection *Flavescentiviridia*) were analyzed. Plant material was collected from different locations in Brazil and cultivated under identical glasshouse conditions in the Rio de Janeiro Botanical Garden. Our attempt is to evaluate the diagnostic potential of leaf and spathe anatomy for taxonomic purposes. Leaves presented smooth cuticle, polygonal epidermal cells randomly disposed in paradermal view, periclinal divisions of epidermal cells in transversal view, non-raised stomata, collenchyma, sclerenchymatic bundle sheaths and raphides in the mesophyll. The spathe presented cuticular striations; rectangular and elongated cells in parallel rows; raised stomata; absence of collenchyma, raphides and sclerenchymatic bundle sheaths and presence of sclerenchyma as fibre caps under phloem. Clustering analysis based on leaf and spathe anatomical characters, revealed that the spathe can give a better resolution for segregation of species groups.

Key-words: leaf, spathe, anatomy, taxonomy, *Anthurium*, Araceae.

RESUMO

(Anatomia comparada da folha e espata de nove espécies de *Anthurium* (seção *Urospadix;* subseção *Flavescentiviridia*) (Araceae) e seu potencial para diagnóstico na taxonomia) São apresentados dados relativos à anatomia da lâmina foliar e espata de sete espécies e duas variedades do gênero *Anthurium* pertencentes à seção *Urospadix*; subseção *Flavescentiviridia.* Os indivíduos foram coletados nos estados do Rio de Janeiro, São Paulo e Minas Gerais, e aclimatados no Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. O objetivo deste estudo é comparar anatomicamente lâmina foliar e espata, visando detectar qual das duas estruturas é mais útil à diagnose taxonômica das espécies estudadas. Observa-se nas folhas a presença de cutícula lisa e células epidérmicas dispostas ao acaso, estômatos nivelados com a epiderme, divisões periclinais em células epidérmicas, além de ráfides no mesofilo e bainha esclerenquimática nos feixes vasculares. Já quanto à espata observa-se cutícula estriada, células alongadas e ordenadas de forma paralela, estômatos por vezes elevados, ausência de ráfides e presença de calota de fibras apenas junto ao floema, quando não ausentes. A análise de agrupamento para folha e espata revelou maior poder de resolução com base em caracteres anatômicos da espata; além dos grupos formados com base nos caracteres anatômicos da folha não serem consistentes taxonomicamente. Sugere-se portanto que a espata apresenta maior valor diagnóstico ao nível anatômico para subsidiar estudos taxonômicos do gênero *Anthurium.*

Palavras-chave: folha, espata, anatomia, taxonomia, *Anthurium*, Araceae.

INTRODUCTION

The family Araceae presents 2823 species in 106 genera (Govaerts *et al.* 2002). The genus *Anthurium*, described by Schott in 1829, is the largest in the family, with approximately 1000 species. In 1878 Engler divided the genera in 18 sections, and in 1898 he determined six subsections for the section *Urospadix* (Coelho 2004). One of these subsections is *Flavescentiviridia* with 26 of its 32 taxa occurring on the southeastern Brazil (Coelho 2004).

Historical and experimental events justify improved efforts for taxonomical and anatomical studies in the genus *Anthurium*. Schott´s herbarium, with type specimens, was

Artigo recebido em 03/2005. Aceito para publicação em 11/2005.

[1]Author for correspondence: André Mantovani, Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Programa Zona Costeira, Rua Pacheco Leão 915, CEP 22460-030, Jardim Botânico, Rio de Janeiro, Brasil, andre@jbrj.gov.br

[2]Bolsista Iniciação Científica PIBIC/CNPq.

destroyed during the World War II, leaving just lectotypes (Mayo *et al.* 1997). Both Schott and Engler described many species from cultivated material that was not deposited in herbaria and was subsequently lost. Engler (1905) also described and determined species using characters of high morphological plasticity like length of petiole, leaf thickness and leaf area. The genus has not been revised until recently, by Coelho (2004), who worked with section *Urospadix*, subsection *Flavescentiviridia*.

Since the classical work by Solereder & Mayer (1928), there have been many publications on leaf anatomy of Araceae, and an extensive list of references can be found on French *et al.* (1995) and Keating (2000, 2003). However, research on the leaf anatomy of *Anthurium* are relatively few (Lindorf 1980, Rada & Jaimez 1992, Mantovani 1999a, b).

The recent extensive revision on the anatomy of Araceae (Keating 2002) not only shows the existence of useful leaf characters for diagnostic purposes, but applies them to a phylogenetic approach for the family. However, little information is presented in relation to the anatomy of the spathe.

The objectives of this paper were to describe leaf and spathe anatomy, and to comparatively evaluate the diagnostic potential of their anatomy for taxonomic purposes in the genus *Anthurium*.

Material and methods

Study site and species

Individuals from *Anthurium* species were collected in different locations in Brazil and cultivated under identical glasshouse conditions in the Rio de Janeiro Botanical Garden, Brazil. Nine taxa were studied: *A. comtum* Schott (RB 353492), *A. harrisii* var. *consanguineum* (Kunth.) Engl. (RB 354740), *A. harrisii* var. *assimile* (Schott) Engl. (RB 353496), *A. harrisii* (Graham) Endl. (RB 414682), *A. regnellianum* Engl. (RB 383406), *A. sellowianum* Kunth (RB 364273), *A. beyrichianum* Kunth (RB 353489), *A. parasiticum* (Vell.) Stellfeld (RB 353493) and *Anthurium* sp. nov. ined. (RB 360300), that followed recent revision of Coelho (2004). The climate in the study area is Am (*sensu* Koppen) (Galante 1984 *apud* Embrapa 1992), with precipitation concentrated in summer and reduced during winter, with mean annual rainfall of 1075mm. The mean annual temperatures during summer and winter are respectively 29° C and 22°C.

Anatomical analysis

For each individual plant, leaves and inflorescence were collected, preserved in humid plastic bags and sent to laboratory. Entire leaves, spathe and spadix were fixed in FAA 70. Sections obtained at mid level from leaves and spathe were fixed in a solution of glutaraldehyde 4% and formaldehyde 1% (McDowel 1978) in a sodium phosphate buffer 0.1M, pH 7.2. Materials fixed in FAA were used to obtain hand paradermal sections that were stained with safranin (Johansen 1940). Cross sections were obtained from material fixed in glutaraldehyde solution, after dehydration in ethylic series and inclusion in hydroxyethylmethacrylate (Gerrits & Smid 1983). Sections at 2-4 mm thickness were realized at a Spencer microtome, and stained with Toluidine Blue O (O'Brien & McCully 1981). Photomicrographs were obtained with an Olympus BX-50 light microscope.

The classification of cells and tissues followed the nomenclature proposed by Keating (2000, 2002).

Statistics

Leaf and spathe anatomy were compared in relation to their diagnostic capacity using hierarchical clustering analysis. Only anatomical traits with recognized low plasticity were used here. Anatomical traits were resumed to binary 0 and 1 relative to absence or presence. The Euclidean distance coefficient was applied, followed by UPGMA algorithm, and cophenetic values higher than 0.8 were considered significant (Valentin 2000).

Table 1. Leaf anatomical characters from species of *Anthurium*. Paradermal view of the epidermises. Size and sinuosity of anticlinal walls; stomatal types and size of subsidiary cells from the brachyparacitic stomata. Abbreviations: ABP = anfibraquiparacytic; BP = braquiparacytic; BPT = braquiparatetracytic; BPH = braquiparahexacytic; BPO = braquiparaoctocytic; UNI = unipolar.

Characters/ Species	Epidermal cells from the abaxial surface	Epidermal cells from the adaxial surface	Stomatal types (abaxial surface)	Size of the subsidiary cells from braquiparacytic stomata (abaxial surface)
A. sellowianum	Short; straight to undulate anticlinal walls	Short; straight to undulate anticlinal walls	ABP; BP; BPH; BPO	Large
A. comtum	Short; straight to undulate anticlinal walls	Short, straight anticlinal walls	ABP;BP; BPH	Large
A. beyrichianum	Short; straight to undulate anticlinal walls	Short; straight to undulate anticlinal walls	BP; BPT; BPH	Large
A. harrisii var. *assimile*	Short; undulate anticlinal walls	Short, straight anticlinal walls	ABP; BP; BPH; BPO; UNI	Large
Anthurium harrisii var. *consanguineum*	Short, straight anticlinal walls	Short, straight anticlinal walls	BP; BPH; UNI	Large
A. harrisii	Short; undulate anticlinal walls	Short; straight to undulate anticlinal walls	ABP, BP; BPH; UNI	Large
A. parasiticum	Short; straight to undulate anticlinal walls	Short; straight to undulate anticlinal walls	BP; BPH; UNI	Large
Anthurium sp. nov.	Short; undulate anticlinal walls	Short; undulate anticlinal walls	BP; BPH	Large
A. regnellianum	Short; straight to undulate anticlinal walls	Short; straight to undulate anticlinal walls	BP; BPH	Large

Results

Leaf anatomy

Paradermal sections of the adaxial and abaxial epidermal surfaces are shown in Fig. 1 (C-H). The cells are short and polygonal, with straight to undulate anticlinal walls. Stomata are found on both surfaces, but at adaxial surface restricted to midrib and margins. Stomata types found on the abaxial surface are brachy-paracytic and its variations (amphybrachy-paracytic, brachypara-tetra, hexa and octocytic) and the unipolar type (Fig. 1, C-H). Two to five distinct types could be found in just one surface (Table 1). The stomata subsidiary cells are large in all species (Fig. 1H). Stomata complex distribuition is random on the abaxial surface and parallel to the elongated epidermal cells on the adaxial surface of the midrib.

The leaf epidermis of all species are monolayered. They are similar in cross section (Fig. 2, B-C) constituted by tabular cells with straight to slightly convex outer periclinal walls covered by a smooth cuticle. The species *A. harrisii* var. *consanguineum* and *A. comtum* present periclinal divisions in some epidermal cells of the adaxial surface (Fig. 2A).

