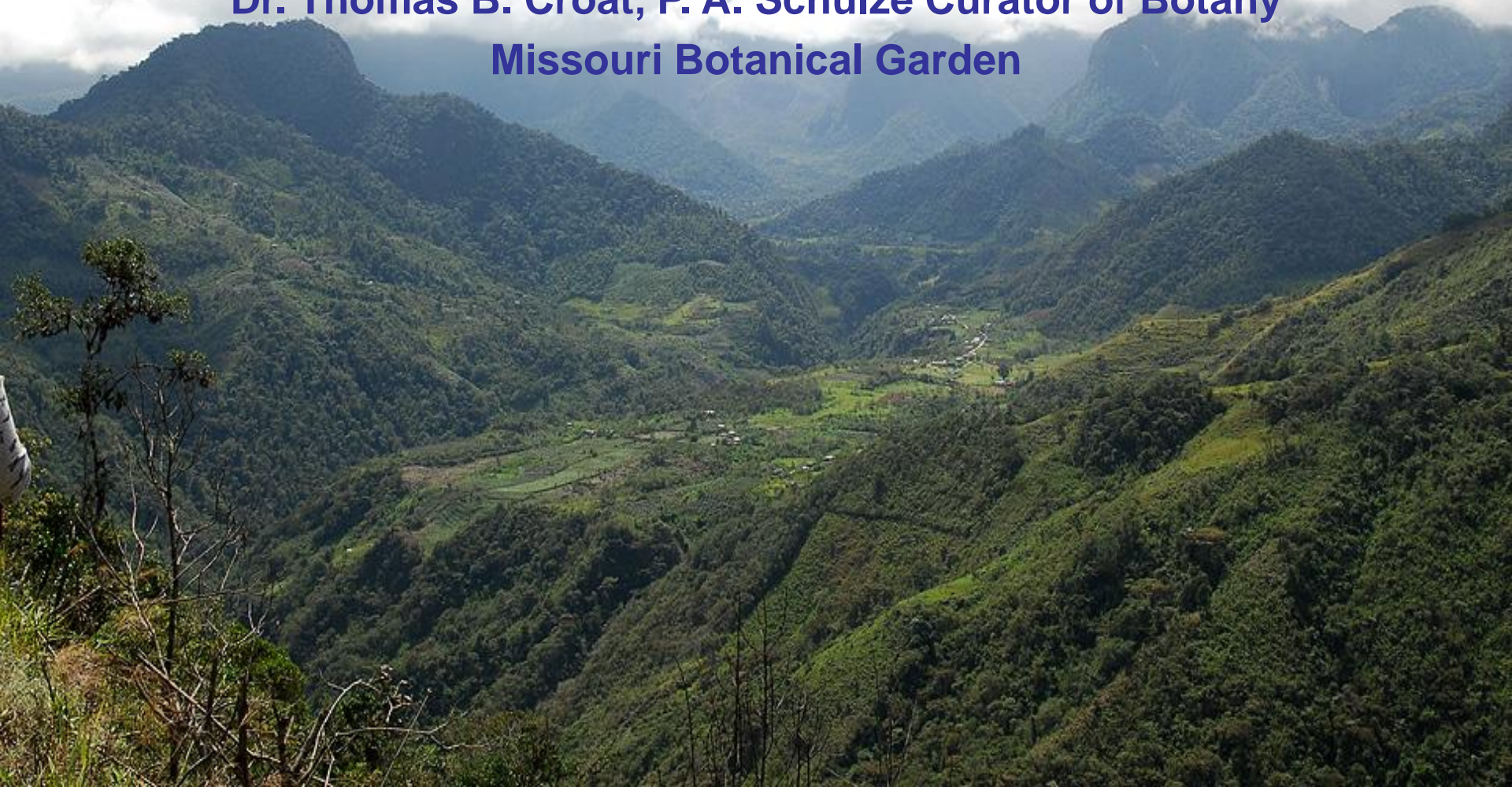


# The *Anthurium* flora of Carchí Province, Ecuador

**Nathan P. Hartley**

**Dr. Thomas B. Croat, P. A. Schulze Curator of Botany  
Missouri Botanical Garden**



# Objective

- To identify and describe as many *Anthurium* species from Carchí Province (NW Ecuador) as possible in 10 weeks.