The mesophyll is dorsiventral in all species (Fig. 2A). The palisade parenchyma has four to five layers of cells and the spongy parenchyma is constituted by 12 to 18 layers of cells. On the adaxial surface of the midrib,

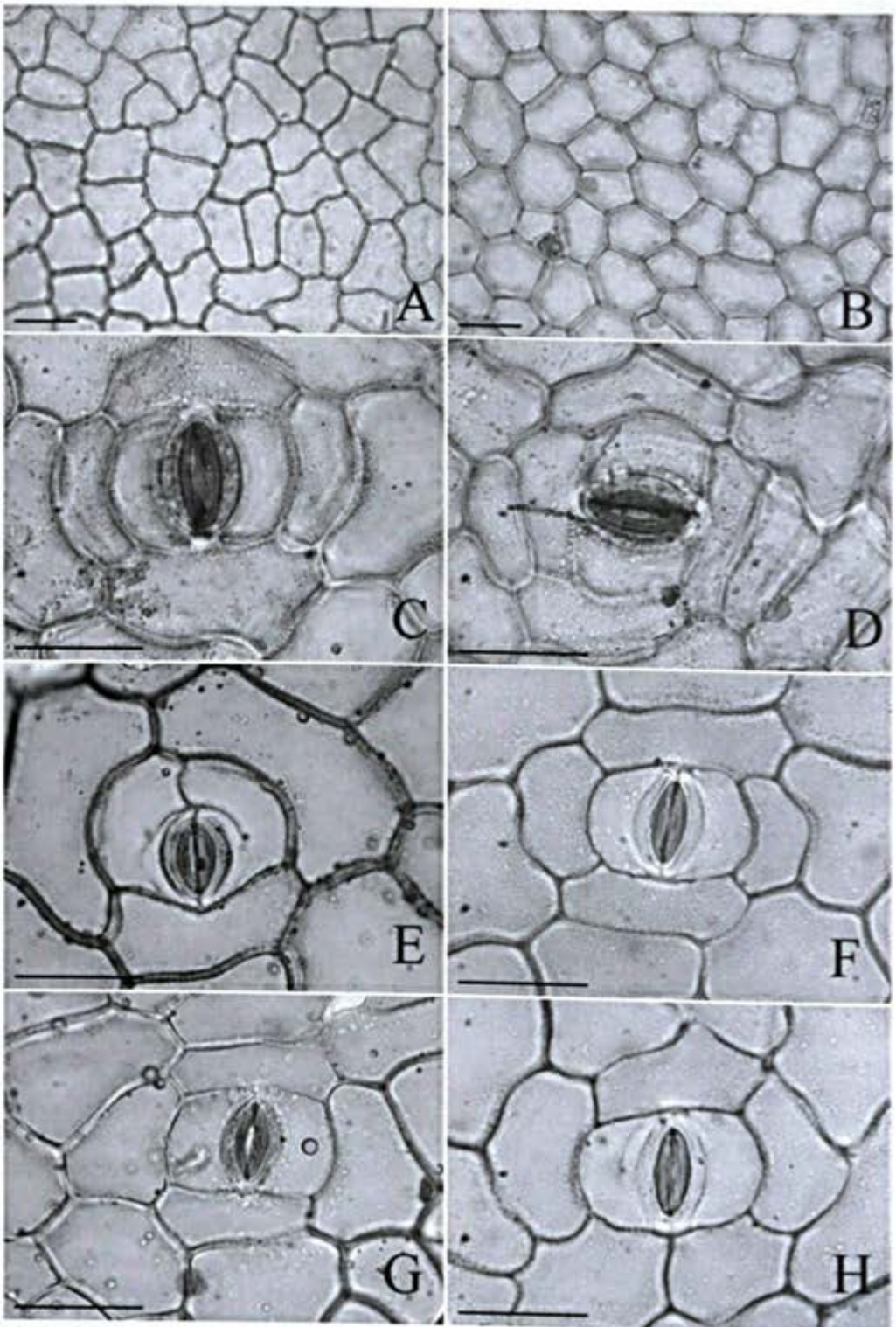


Figure 1 – Leaf epidermis. Adaxial (A, B) and abaxial (C-H)surfaces in paradermal view. A. epidermal cells with undulate anticlinal walls. (*Anthurium* sp. nov.); B. epidermal cells with straight anticlinal walls (*A. harrisii* var. *assimile*); C. amphibrachyparacitic stomata. (*A. harrisii*); D. brachyparaoctocitic stomata. (*A. harrisii* var. *assimile*); E. unipolar stomata. (*A. parasiticum*); F. brachyparahexacitic stomata. (*Anthurium* sp. nov.); G. brachyparatetracitic stomata. (*A. harrisii*); H. brachyparacitic stomata. Note narrow subsidiary cells. (*Anthurium* sp. nov.). Bar = 20 µm.

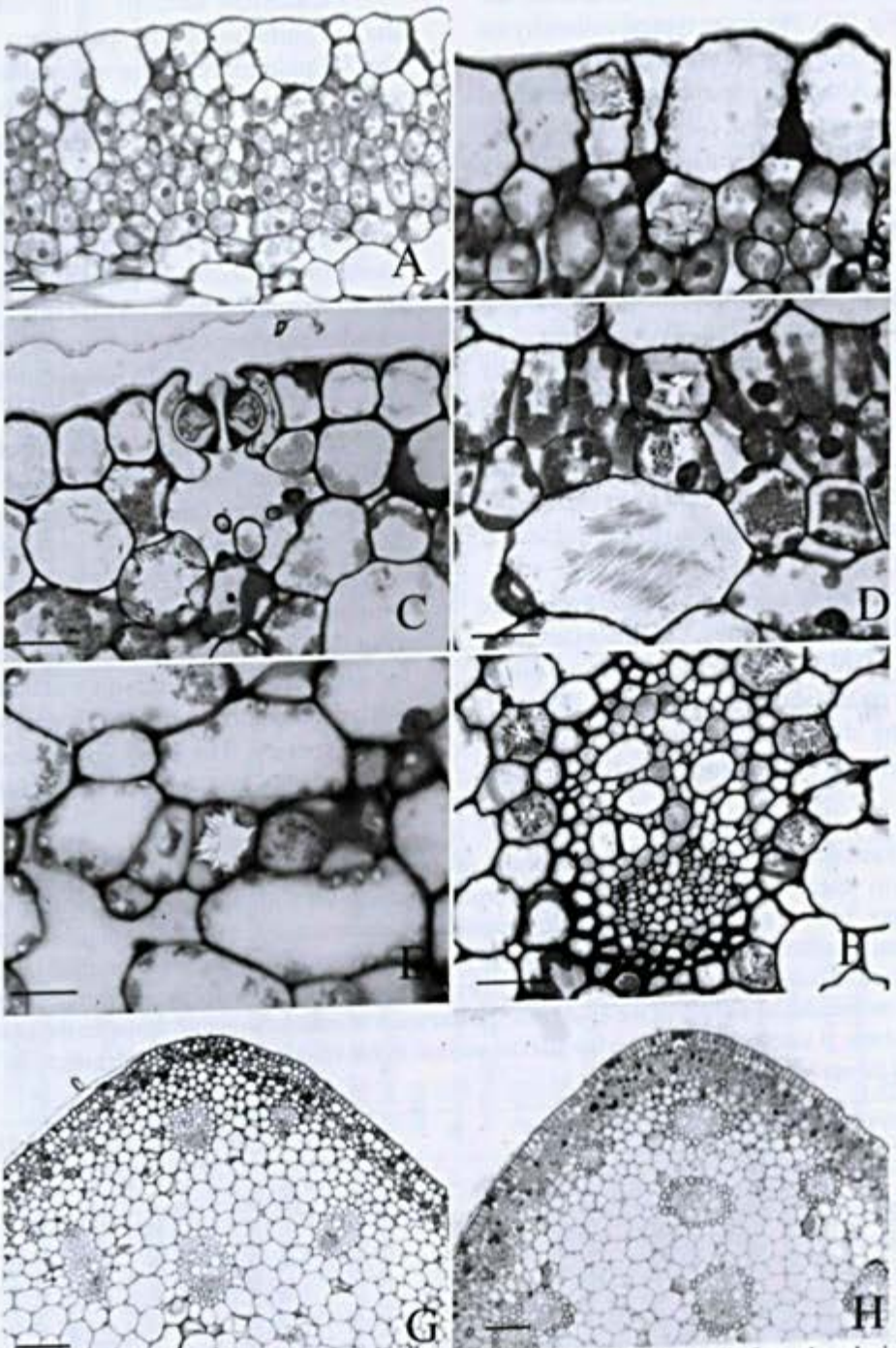


Figure 2 – Leaf mesophyll. Transversal section. A. periclinal divisions in epidermal cells from the adaxial surface. Note multilayered palisade parenchyma composed by short cells. (*A. harrisii* var. *consanguineum*); B. smooth cuticle above adaxial surface of the epidermis. Note presence of druses on epidermis and palisade parenchyma. (*A. harrisii*); C. stomata at same level of epidermal cells from abaxial surface. (*A. harrisii* var. *assimile*); D. raphides on the spongy parenchyma. (*A. harrisii* var. *consanguineum*); E. druses on the spongy parenchyma. (*A. harrisii* var. *assimile*); F. colateral vascular bundles with sclerenchymatic fiber sheath. Note thicker fiber cells near phloem. (*A. parasiticum*); G. adaxial surface of midvein. Note absence of palisade parenchyma; H. adaxial surface of midvein. Note presence of palisade parenchyma, evident as a continuous and deeply stained region below the epidermis. Bar = 20 µm.

the palisade parenchyma is usually interrupted by a collenchymatous tissue in almost all species (Fig. 2G). However, typical collenchyma cells are found only in the abaxial region of the midrib. Although presenting thick periclinal walls in transversal view, collenchymatous cells on the adaxial surface are not typically elongated in longitudinal view (Fig. 2G). In *A. regnellianum*, collenchymatous cells are poorly developed and continuous palisade parenchyma occurs adjacent to the adaxial surface at the midrib (Fig. 2H).

The sclerenchyma is represented only by the fibres from the sclerenchymatic bundle sheaths (Fig. 2F). Leaves have reticulated venation. In cross section, vascular bundles are collateral and constituted by several proto and metaxylem cells adjacent to a semicircular phloem (Fig. 2F).

Raphides of calcium oxalate crystals are found with low frequency, but druses are very frequent (Table 2). The raphides occur rarely and only on the spongy parenchyma (Fig. 2D) while the druses are frequent in all the mesophyll and in both surfaces (Fig. 2, C-E).

Spathe anatomy

Paradermal sections of the adaxial and abaxial surfaces of the spathe are shown in Fig. 3. Epidermal cells are rectangular, varying from short to elongate but always oriented in longitudinal parallel rows. Most of the species present short cells on the adaxial surface and medium or elongated cells on the abaxial surface (Table 3). Medium sized cells are found in *A. parasiticum* and short sized cells in *A. regnellianum*. Anticlinal walls in paradermal view vary from straight to sinuous and some epidermal cells present oblique edges (Fig. 3B).

Stomata are present on both spathe surfaces. The brachyparacytic type (Fig. 3H) and its variations (amphibrachyparacytic (Fig. 3G), brachypara-tetracytic, -hexacytic (Fig. 3F), and octocytic (Fig. 3E)), as well as the unipolar (Fig. 3D) and the anomocytic types (Fig. 3C) are found. One to four different types of stomata are found on each epidermal surface. The brachyparacytic type was found in all species. The brachyparatetracytic type is found only in *A. harrisii* and *A. sellowianum*

Table 2. Leaf anatomical characters from species of *Anthurium*. Transversal view. Data are presence (1) or absence (0) selected characters. Numbers represent: 1=druse on both epidermises; 2=druse on palisade parenchyma; 3=druse on spongy parenchyma; 4=raphides on chlorenchyma; 5= presence of palisade parenchyma on the adaxial surface on the midvein; 6= absence of palisade parenchyma on the adaxial surface on the midvein; 7=stomata on adaxial surface of the epidermis, 8= stomata on the abaxial surface of the epidermis; 9=cell periclinal divisions on the adaxial surface of the epidermis; 10=presence of collenchymatous tissue on the adaxial surface of the midvein; 11=smooth cuticle on the adaxial surface of the epidermis; 12= smooth cuticle on the abaxial surface of the epidermis.

Characters/Species	1	2	3	4	5	6	7	8	9	10	11	12
A. sellowianum	0	1	1	0	0	1	1	1	1	0	1	1
A. comtum	1	1	1	1	1	0	0	1	1	0	1	1
A. beyrichianum	0	1	1	1	1	0	1	1	0	1	1	1
A. harisii var. *assimile*	0	1	1	1	0	1	1	1	0	1	1	1
A. harisii var. *consanguineum*	0	1	1	1	0	1	1	1	1	1	1	1
A. harisii	1	1	1	0	0	1	1	1	0	1	1	1
A. parasiticum	0	1	1	0	0	1	1	1	0	1	1	1
Anthurium sp. nov.	0	1	1	0	0	1	1	1	0	1	1	1
A. regnelianum	0	1	1	0	1	1	1	1	0	0	1	1

Table 3. Spathe anatomical characters from species of *Anthurium*. Paradermal view of the epidermises. Size and sinuosity of anticlinal walls; occurrence of oblique anticlinal walls at polar cell extremities, stomatal types and size of subsidiary cells from the brachyparacitic stomata. Abbreviations: ABP=anfibraquiparacytic; BP=braquiparacytic; BPT = braquiparatetracytic; BPH=braquiparahexacytic; BPO=braquiparaoctocytic; UNI=unipolar; ANOMO=anomocytic.

Characters/ Species	Epidermal cells from the adaxial surface	Epidermal cells from the abaxial surface	Oblique wall (adaxial surface)	Oblique wall (abaxial surface)	Stomatal types (adaxial surface)	Stomatal types (abaxial surface)	Size of the subsidiary cells from braquiparacytic stomata (abaxial surface)
A. sellowianum	Short; straight to undulate anticlinal walls	Long; straight to undulate anticlinal walls	Presence	Presence	BP; BPT; UNI	ABP; BP; ANOMO;UNI	Narrow
A. comtum	Short; straight to undulate anticlinal walls	Medium long, straight to undulate anticlinal walls	Presence	Presence	BP; ANOMO	ABP; BP; ANOMO	Narrow
A. beyrichianum	Short; straight to undulate anticlinal walls	Long; straight to undulate anticlinal walls	Presence	Presence	BP; ANOMO	ABP; BP; ANOMO	Narrow
A. harrisii var. *assimile*	Short; straight to undulate anticlinal walls	Long; straight to undulate anticlinal walls	Presence	Presence	BP;BPH; BPO	BP;BPH; ABP	Narrow
A. harrisii var. *consanguineum*	Short; straight to undulate anticlinal walls	Long; straight to undulate anticlinal walls	Presence	Absence	BP; ABP	BP; BPH	Narrow
A. harrisii	Short, straight anticlinal walls	Long; undulate anticlinal walls	Presence	Presence	BP;ABP; ANOMO	BP; BPT	Narrow
A. parasiticum	Medium long, straight to undulate anticlinal walls	Medium long, straight to undulate anticlinal walls	Presence	Absence	BP;UNI; ANOMO	BP; ABP	Large (narrow in the adaxial surface)
Anthurium sp. nov.	Medium long, straight to undulate anticlinal walls	Long; straight to undulate anticlinal walls	Presence	Presence	BP; ANOMO	BP	Narrow
A. regnellianum	Short; straight to undulate anticlinal walls	Short; straight to undulate anticlinal walls	Absence	Presence	BP; UNI	BP;ABP; ANOMO	Narrow

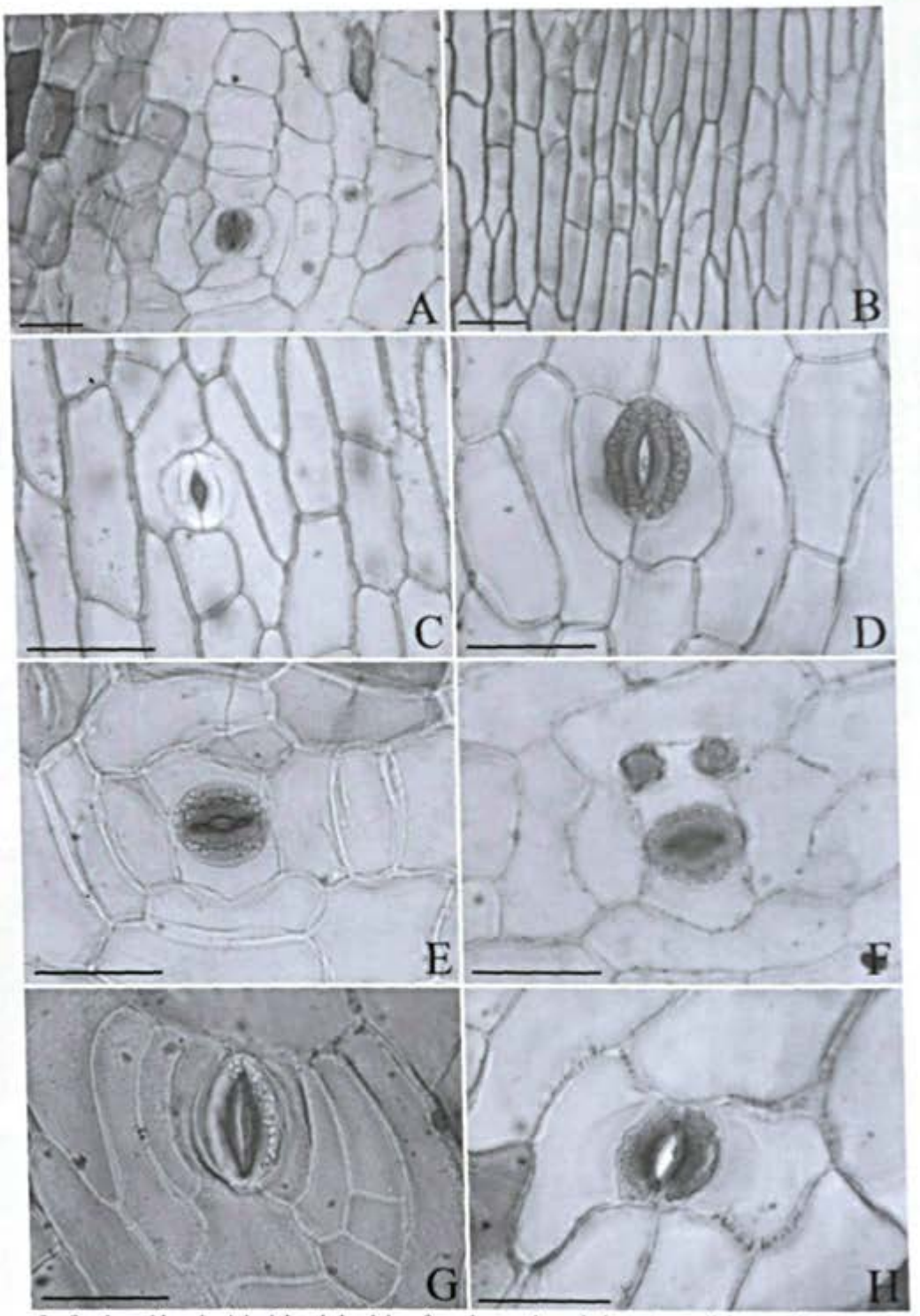


Figure 3 – Spathe epidermis. Adaxial and abaxial surfaces in paradermal view. A. parallel rows of short epidermal cells. Note straight to undulate anticlinal walls. (*A. harrisii* var. *assimile*; adaxial surface); B. parallel rows of long epidermal cells. Note oblique orientation of anticlinal walls in the polar extremities of the cells. (*A. harrisii* var. *assimile*; abaxial surface); C. anomocitic stom ata. (*A. regnelianum*; abaxial surface); D. unipolar stomata. (*A. parasiticum*; abaxial surface); E. brachyparaoctocitic stomata. (*A. harrisii* var. *assimile*; abaxial surface); F. brachyparahexacitic stomata. (*A. harrisii* var. *assimile*; abaxial surface); G. amphibrachyparacitic stomata. (*A. parasiticum*; abaxial surface); H. brachyparacitic stomata. Note large subsidiary cells. (*A. parasiticum*; abaxial surface). Bar ≈ 20 µm.