# Tom Croat

- Life-long affiliation with plants
- 48 years at MBG
- 2,000 new species
- 104,647 plant collections
- 1 of 4 people to collect over 100,000 plant specimens
- Cultivator of the world's largest aroid collection
- >200 publications
- Countless adventures and mishaps all over the globe in 65 countries

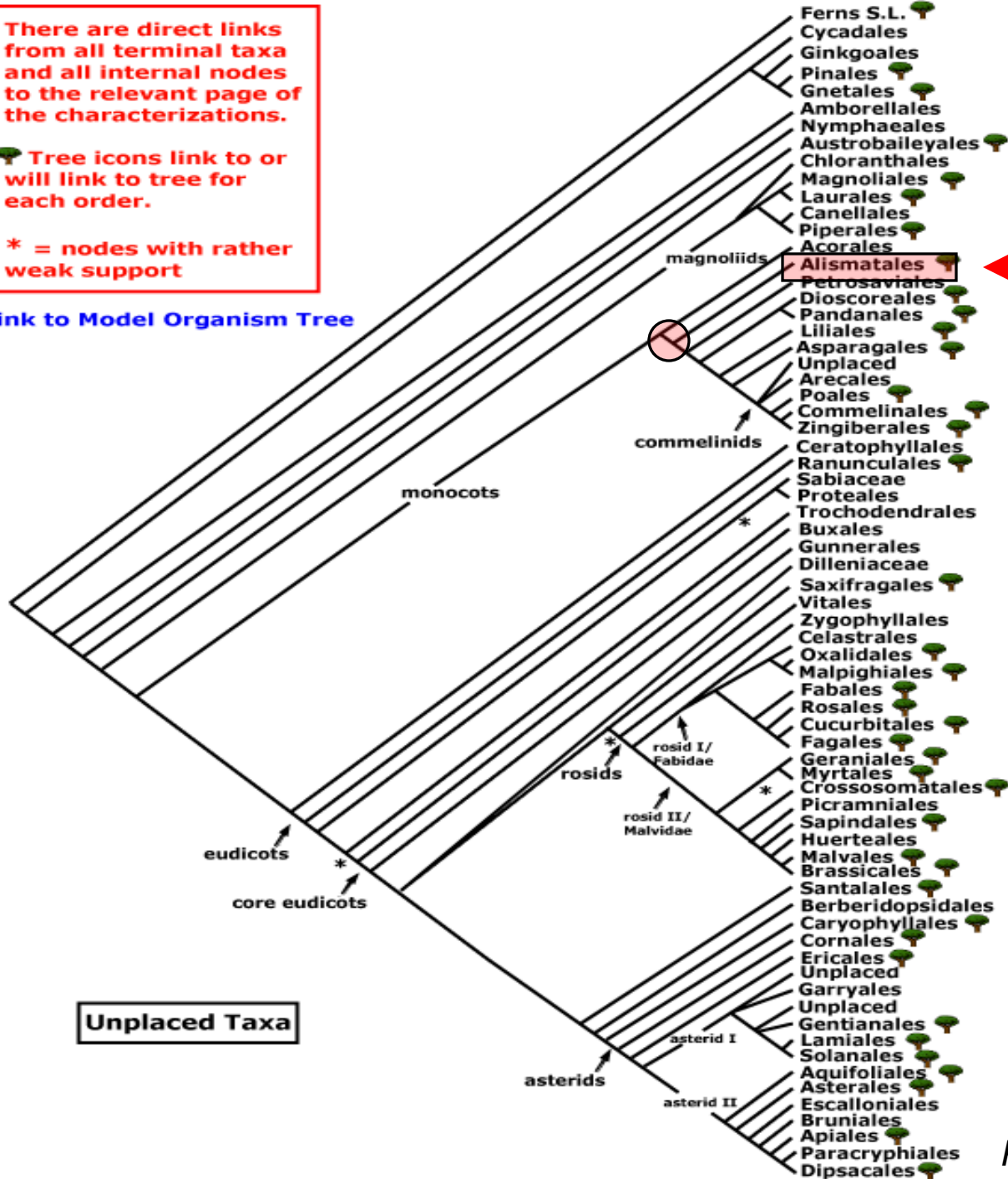


There are direct links from all terminal taxa and all internal nodes to the relevant page of the characterizations.