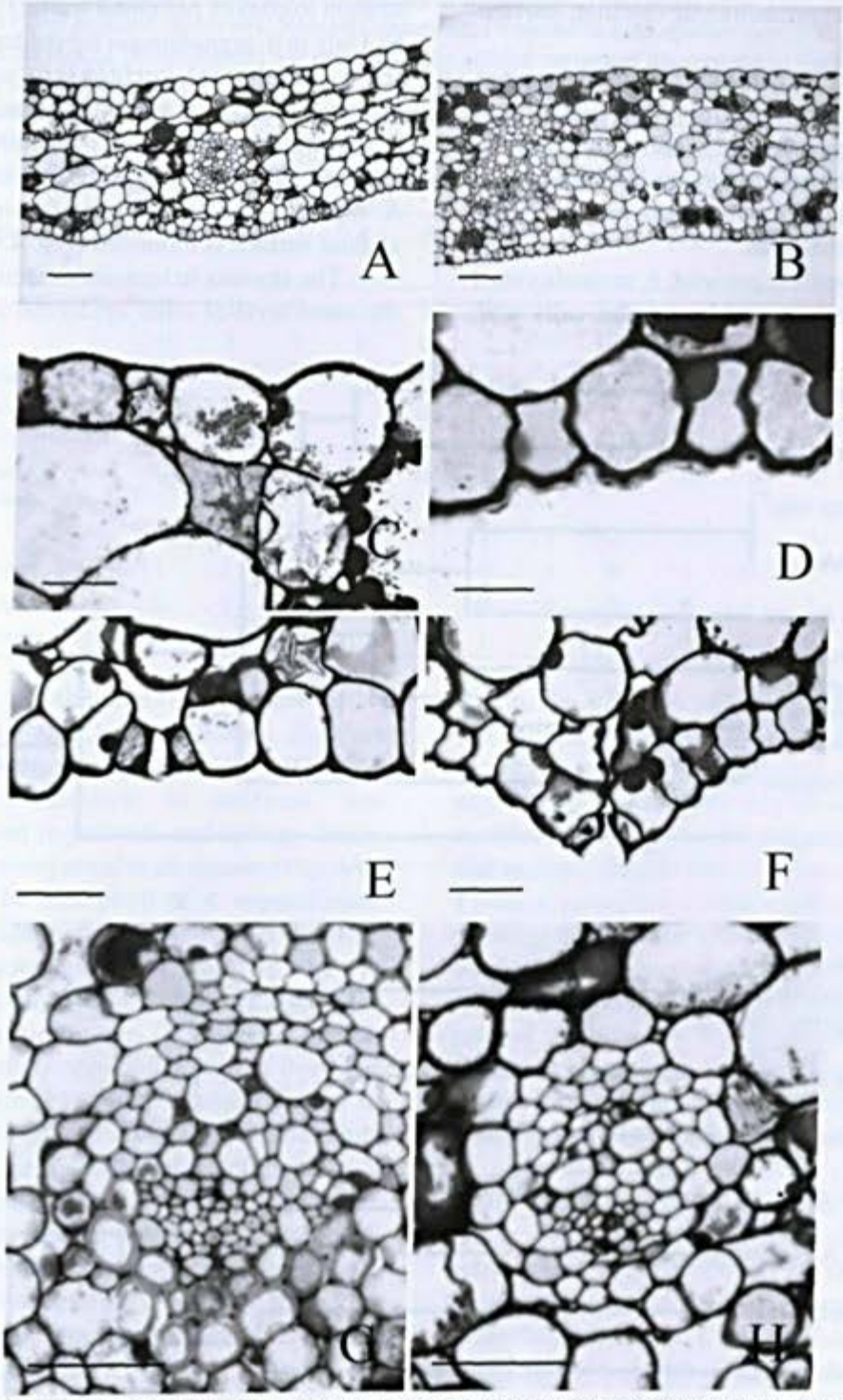


Figure 4 – Spathe mesophyll. Transversal section. A. uniform mesophyll with highly compacted cells. Note mounds on the abaxial surface. (*Anthurium* sp. nov.); B. uniform mesophyll with intercellular spaces. Note straight abaxial surface. (*A. regnelianum*); C. druse oxalate crystals occurring on the epidermis and parenchyma. (*A. harrisii*); D. cuticular striations on the abaxial surface. (*A. regnelianum*); E. stomata on the abaxial surface level with other epidermal cells. (*A. harrisii* var. *assimile*); F. stomata no the abaxial surface above other epidermal cells. (*Anthurium* sp. nov.); G. colateral vascular bundles with fiber cap above phloem. (*A. harrisii* var. *consanguineum*); H. colateral vascular bundle without fiber cap. (*Anthurium* sp. nov.). Bar = 20 µm.

and the brachyparaoctocytic one in *A. harrisii* var. *assimile*.

The brachyparacytic stomata present short subsidiary cells in all species, but *A. parasiticum* presents large subsidiary cells on the abaxial epidermal surface. The orientation of the guard cells was always parallel to the other epidermal cells.

All species present a monolayered epidermis constituted by tabular cells with straight to convex periclinal walls (Figs. 4, A-F). Only in *A. regnellianum* the epidermal cells from the abaxial surface are somehow columnar, taller than wide. The abaxial cuticle is smooth to ornamented, presenting few to frequent striations (Fig. 4D). On the species *A. regnellianum* and *A. parasiticum* the leaf abaxial surface is mounded (Fig. 4A).

The stomata in transverse section are on the same level of other epidermal cells (Fig.

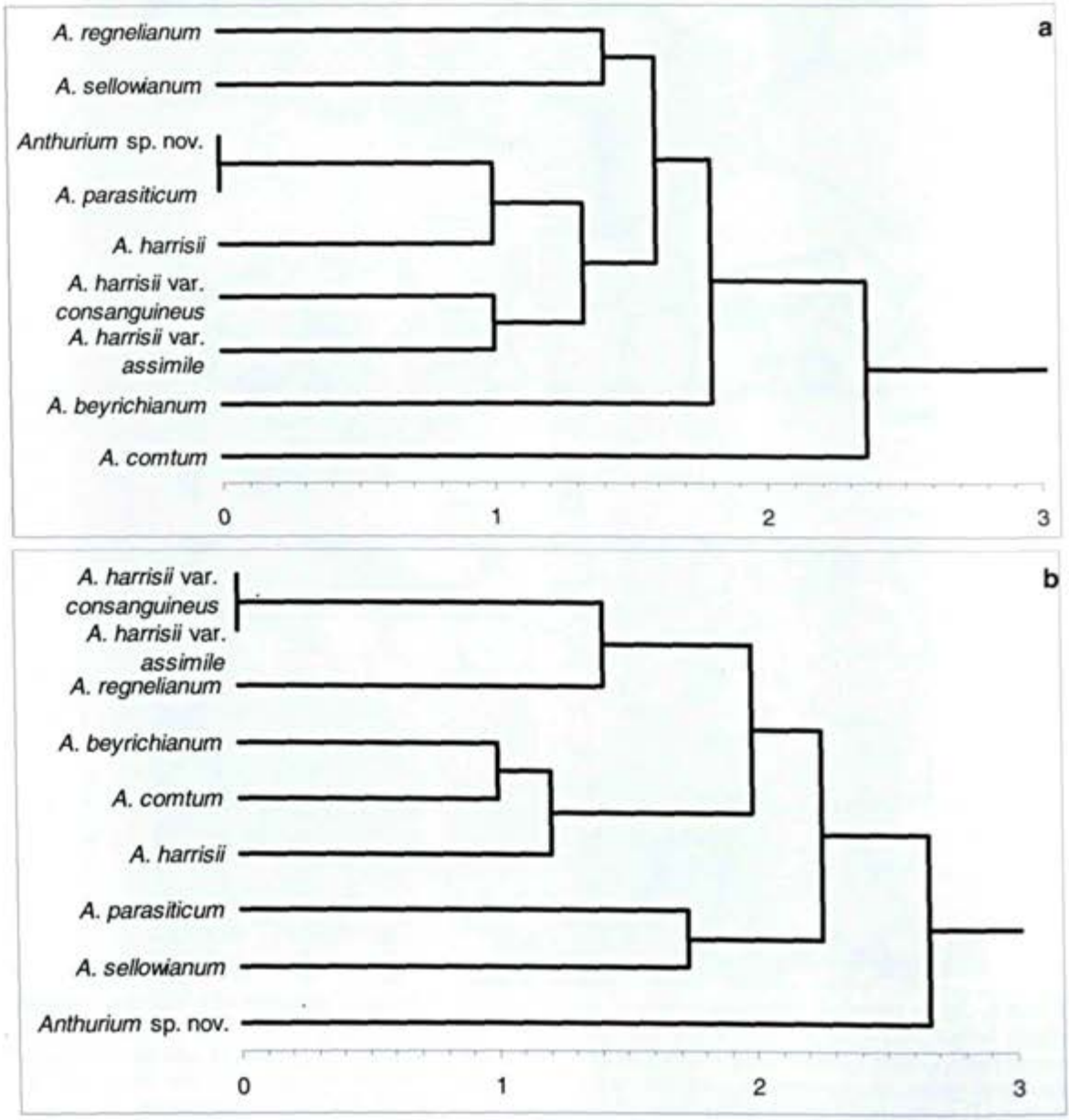


Figure 5 – Clustering analysis obtained with Euclidean distance and UPGMA algorithm, based on the presence or absence of distinct anatomical characters. a. leaf; b. spathe.

Table 4. Spathe anatomical characters from species of *Anthurium*. Transversal view. Data are presence (1) or absence (0) of selected characters. Numbers represent: 1 = druse on both epidermises; 2 = tabular cells in the abaxial surface of the epidermis; 3 = stomata on the adaxial surface of the epidermis; 4 = stomata on the abaxial surface of the epidermis; 5 = stomata above epidermal cells on the abaxial surface; 6 = stomata level with epidermal cells; 7 = fiber caps; 8 = mesophyll with large intercelular spaces; 9 = faint cuticle striations on the abaxial surface of the epidermis; 10 = striated on the abaxial surface of the epidermis; 11 = compact mesophyll; 12 = tall epidermal cells on the abaxial surface; 13 = mounds on the abaxial surface of the epidermis.

Characters/ Species	1	2	3	4	5	6	7	8	9	10	11	12	13
A. sellowianum	0	1	0	1	1	0	1	0	1	0	1	0	0
A. comtum	0	1	1	1	0	1	1	0	1	0	1	1	0
A. beyrichianum	1	1	1	1	0	1	1	0	1	0	1	1	0
A. harisii var. *assimile*	0	1	1	1	0	1	1	0	0	1	1	0	0
A. harisii var. *consanguineum*	0	1	1	1	0	1	1	0	0	1	1	0	0
A. harisii	1	1	1	1	0	1	1	0	1	0	1	0	0
A. parasiticum	1	1	1	1	1	0	1	0	1	0	1	0	1
Anthurium sp. nov.	0	0	1	1	1	0	0	0	0	1	1	1	1
A. regnelianum	0	1	1	1	0	1	1	1	0	1	0	0	0

4E), but, on the abaxial surface of *A. sellowianum* and *A. regnellianum*, they are positioned above the epidermal level (Fig. 4F).

The mesophyll is uniform, not differentiated in palisade and spongy tissue, and highly compacted in all species (Fig. 4A). However, the mesophyll of *A. regnellianum* have large intercellular spaces (Figure 4B).

Sclerenchyma on the spathe is represented only by fibres close to the vascular bundles forming a cap (Fig. 4G), with the exception of *A. regnellianum*, that does not present fibres (Fig. 4H). Spathe venation is parallel, with collateral vascular bundles with proto and metaxylem cells adjacent to a semicircular phloem (Figs. 4, G-H).

Calcium oxalate crystals are represented by druses occurring in all mesophyll and in both epidermal surfaces (Figs. 4, C-E). Raphides were not found. Tannin idioblasts occurred along all the mesophyll.

Statistical analysis

Clustering analysis reveals distinct results for the leaf and spathe anatomy (Fig. 5). For the leaf anatomy, coefficients vary from 0.0 to 2.6, the UPGMA values vary from 0.0 to 2.3 and the cophenetic index is 0.9 ($p<0.01$). However, taxonomically distinct species are considered as identical (Euclidean distance coefficient =0.0) in the dendrogram based on leaf anatomy (Figure 5A). For example, cluster 1 joins *A. parasiticum* and *Anthurium* sp. nov., showing that similar anatomical traits occur on morphologically distinct species. Other species that are morphologically similar, as the pairs *A. parasiticum* X *A. sellowianum* and *A. beyrichianum* X *A. comtum* appear as distinct groups in the cluster analysis (distance coefficient =1.4 and 2.0, respectively).

For the spathe anatomy (Fig. 5B) coefficients vary from 0.0 to 3.0, UPGMA values vary from 0.0 to 2.6 and cophenetic index is 0.9 ($p<0.01$). Based on the spathe, taxonomically related species appear closer in the cluster analysis. Cluster 1 links the two varieties of *A. harrisii*, cluster 2 links *A. beyrichianum* and *A. comtum*, cluster 5 links *A. parasiticum* and *A. sellowianum*, while *Anthurium* sp. nov. is isolated from other species, in cluster 8.

The comparative analysis between the dendrograms generated with leaf and spathe anatomy reveals a higher and better resolution for the spathe anatomical features, based not only on the higher distance and UPGMA coefficients but also on the maintenance of a clear dissimilarity on both the taxonomic and morphological analysis. Only the species *A. harrisii* was not considered similar to its two varieties *A. harrisii* var. *consanguineum* and *A. harrisii* var. *assimile*.

Discussion

Keating (2002) reported several useful leaf anatomical characters for diagnostic use in 380 species and 105 genera of Araceae. Despite the relatively large number of species of *Anthurium* (35 species) studied by Keating (2002), complementary studies are still need in order to improve the anatomical description of this large genus.

Keating (2002) classifies the epidermal cell walls in paradermal view as straight, undulate or extremely sinuous, and all these states of character occur in *Anthurium*. This character presented little variation here, with all studied species presenting straight to undulate walls.

For the species analyzed here, however, the epidermis of the spathe presented distinct anatomical characters in comparison to the leaf epidermis. Leaf epidermal cells were randomly distributed on paradermal view, but in the spathe they were distributed in rows parallel to the longitudinal axis of the organ. This disposition is usually found on leaves of grasses and other monocotyledons (Vieira & Mantovani 1995, Vieira *et al.* 2002). However Mayo (1986) shows short cells randomly distributed on spathe epidermis of *Philodendron* species.

Aroid species predominantly show smooth cuticles without ornamentation (Keating 2000), although striate cuticle occurs on the subfamily Pothoidae (Potiguara & Nascimento 1994) and in some *Anthurium* species (Keating 2002). The species analyzed here have smooth cuticle on leaves and striated on the spathe.

Mayo (1986) and Keating (2002) state that in some aroid genera the outline of the periclinal wall of the epidermal cells, as well as their height/width proportion, have diagnostic value for taxonomy. In the *Anthurium* species studied here the outer periclinal cell wall in both surfaces vary from straight to convex, not revealing differences in leaves. However, epidermal cells from the abaxial surface of some species as *Anthurium* sp. nov. are typically columnar and distinct from the tabular cells present on the abaxial surfaces of the other species.

Hypodermis is reported for the leaves of some species of *Anthurium* (Keating 2002), *Philodendron alternans* Schott and *Philodendron crassinervium* Lindley (Mantovani 1997). This tissue is absent in *A. longifolium* G. Don. (Mantovani 1999b) and *A. bredemeyeri* Schott (Rada & Jaimez 1992). Periclinal cell divisions on the leaf adaxial epidermis are found here for some of the studied *Anthurium* species. Although ontogenetic studies were not carried out, the presence of such divisions suggests the possible occurrence of a multiple epidermis.

The number and distribution of the subsidiary cells from the stomata vary significantly for the Araceae. Keating (2002) reports brachyparacytic stomata and its variations, besides unipolar stomata for the family. All these types of stomata were found in the *Anthurium* species studied here, although only the amphibrachyparacytic, brachyparacytic and brachyparahexacytic types were reported by Keating (2002) for the genus *Anthurium*. The anomocytic type, considered rare for the Araceae (Grear 1973, Keating 2002), is only found in spathe in the present work.

According to Lindorf (1980), medium to large subsidiary cells characterize the brachyparacytic type of stomata on *Anthurium*, as observed here on leaves. On

the spathe, short subsidiary cells are predominant.

Almost all aroid genera present stomata randomly distributed in leaves (Keating 2002), with exception of *Gymnostachys* and *Lemnoideae*, where the polar axis of the stomata is parallel to the leaf axis. Orientation and position of the stomata, respectively on paradermal and transversal view, vary between leaves and spathe in the species studied here. In paradermal view the orientation of leaf stomata is random. On the spathe, stomata orientation is regular and parallel to the spathe axis, as commonly seen in graminoids and other monocotyledons (Vieira & Mantovani 1995). In transversal view, the stomata of the species studied here were positioned at the same level of epidermal cells in all species, but in *A. sellowianum*, *A. parasiticum* and *Anthurium* sp. nov. the stomata occurred above the epidermal cells on the abaxial surface of the spathe.

Few studies analyzed the potential use of the mesophyll features for taxonomic purposes in Araceae. Keating (2002, 2003) suggests a typology based on the occurrence of the palisade parenchyma and on types of aerenchyma, being the dorsiventral mesophyll typical for the aroid leaves (Mantovani 1997, 1999a, Keating 2000). For the *Anthurium* species analyzed here, the leaf mesophyll was always dorsiventral with large aerenchyma. On the other hand, the spathe mesophyll was always uniform, with compacted spongy cells, without aerenchyma. Only in *A. regnellianum* there are large intercellular spaces in the spathe. Mesophyll with elongated cells and large aerenchyma is cited for the spathe of *Philodendron* species (Mayo 1986, Sakuragui 1998).

Collenchyma and sclerenchyma are cited for Araceae (French 1997). Keating (2002) suggests five distinct types of collenchyma in aroids, based on its distribution on transversal view (caps over phloem, banded, banded interrupted, strands between vascular bundles, strands aligned with bundles). The banded and cap over phloem types are cited to *Anthurium* (Keating 2002). In the present group of species, we only found the banded type, on the abaxial surface of the midrib. Thickened cellulosic walls were found on cells adjacent to the adaxial surface of the midrib, but these could not be characterized as collenchyma due to their short length on longitudinal view (Esau 1977). In *A. regnellianum*, these collenchymatous cells of the midrib are substituted on the adaxial side by chlorenchymatic cells. This occurrence is cited by Keating (2002) for other *Anthurium* species. Although present in leaves, collenchyma was absent on spathes. However, Mayo (1986) cites the presence of collenchyma on spathes of *Philodendron* species.

Sclereids and fibres are reported for Araceae (Keating 2002). In *Anthurium* species, fibres are predominantly present as bundles sheaths, but caps of sclerenchyma over phloem or xylem occur in *A. parisiense* Bunting (Keating 2002). The leaves studied here only presented fibres forming vascular bundles. On the spathe, the fibres were always present as caps adjacent to the phloem, except for *Anthurium* sp. nov. whithout any fibres.

Keating (2002) and French & Tomlinson (1981) reported collateral bundles to Araceae. In the species analyzed here the vascular bundles are characterized by several elements of proto and metaxylem, adjacent to a semi-circular phloem, in the type described by Keating (2000) as type 1.

In relation to the occurrence of calcium oxalate crystals, all types (druses, raphides, sand, prismatics and, although rare, styloids) are cited to Araceae (Gemia & Hillson 1985, Mantovani 1997, Keating 2003). Keating (2002) reports that two or more crystal types can occur simultaneously in the same organ in Araceae, with raphides and druses occurring in *Anthurium* species. Prychid & Rudall (1999) demonstrate that the occurrence and distribution of crystals can be useful for taxonomic purposes in monocotyledons. Here

druses occur not only in the mesophyll, but also in the epidermis of leaves and spathes, which is not cited by Keating (2000; 2002) to *Anthurium*. Raphides were only seen on leaves, however Mayo (1986) shows the raphides in the spathes of *Philodendron* species.

Although secretory structures were reported by Lindorf (1980) and Keating (2000) for the genus *Anthurium*, they were not found in the species studied here.

The spathe is a reproductive structure with functional morphology related to the pollinization (Gottsberger & Amaral 1984), but its similarity with leaves leads some authors to characterize them as "*leaf-like structures*" (*sensu* Grayum 1990). In fact, in some aroid genera such as *Gymnostachys*, *Orontium* and *Pothoidium*, the spathe is absent, being substituted in position and function by the apical leaf of the rizhome (Grayum 1990). These similarities resulted in anatomical comparisons between leaf and spathe.

Keating (2002) proposes trends of anatomical specializations in Araceae based on morphological and molecular analyses (French *et al.* 1995, Keating 2000). Following such propositions, we suggest that some anatomical characters presented in the spathe of the species studied (paralell venation, uniform mesophyll, presence of anomocytic stomata, lack of hypodermis and palisade parenchyma, poorly developed aerenchyma, absence of collenchyma and raphides) would be plesiomorphic characters in relation to the leaf anatomical characters (reticulated venation, dorsiventral mesophyll, absence of anomocitic stomata, presence of hypodermis and palisade, highly developed aerenchyma, presence of collenchyma and raphides).

These results could represent either distinct evolutionary rates for the leaf and spathe, or specific specialization trends for the anatomy of spathes. Interestingly, Mayo (1986) and Sakuragui (1998) report differentiated subepidermal cells, large aerenchyma, collenchyma and raphides in the spathe of *Philodendron* species, which is considered derived in relation to *Anthurium* (Grayum 1990, French *et al.* 1995). Complementary studies are necessary to test the hypotheses above.

Keating (2002) states that, although some anatomical characters with diagnostic value exist in Araceae, only a few are useful if analyzed separately, and that the best strategy for diagnosis in the family is the combination of a large number of characters. We conclude that, although some groups of characters could be obtained in leaves, spathe anatomical characters are more useful for diagnostic purposes in the *Anthurium* species analyzed here.

Acknowledgments

Authors are indebted to Dr. Thomas Croat for revision of the manuscript, Dr. Marcus Nadruz Coelho and Dra. Karen Lúcia Gama De Toni for the encouragement and advise, and Noa Magalhães for help with the plates. Authors thanks also the valuable suggestions from anonymous reviewers. The second author was sponsored by the Conselho Nacional de Pesquisa e Desenvolvimento (CNPq).

Literature Cited

Coelho, M. A. N. 2004. Taxonomia e biogeografia de *Anthurium* (Araceae). Seção *Urospadix*, subseção *Flavescentiviridia*. Tese de Doutorado. Universidade Federal do Rio Grande do Sul, Porto Alegre, 321p.

Embrapa-Snlcs-Ibama-1992. Identificação de limitações pedológicas e ambientais causadoras da degradação de áreas do Jardim Botânico do Rio de Janeiro. Publicação do Jardim Botânico do Rio de Janeiro. Série Estudos e Contribuições nº. 10. Rio de Janeiro. 101p.

Engler, A. 1905. Pothoideae. *In*: A. Engler (editor), Das Pflanzenreich IV. 23B (Heft 21), Engelmann, Leipzig. 330p.

Esau, K. 1977. Anatomy of seed plants. 2ed. John Wiley & Sons, New York. 550p.

French, J. C. 1997. Vegetative anatomy. *In*: Mayo, S. J.; Borgner, J. & Boyce, P. C. The genera of Araceae. Royal Botanic Gardens, Kew. Pp. 9-29.