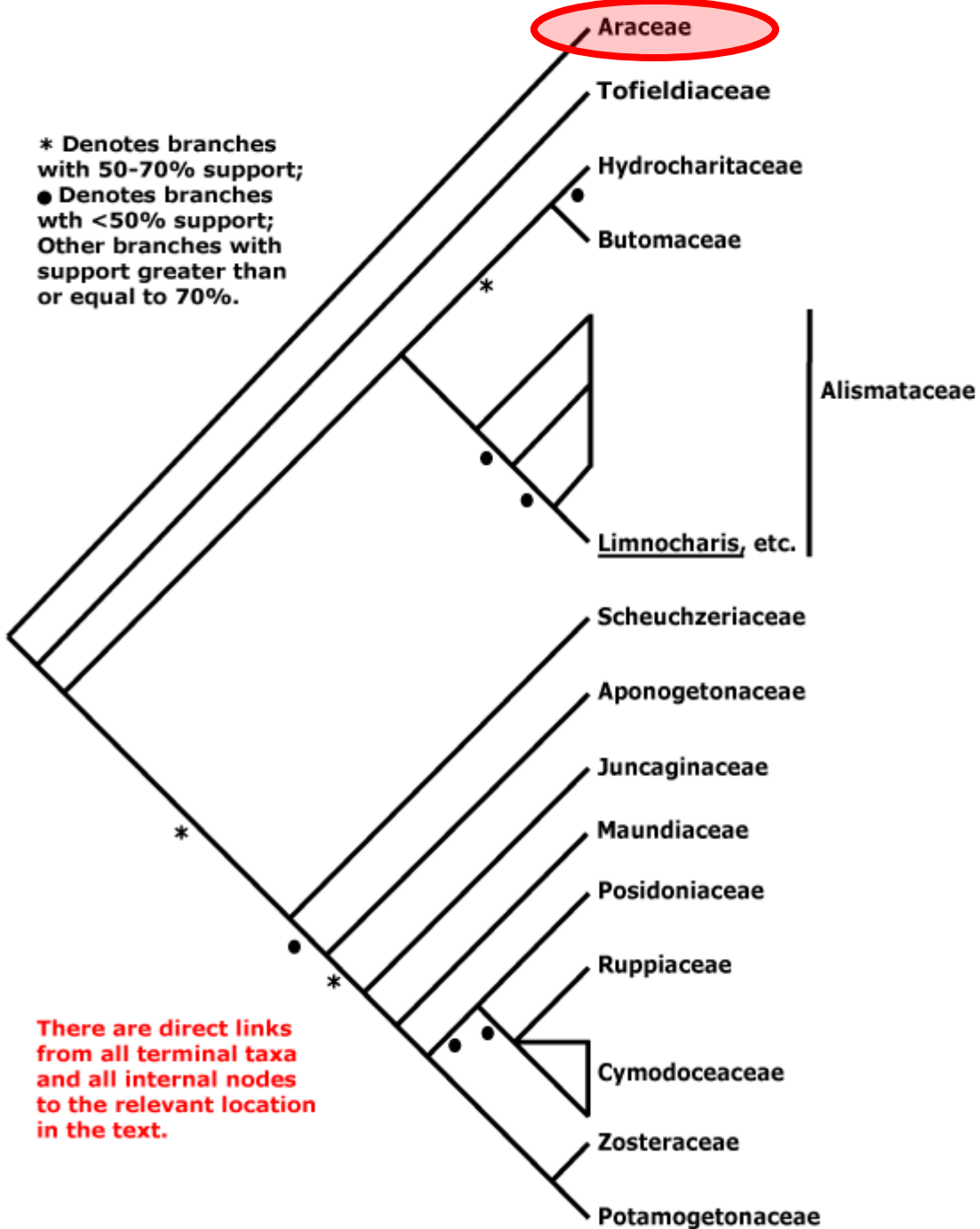
 Tree icons link to or will link to tree for each order.