French, J. C. & Tomlinson, P. B. 1981. Vascular patterns in stems of Araceae: subfamily Monsteroideae. American Journal of Botany 68: 713-729.

French, J. C.; Chung, M. & Hur, Y. 1995. Chloroplast DNA phylogeny of the Ariflorae. *In*: Rudall, P. J.; Cribb, P. J.; Cutler, D. F. & Gregory, M. Monocotyledons: systematics and evolution. Academic Press, London. Pp. 255-275.

Galante, M. L. V. 1984. Geomorfologia: Jardim Botânico do Rio de Janeiro. Parque Lage, Rio de Janeiro. (mimeografado) 28pp.

Gemia, J. M. & Hillson, C. J. 1985. The occurrence, type and location of calcium oxalate crystals in the leaves of fourteen species of Araceae. Annals of Botany 56: 351-361.

Gerrits, P. O. & Smid, L. 1983. A new, less toxic polymerization system for the embedding of soft tissues in glycol methacrylate and subsequent preparing of serial sections. Journal of Microscopy 132: 81-85.

Gottsberger, G. & Amaral, A. 1984. Pollination strategies in Brazilian *Philodendron* species. Berichte Der Deutschen Botanischen Gesellschaft 97: 391-410.

Govaerts, R.; Frodin, D. G.; Bogner, J.; Boyce, P.; Cosgriff, B.; Croat, T. B.; Gonçalves E. G.; Gayum, M.; Hay, A.; Hetterscheid, W.; Landolt E.; Mayo, S. J.; Murata, J.; Nguyen, V. D.; Sakuragui, C. M.; Singh, Y.; Thompson, S. & Zhu, G. 2002. World checklist and bibliography of Araceae (and Acoraceae). Kew: Royal Botanic Garden. 560 p.

Grayum, M. H. 1990. Evolution and phylogeny of the Araceae. Annals of the Missouri Botanical Garden 77: 628-697.

Grear, J. W. 1973. Observations on the stomatal apparatus of *Orontium aquaticum* (Araceae). Botanical Gazette 134: 151-153.

Johansen, D. A. 1940. Plant microtechnique. Mc-Graw. Hill Book Co. Inc. New York, 523p.

Keating, R. C. 2000. Collenchyma in Araceae: Trends and relation to classification. Botanical Journal of the Linnean Society 134: 203-214.

_____. 2002. Acoraceae and Araceae. *In*: Gregory, M. and Cutler, D. F. Anatomy of the monocotyledons. Oxford University Press, New York, 322p.

Keating, R. C. 2003. Leaf anatomical characters and their value in understand morphoclines in the Araceae. Botanical Review 68(4): 510-523.

Lindorf, H. 1980. Leaf structure of 15 shade monocotyledons of the cloud forest of Rancho Grande: 1. Bifacials: Araceae, Marantaceae, Musaceae. Memorias de la Sociedad de Ciencias Naturales "La Salle" 40(113): 19-72.

Mantovani, A. 1997. Considerações iniciais sobre a conquista do hábito epifítico na família Araceae. Universidade Federal do Rio de Janeiro, Programa de Pós-Graduação em Ecologia, 216p.

_____. 1999a. Leaf morphophysiology and distribution of epiphytic aroids along a vertical gradient in a Brazilian rain forest. Selbyana 20(2): 241-249.

_____. 1999b. A method to improve leaf succulence quantification. Brazilian Archives of Biology and Technology 42(1): 9-14.

Mayo, S. J. 1986. Systematics of *Philodendron* Schott (Araceae) with special reference to inflorescence characters. PhD Thesis, 972 p. University of Reading, UK.

Mayo, S. J.; Borgner, J. & Boyce, P. C. 1997. The genera of Araceae. Royal Botanic Gardens, Kew, 370p.

Mcdowel, E. M. 1978. Fixation and processing. *In*: Trump, B. F. & Jones, R. T. Diagnostic electron microscopy. John Wiley & Sons, New York. pp. 113-139.

O'Brien, T. P. & McCully, M. E. 1981. The study of plants structure: principles and selected methods. Melbourne: Termarcarphi Pty. pp. 446-455.

Potiguara, R. C. V. & Nascimento, M. E. 1994. Contribuição à anatomia dos órgãos vegetativos de *Heteropsis jenmani* Oliv. (Araceae). Boletim do Museu Paraense Emílio Goeldi 10(2): 237-247.

Prychid, C. J. & Rudall, P. J. 1999. Calcium oxalate crystals in monocotyledons: a review of their structure and systematics. Annals of Botany 84: 725-739.

Rada, F. & Jaimez, R. 1992. Comparative ecophysiology and anatomy of terrestrial and epiphytic *Anthurium bredemeyeri* Schott in a tropical Andean cloud forest. Journal of Experimental Botany 43: 723-727.

Sakuragui, C. M. 1998. Taxonomia e filogenia das espécies de *Philodendron*, seção *Calostigma* (Schott) Pfeiffer no Brasil. Tese de Doutorado. São Paulo, Universidade de São Paulo. 238p.

Solereder, H. & Meyer, F. J. 1928. Systematische anatomie der Monokotyledonen. Heft III, Gebruder Borntträeger, Berlin. Pp. 100-169.

Valentin, J. L. 2000. Ecologia Numérica: uma introdução à análise multivariada de dados ecológicos. Editora Interciência, Rio de Janeiro, 117p.

Vieira, R. C. & Mantovani, A. 1995. Anatomia foliar de *Deschampsia antarctica* Desv. Revista Brasileira de Botânica 18(2): 207-220.

Vieira, R. C.; Gomes, D. M. S.; Sarahyba, L. S. & Arruda, R. C. O. 2002. Leaf anatomy of three herbaceous bamboo species. Brazilian Journal of Biology 62(4): 907-922.

INSTRUÇÕES AOS AUTORES

Escopo

A Rodriguésia é uma publicação quadrimestral do Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, que publica artigos e notas científicas, em Português, Espanhol ou Inglês em todas as áreas da Biologia Vegetal, bem como em História da Botânica e atividades ligadas a Jardins Botânicos.

Encaminhamento dos manuscritos

Os manuscritos devem ser enviados em 3 vias impressas à:

Revista Rodriguésia
Rua Pacheco Leão 915
Rio de Janeiro - RJ
CEP: 22460-030
Brasil
Fone: (0xx21) 3204-2519

Os artigos devem ter no máximo 30 páginas digitadas, aqueles que ultrapassem este limite poderão ser publicados após avaliação do Corpo Editorial. O aceite dos trabalhos depende da decisão do Corpo Editorial.

Todos os artigos serão submetidos a 2 consultores *ad hoc*. Aos autores será solicitado, quando necessário, modificações de forma a adequar o trabalho às sugestões dos revisores e editores. Artigos que não estiverem nas normas descritas serão devolvidos.

Serão enviadas aos autores as provas de página, que deverão ser devolvidas ao Corpo Editorial em no máximo 5 dias úteis a partir da data do recebimento. Os trabalhos, após a publicação, ficarão disponíveis em formato digital (PDF, AdobeAcrobat) no *site* do Instituto de Pesquisas Jardim Botânico do Rio de Janeiro (http://www.jbrj.gov.br).

Formato dos manuscritos

Os autores devem utilizar o editor do texto *Microsoft Word*, versão 6.0 ou superior, fonte Times New Roman, corpo 12, em espaço duplo.

O manuscrito deve ser formatado em tamanho A4, com margens de 2,5 cm e alinhamento justificado, exceto nos casos indicados abaixo, e impresso em apenas um lado do papel. Todas as páginas, exceto a do título, devem ser numeradas, consecutivamente, no canto superior direito. Letras maiúsculas devem ser utilizadas apenas se as palavras exigem iniciais maiúsculas, de acordo com a respectiva língua do manuscrito. Não serão considerados manuscritos escritos inteiramente em maiúsculas.

Palavras em latim devem estar em itálico, bem como os nomes científicos genéricos e infragenéricos. Utilizar nomes científicos com-pletos (gênero, espécie e autor) na primeira men-ção, abreviando o nome genérico subseqüente-mente, exceto onde referência a outros gêneros cause confusão. Os nomes dos autores de táxons devem ser citados segundo Brummitt & Powell (1992), na obra "Authors of Plant Names".

Primeira página – deve incluir o título, autores, instituições, apoio financeiro, autor e endereço para correspondência e título abreviado. O título deverá ser conciso e objetivo, expressando a idéia geral do conteúdo do trabalho. Deve ser escrito em negrito com letras maiúsculas utilizadas apenas onde as letras e as palavras devam ser publicadas em maiúsculas.

Segunda página – deve conter Resumo (incluindo título em português ou espanhol), Abstract (incluindo título em inglês) e palavras-chave (até 5, em português ou espanhol e inglês). Resumos e abstracts devem conter até 200 palavras cada. O Corpo Editorial pode redigir o Resumo a partir da tradução do Abstract em trabalhos de autores não fluentes em português.

Texto – Iniciar em nova página de acordo com seqüência apresentada a seguir: Introdução, Material e Métodos, Resultados, Discussão, Agradecimentos e Referências Bibliográficas. Estes itens podem ser omitidos em trabalhos sobre a descrição de novos táxons, mudanças nomenclaturais ou similares. O item Resultados pode ser agrupado com Discussão quando mais adequado. Os títulos (Introdução, Material e Métodos etc.) e subtítulos deverão ser em negrito. Enumere as figuras e tabelas em arábico de acordo com a seqüência em que as mesmas aparecem no texto. As citações de referências no texto devem seguir os seguintes exemplos: Miller (1993), Miller & Maier (1994), Baker *et al.* (1996) para três ou mais autores ou (Miller 1993), (Miller & Maier 1994), (Baker *et al.* 1996).

Referência a dados ainda não publicados ou trabalhos submetidos deve ser citada conforme o exemplo: (R.C. Vieira, dados não publicados). Cite resumos de trabalhos apresentados em Congressos, Encontros e Simpósios se estritamente necessário

O material examinado nos trabalhos taxonômicos deve ser citado obedecendo a seguinte ordem: local e data de coleta, fl., fr., bot. (para as fases fenológicas), nome e número do coletor (utilizando *et al.* quando houver mais de dois) e sigla(s) do(s) herbário(s) entre parêntesis, segundo o *Index Herbariorum*. Quando não houver número de coletor, o número de registro do espécime, juntamente com a sigla do herbário,deverá ser citado. Os nomes dos países e dos estados/províncias deverão ser citados por extenso, em letras maiúsculas e em ordem alfabética, seguidos dos respectivos materiais estudados.
Exemplo:
BRASIL. BAHIA: Ilhéus, Reserva da CEPEC, 15.XII.1996, fl. e fr., *R. C. Vieira et al. 10987* (MBM, RB, SP).

Para números decimais, use vírgula nos artigos em Português e Espanhol (exemplo: 10,5 m) e ponto em artigos em Inglês (exemplo: 10.5 m). Separe as unidades dos valores por um espaço (exceto em porcentagens, graus, minutos e segundos).

Use abreviações para unidades métricas do Systeme Internacional d'Unités (SI) e símbolos químicos amplamente aceitos. Demais abreviações podem ser utilizadas, devendo ser precedidas de seu significado por extenso na primeira menção.

Referências Bibliográficas – Todas as referências citadas no texto devem estar listadas neste item. As referências bibliográficas devem ser relacionadas em ordem alfabética, pelo sobrenome do primeiro autor, com apenas a primeira letra em caixa alta, seguido de todos os demais autores. Quando houver repetição do(s) mesmo(s) autor(es), o nome do mesmo deverá ser substituído por um travessão; quando o mesmo autor publicar vários trabalhos num mesmo ano, deverão ser acrescentadas letras alfabéticas após a data. Os títulos de periódicos não devem ser abreviados.
Exemplos:

Tolbert, R. J. & Johnson, M. A. 1966. A survey of the vegetative shoot apices in the family Malvaceae. American Journal of Botany 53(10): 961-970.

Engler, H. G. A. 1878. Araceae. *In*: Martius, C. F. P. von; Eichler, A. W. & Urban, I. Flora brasiliensis. Munchen, Wien, Leipzig, 3(2): 26-223.

_____. 1930. Liliaceae. *In*: Engler, H. G. A. & Plantl, K. A. E. Die Naturlichen Pflanzenfamilien. 2. Aufl. Leipzig (Wilhelm Engelmann). 15: 227-386.

Sass, J. E. 1951. Botanical microtechnique. 2ed. Iowa State College Press, Iowa, 228p.

Cite teses e dissertações se estritamente necessário, isto é, quando as informações requeridas para o bom entendimento do texto ainda não foram publicadas em artigos científicos.

Tabelas - devem ser apresentadas em preto e branco, no formato Word for Windows. No texto as tabelas devem ser sempre citadas de acordo com os exemplos abaixo:

"Apenas algumas espécies apresentam indumento (Tabela 1)..."

"Os resultados das análises fitoquímicas são apresentados na Tabela 2..."

Figuras - não devem ser inseridas no arquivo de texto. Submeter originais em preto e branco e três cópias de alta resolução para fotos e ilustrações, que também podem ser enviadas em formato eletrônico, com alta resolução, desde que estejam em formato TIF ou compatível com *CorelDraw*, versão 10 ou superior. Ilustrações de baixa qualidade resultarão na devolução do manuscrito. No caso do envio das cópias impressas a numeração das figuras, bem como textos nelas inseridos, devem ser assinalados com *Letraset* ou similar em papel transparente (tipo manteiga), colado na parte superior da prancha, de maneira a sobrepor o papel transparente à prancha, permitindo que os detalhes apareçam nos locais desejados pelo autor. Os gráficos devem ser em preto e branco, possuir bom contraste e estar gravados em arquivos separados em disquete (formato TIF ou outro compatível com *CorelDraw 10*). As pranchas devem possuir no máximo 15 cm larg. x 22 cm comp. (também serão aceitas figuras que caibam em uma coluna, ou seja, 7,2 cm larg.x 22 cm comp.). As figuras que excederem mais de duas vezes estas medidas serão recusadas. As imagens digitalizadas devem ter pelo menos 600 dpi de resolução.

No texto as figuras devem ser sempre citadas de acordo com os exemplos abaixo:

"Evidencia-se pela análise das Figuras 25 e 26...."

"Lindman (Figura 3) destacou as seguintes características para as espécies..."

Após feitas as correções sugeridas pelos assessores e aceito para a publicação, o autor deve enviar a versão final do manuscrito em duas vias impressas e em uma eletrônica.

INSTRUCCIONES A LOS AUTORES

Generalidades

Rodriguésia es una publicación quadrimestral de el Instituto de Pesquisas del Jardín Botánico de Rio de Janeiro, que publica artículos y notas científicas, en Portugués, Español y Inglés en todas las áreas de Biología Vegetal, asi como en Historia de la Botánica y actividades ligadas a Jardines Botánicos.

Preparación del manuscrito

Tres copias del manuscrito deben ser enviadas a la siguiente dirección:
Revista Rodriguésia
Rua Pacheco Leão 915
Rio de Janeiro - RJ
CEP: 22460-030 - Brasil
Fone: (0xx21) 3204-2519

Los artículos pueden tener una extensión máxima de 30 páginas (sin contar tablas y figuras). Los que se extiendan más que 30 páginas podrán ser publicados después de ser evaluados por el Consejo Editorial. La aceptación de los trabajos depende de la decisión de el Comité Científico.

Todos los artículos serán examinados por dos revisores *ad hoc*. Cuando sea necesario, se solicitará a los autores realizar modificaciones al manuscrito para adecuarlo a las sugerencias de los revisores y editores. Artículos que no sigan las normas descritas serán devueltos.

Las pruebas de galera serán enviados a los autores, y deben ser devueltas al Consejo Editorial en un máximo de cinco días a partir de la fecha de recibo. Después de publicados los artículos estarán disponibles en formato digital (PDF, AdobeAcrobat) en la página del Instituto de Pesquisas del Jardim Botânico de Rio de Janeiro (http://www.jbrj.gov.br).

Preparación de los manuscritos

Los autores deben utilizar el editor de texto *Microsoft Word* 6.0 o superior, letra Times New Roman 12 puntos y doble espacio.

El manuscrito debe estar formateado en hoja tamaño A4 (o carta), impresas por un solo lado, con márgenes de 2,5 cm en todos los lados de la página y alinear el texto a la izquierda y a la derecha, excepto en los casos indicados abajo. Todas las páginas, excepto el título, deben ser numeradas, consecutivamente, en la esquina superior derecha. Las letras mayúsculas deben ser utilizadas apenas en palabras que exijan iniciales mayúsculas, de acuerdo con el respectivo idioma usado en el manuscrito. No serán considerados manuscritos escritos completamente con letras mayúsculas.

Palabras en latín, nombres científicos genéricos y infra-genéricos deben estar escritas en itálica. Utilizar nombres científicos completos (género, especie y autor) la primera vez que sean mencionados, abreviando el nombre genérico en las próximas veces, excepto cuando los otros nombres genéricos sean iguales. Los nombres de autores de los taxones deben ser citados siguiendo Brummitt & Powell (1992), en la obra "Authors of Plant Names".

Primera página - debe incluir el título, autores, afiliación profesional, financiamiento, autor y dirección para correspondencia y título abreviado. El título deberá ser conciso y objetivo, expresando la idea general de el contenido de el artículo. Debe ser escrito en negrito con letras mayúsculas utilizadas apenas donde las letras y las palabras deban ser publicadas en mayúsculas.

Segunda página - debe tener el Resumen (incluyendo título en portugués o español), Abstract (incluyendo título en ingles) y palabras-clave (hasta 5, en portugués o español e ingles). Resúmenes y abstracts llevan hasta 200 palabras cada uno. El Consejo Editorial puede traducir el Abstract, para hacer el Resumo en trabajos de autores no fluentes en portugués.

Texto – Iniciar en una nueva página y en la siguiente secuencia: Introducción, Materiales y Métodos, Resultados, Discusión, Agradecimientos y Referencias Bibliográficas. Estas secciones pueden ser omitidos en trabajos sobre la descripción de nuevos taxones, cambios nomenclaturales o similares. La sección Resultados puede ser agrupada con Discusión cuando se considere mas adecuado. Las secciones (Introducción, Materiales y Métodos, etc.) y subtítulos deberán ser en negrilla. Numere las figuras y tablas con números arábicos de acuerdo con la secuencia en que estas aparecen en el texto. Las citaciones de referencias en el texto deben seguir los ejemplos: Miller (1993), Miller & Maier (1994), Baker *et al.* (1996) para tres o mas autores o (Miller 1993), (Miller & Maier 1994), (Baker *et al.* 1996).

Referencia a dados todavía no publicados o trabajos sometidos deben ser citados conforme el ejemplo: (R. C. Vieira, com. pers., o R. C. Vieira obs. pers.). Cite resúmenes de trabajos presentados en Congresos, Encuentros y Simposios si es estrictamente necesario.

El material examinado en los trabajos taxonómicos debe ser citado obedeciendo el siguiente orden: localidad y fecha de colección, fl., fr., bot. (para las fases fenológicas), nombre y número del colector (utilizando *et al.* cuando existan mas de dos) y sigla(s) de lo(s) herbario(s) entre paréntesis, siguiendo el *Index Herbariorum*. Cuando no exista número de colector, deberá ser citado el número de registro de el espécimen, y la sigla del herbario. Los nombres de los países y de los estados o provincias deberán ser citados por extenso, en letras mayúsculas y en orden alfabético, seguidos de los respectivos materiales estudiados.

Ejemplo:

BRASIL. BAHIA: Ilhéus, Reserva da CEPEC, 15.XII.1996, fl. y fr., *R.C. Vieira et al. 10987* (MBM, RB, SP).

Para números decimales, use coma en los artículos en Portugués y Español (ejemplo: 10,5 m) y punto en artículos en Ingles (ejemplo: 10.5 m). Separe las unidades de los valores por un espacio (excepto en porcentajes, grados, minutos y segundos).

Use abreviaciones para unidades métricas de el Systeme Internacional d'Unités (SI) y símbolos químicos ampliamente aceptados. Las otras abreviaciones pueden ser utilizadas, pero debe incluirse su significado por extenso en la primera mención.

Referencias Bibliográficas - Todas las referencias citadas en el texto deben estar listadas en esta sección. Las referencias bibliográficas deben organizarse en orden alfabético, por apellido del primer autor, con apenas la primera letra en mayúsculas, seguido de los demas autores. Cuando exista repetición de el(los) mismo(s) autor(es), el nombre de éste(s) se debe substituir por una línea; cuando el mismo autor tenga varios trabajos en un mismo año, utilice letras alfabéticas después de la fecha para reonocerlos. Los títulos de revistas no deben ser abreviados.

Ejemplos:

Tolbert, R. J. & Johnson, M. A. 1966. A survey of the vegetative shoot apices in the family Malvaceae. American Journal of Botany 53(10): 961-970.

Engler, H. G. A. 1878. Araceae. *In*: Martius, C. F. P. von; Eichler, A. W. & Urban, I. Flora brasiliensis. Munchen, Wien, Leipzig, 3(2): 26-223.

_____. 1930. Liliaceae. *In*: Engler, H. G. A. & Plantl, K. A. E. Die Naturlichen Pflanzenfamilien. 2. Aufl. Leipzig (Wilhelm Engelmann). 15: 227-386.

Sass, J. E. 1951. Botanical microtechnique. 2ed. Iowa State College Press, Iowa, 228p.

Cite tesis y disertaciones si es extrictamente necesario, o cuando las informaciones requeridas para un mejor entendimiento del texto todavía no fueron publicadas en artículos científicos.