\* = nodes with rather weak support

[Link to Model Organism Tree](#)

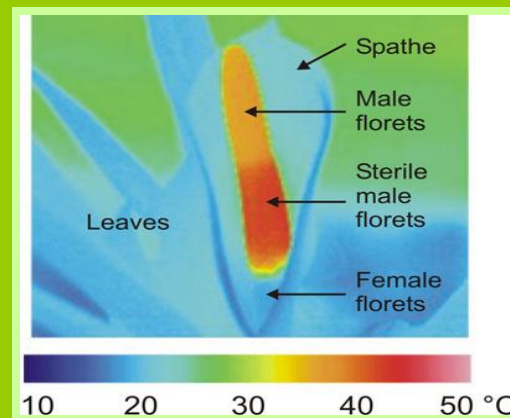


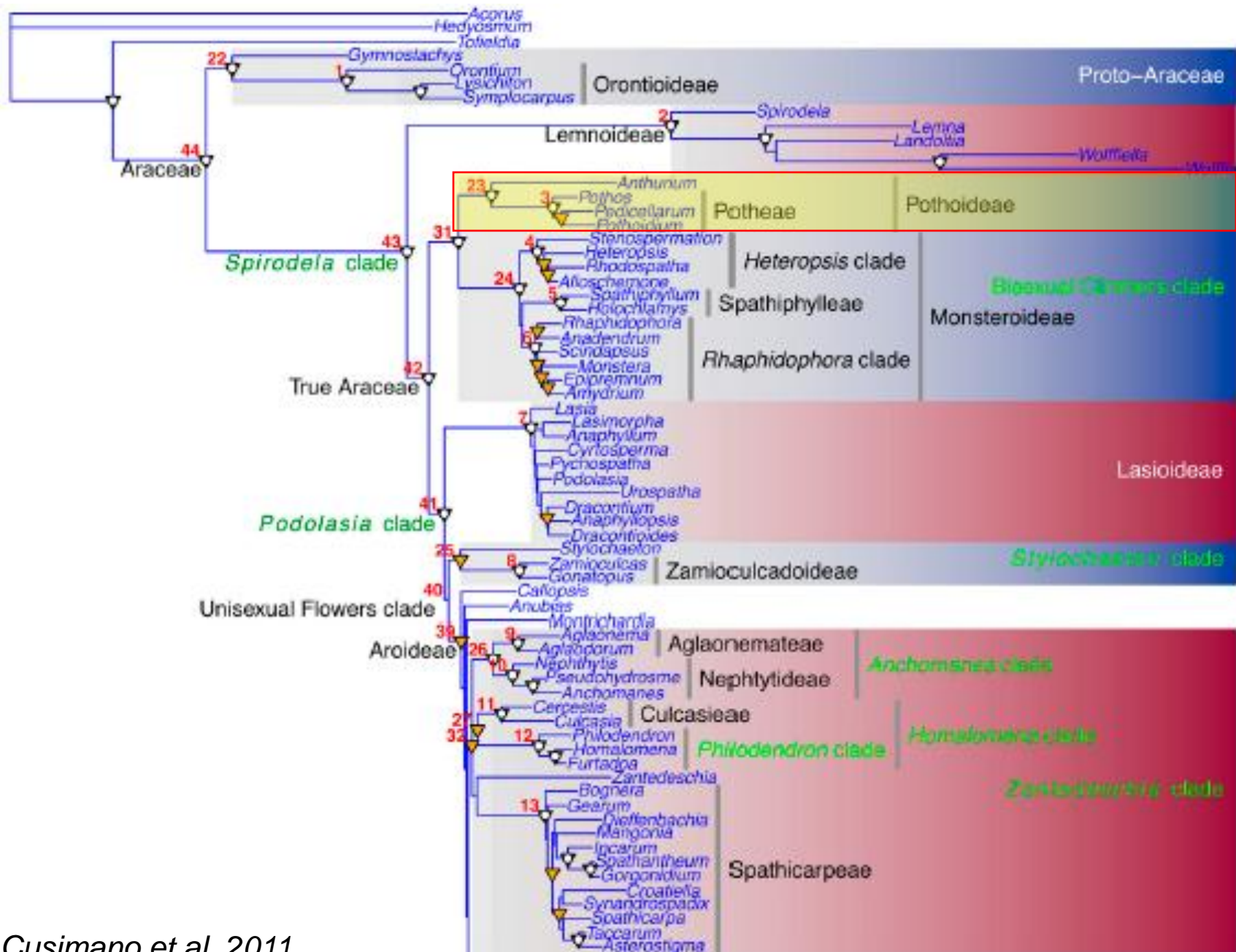
# Alismatales



# Araceae

- 117 genera, ~ 4,095 ssp. (est. ~ 5,422 and counting)
- **Symplesiomorphic monocots**
  - Reticulate venation
  - Sympodial growth habit
  - 2-3 merous flowers densely spiraled around a central stalk (spadix)
  - Conspicuous inflorescence bract (spathe)
  - Berries







# *Anthurium* Schott

- Largest genus in Araceae
- 905 published species
- ~1,300 described species
- Central and South America
- Highly endemic
- At the Sectional level



*A. bakeri* Hook.f.