Tablas - deben ser presentadas en blanco y negro, en el formato Word para Windows. En el texto las tablas deben estar siempre citadas de acuerdo con los ejemplos abajo:

"Apenas algunas especies presentan indumento (Tabla 1)..."

"Los resultados de análisis fitoquímicos son presentados en la Tabla 2..."

Figuras - no deben ser incluidas en el archivo del texto. Someter originales en blanco y negro por triplicado. Use alta resolución para fotos e ilustraciones impresas. Las figuras también pueden ser enviadas en formato electrónico, con alta resolución, desde que sean en formato TIF o compatible con *CorelDraw*, versión 10 o superior. Ilustraciones de baja calidad resultarán en la devolución del manuscrito. En el caso de envío de las copias impresas la numeración de las figuras, así como, textos en ellas inseridos, deben ser marcados con *Letraset* o similar en papel transparente (tipo mantequilla), pegado en la parte superior de la figura, de manera al sobreponer el papel transparente en la figura, permitiendo que los detalles aparezcan en los locales deseados por el autor. Los gráficos deben ser en blanco y negro, con excelente contraste y gravados en archivos separados en disquete (formatoTIF o otro compatible con *CorelDraw 10*). Las figuras se publican con el máximo 15 cm de ancho x 22 cm de largo, también serán aceptas figuras del ancho de una columna - 7,2 cm. Las figuras que excedan mas de dos veces estas medidas serán rechazadas. Es necesario que las figuras digitalizadas tengan al menos 600 dpi de resolución.

En el texto las figuras deben citarse de acuerdo con los siguientes ejemplos:

"Evidencia por el análisis de las Figuras 25 y 26...."

"Lindman (Figura 3) destacó las siguientes características para las especies..."

Cuando el manuscrito es aceptado para publicación, después de hacer las correcciones sugeridas por los revisores, el autor debe enviar la versión final del manuscrito en dos copias impresas y una copia electrónica. Identifique el disquete con nombre y número del manuscrito. **Es importante estar seguro que las copias en papel y la versión en disquete sean idénticas.**

INSTRUCTIONS TO THE AUTHORS

Scope

Rodriguésia, issued three times a year by the Botanical Garden of Rio de Janeiro Research Institute (Instituto de Pesquisa Jardim Botânico do Rio de Janeiro), publishes scientific articles and short notes in all areas of Plant Biology, as well as History of Botany and activities linked to Botanic Gardens. Articles are published in Portuguese, Spanish or English.

Submission of manuscripts

Manuscripts are to be submitted with 3 printed copies (we will request the text on diskette or as an e-mail attachment after the review stage) to:
Revista Rodriguésia
Rua Pacheco Leão 915
Rio de Janeiro - RJ
CEP: 22460-030
Brazil
Fone: (0xx21) 3204-2519

The maximum recommended length of the articles is 30 pages, but larger submissions may be published after evaluation by the Editorial Board. The articles are considered by the Editorial Board of the periodical, and sent to 2 referees *ad hoc*. The authors may be asked, when deemed necessary, to modify or adapt the submission according to the suggestions of the referees and the editors.

Once the article is accepted, it will be type-set and the authors will receive proofs to review and send back in 5 working days from receipt. Following their publication, the articles will be available digitally (PDF, AdobeAcrobat) at the site of the Instituto de Pesquisas Jardim Botânico do Rio de Janeiro (http://www.jbrj.gov.br).

Guidelines

Manuscripts must be presented in *Microsoft Word* software (vs 6.0 ou more recent), with Times New Roman font size 12, double spaced. Page format must be size A4, margins 2,5 cm, justified (except in the cases explained below), printed on one side only. All pages, except the title page, must be numbered in the top right corner. Capital letters to be used only for initials, according to the language.

Latin words must be in italics (incl. genera and all other categories below generic level), and the scientific names have to be complete (genus, species and author) when they first appear in the text, and afterwards the genus can be abbreviated and the authority of the name suppressed, unless for some reason it may be cause for confusion. Names of authors to be cited according to Brummitt & Powell (1992), "Authors of Plant Names".

First page – must include title, authors, addresses, financial support, main author and contact address and abbreviated title. The title must be short and objective, expressing the general idea of the contents of the article. It must appear in bold with capital letters where relevant.

Second page – must contain a Portuguese summary (including title in Portuguese or Spanish), Abstract (including title in English) and key-words (up to 5, in Portuguese or Spanish and in English). Summaries and abstracts must contain up to 200 words each. The Editorail Board may translate the Abstract into a Portuguese summer if the authors are not Portuguese speakers.

Text – Start in a new page, according to the following sequence: Introduction, Material and Methods, Results, Discussion, Acknowledgements and Bibliography. Some of these items may be omitted in articles describing new *taxa* or presenting nomenclatural changes, etc. In some cases, the Results and Discussion can be merged. Titles (Introduction, Material and Methods, etc.) and subtitles must be presented in bold. Number figures and tables in 1-10 etc., according with the sequence these occupy within the text. References within the text are to follow the example: Miller (1993), Miller & Maier (1994), Baker *et al.* (1996) for three or more authors or (Miller 1993), (Miller & Maier 1994), (Baker *et al.* 1996). Unpublished data should appear as: (R. C. Vieira, unpublished). Conference, Symposia and Meetings abstracts should only be cited if strictly necessary.

For Taxonomic Botany articles, the examined material ought to be cited following this order: locality and date of collection, phenology (fl., fr., bud), name and number of collector (using *et al.* when more than two collectors were present) and acronym of the herbaria between brackets, according to *Index Herbariorum*. When the collector's number is not available, the herbarium record number should be cited preceded by the Herbarium's acronym. Names of countries and states/provinces should be cited in full, in capital

letters and in alphabetic order, followed by the material studied, for instance:

BRASIL. BAHIA: Ilhéus, Reserva da CEPEC, 15.XII.1996, fl. e fr., *R. C. Vieira et al. 10987* (MBM, RB, SP).

Decimal numbers should be separated by comma in articles in Portuguese and Spanish (e.g.: 10,5 m), full stop in English (e.g.: 10.5 m). Numbers should be separated by space from values/ measurements, except in percentages, degrees, minutes and seconds.

Metric unities should be abbreviated according to the Systeme Internacional d´Unités (SI), and chemistry symbols are allowed. Other abbreviations can be used as long as they are explained in full when they appear for the first time

References – All references cited in the text have to be listed within this item, in alphabetic order by the surname of the first author, first names in capital letters, and all other authors have to be cited. When the same author is repeated, the name is substituted by long dash; when the same author publishes more than one paper in the same year, these have to be differentiated by letters after the year of publication. Titles of papers should not be abbreviated.

Examples:

Tolbert, R. J. & Johnson, M. A. 1966. A survey of the vegetative shoot apices in the family Malvaceae. American Journal of Botany 53(10): 961-970.

Engler, H. G. A. 1878. Araceae. *In*: Martius, C. F. P. von; Eichler, A. W. & Urban, I. Flora brasiliensis. Munchen, Wien, Leipzig, 3(2): 26-223.

_____. 1930. Liliaceae. *In*: Engler, H. G. A. & Plantl, K. A. E. Die Naturlichen Pflanzenfamilien. 2. Aufl. Leipzig (Wilhelm Engelmann). 15: 227-386.

Sass, J. E. 1951. Botanical microtechnique. 2ed. Iowa State College Press, Iowa, 228p.

MSc and PhD thesis should be cited only when strictly necessary, if the information is as yet unpublished in the form of scientific articles.

Tables – should be presented in black and white, in the same software cited above. In the text, tables should be cited following in the examples below:

"Only a few species present hairs (Table 1)..."

"Results to the phytochemical analysis are presented in Table 2..."

Figures - must not be included in the file with text. Submit originals in black and white high good quality copies for photos and illustrations, or in electronic form with high resolution in format TIF 600 dpi, or compatible with *CorelDraw* (vs. 10 or more recent). Low or poor quality illustrations will result on the return of the manuscript. In the case of printed copies, the numbering and text of the figures should be made on an overlapping sheet of transparent paper stuck to the top edge of the plates, and not on the original drawing itself. Graphs should also be black and white, with good contrast, and in separate files on disk (format TIF 600 dpi, or compatible with *CorelDraw 10*). Plates should be a maximum of 15 cm wide x 22 cm long for a full page, or column size, with 7,2 cm wide and 22 cm long. The resolution for grayscale images should be 600 dpi.

In the text, figures should be cited according with the examples:

"It is made obvious by the analysis of Figures 25 and 26...."

"Lindman (Figure 3) outlined the following characters for the species..."

After adding modifications and corrections suggested by the two reviewers, the author should submit the final version of the manuscript electronically plus two printed copies.

Consultores *ad hoc* da Rodriguésia em 2005

Agnes Elisete Luchi
Alessandro Rapini
Alexandre Adalardo de Oliveira
André Luís Laforga Vanzela
André Mantovani
Andrea Ferreira da Costa
Andrea Pereira Luizi Ponzo
Aparecida Donisete Faria
Bernardo Antonio Perez da Gama
Cassia Mônica Sakuragui
Catarina Carvalho Nievola
Cíntia Kameyama
Claudia Petean Bove
Claudine Massi Mynssen
Dan Nicolson
Daniela Zappi
Daniela Guimarães Simão
Dória Maria Saiter Gomes
Dorothy Sue Dunn de Araújo
Douglas Antônio de Carvalho
Eduardo Gomes Gonçalves
Eliana Regina Forni Martins
Elisabeth Atalla Mansur de Oliveira
Elsie Franklin Guimarães
Fernanda Reinert Thomé Macrae
Fernando Pedroni
Flávio Coelho Edler
Gerlene Lopes Esteves
Jefferson Prado
João Renato Stehmann
John Du Vall Hay
José Aldo Alves Pereira
Júlio Antônio Lombardi
Katia Cavalcanti Pôrto
Leandro Freitas
Lidyanne Yuriko Saleme Aona
Lucia Garcez Lohmann
Marco Aurélio Leite Fontes
Marcus Alberto Nadruz Coelho
Maria Cândida Henrique Mamede
Maria das Graças Sajo
Maria do Carmo Estanislau do Amaral
Marli Pires Morim
Mauro Galetti Rodrigues
Mercedes Maria da Cunha Bustamante
Milton Groppo Júnior
Nair Sumie Yokoya
Nidia Majerowicz
Oberdan José Pereira
Pablo José Francisco Pena
Patrícia Borges Pita
Paulo Takeo Sano
Paul J. M. Maas
Regina Helena Potsch Andreata
Ricardo Pereira Louro
Ricardo Tadeu de Faria
Roberto Campos Villaça
Ronald Bastos Freire
Rosana Romero
Thomas B. Croat
Timothy Molton
Vânia Regina Pivello
Vera Lúcia Scatena
Waldir Mantovani
Yule Roberta Ferreira Nunes