*A. peltigerum* Sodiro



*A. polyschistum* R.E.Schult. & Idrobo



*A. bogotense* Schott

# Carchí Province Ecuador



# Páramo del Ángel



*Espeletia* sp.

# 2012 Colombia-Ecuador Expedition Crew

Tom Croat

Claudia  
Henríquez

Elisa  
Levy

David  
Scherberich

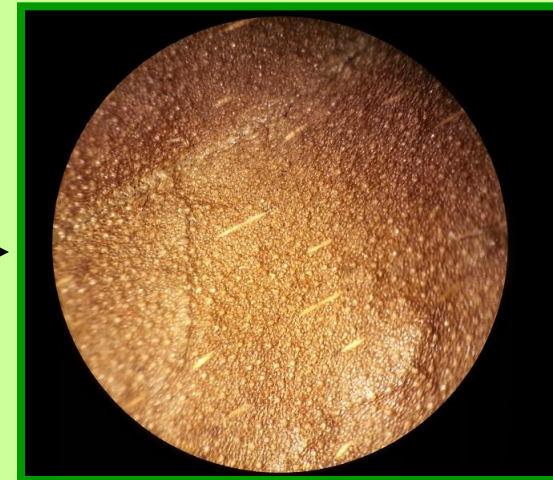
Genèveve Ferry



# How do you identify a new species?

- Group specimens based on section, gestalt, and conservative characters
- Confirm tentative groupings with expert
- Character analysis in Lucid *Anthurium* key
- Compare specimen with most similar species
- Distinguish differences between specimens
- Morphometric analysis of novel specimen(s)
- Begin describing!

# Grouping, I.D.ing, Comparing & Analyzing



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																		
2	Coll. #	Blade Lnth	Blade Wdth	L-W Ratio	Blid./Pet. Ratio	Pet. Lnth	Leaf Lgth	Sinus Depth	Sinus Width	Ant. Lobe	Post. Lobe Lnth	Post. Lobe Wdth	Ped. Lnth	Spathe Lnth	Infl. Lgth	Spathe Wdth	Ped./Spth. Ratio	Spdi Lnth
3																		
4	A. hartleji	38.5	31	1.241935	0.506578947	76	104	10	3	28	14.5	14.5	30.5	9.5	40	9.5	3.210526316	5.2
5	1	35.5	28.5	1.245614	0.420118343	84.5	110	8.5	1.5	25.5	12.5	12.5	30	9.5	39.5	6	3.157894737	5.5
6	2	23.5	22	1.068182	0.412280702	57	74	6	3.5	17	10.5	10						
7	3	31.5	27	1.166667	0.355932203	88.5	113.5	7	4	25	11	12						
8	4	32.5	25.5	1.27451	0.481481481	67.5	92	7	1.1	24.5	12	12						
9	5	36.5	28	1.303571	0.459119497	79.5	105.5			26	13.5	14.25	25.5	9	34.5	6	2.833333333	
10	7	34	28	1.214286	0.459459459	74	98	9		24	13	14						
11	8	36	30.5	1.180328	0.371134021	97	123	8.5	0.5	26	14	14.5						
12	9	33	26.5	1.245283	0.559322034	59	83	8.5	1	24	12.5	12.5						
13	Para 1	47.5	40	1.1875	0.688405797	69	102			33	18.5	19	38	8.5	46.5	7	4.470588235	6.5
14	Para 2	53.5	36	1.486111	0.672955975	79.5	116.5			37	19.5	18	39					
15	Para 3	15	11.75	1.276596	0.666666667	22.5	34	3	0.4	11.5	5	5.5						
16						36.5												
17						50												
18																		
19																		
20																		
21																		
22	Maximum	53.5	40	1.486111	0.688405797	97	123	10	4	37	19.5	19	39	9.5	46.5	9.5	4.470588235	6.5
23	Minimum	15	11.75	1.068182	0.355932203	22.5	34	3	0.4	11.5	5	5.5	30	8.5	34.5	6	2.833333333	5.2
24	Average	34.75	27.895833	1.240882	0.504454594	67.17857143	96.2917	7.5	1.875	25.125	13.04166667	13.22916667	34.375	9.125	40.125	7.125	3.418085655	5.733333



NY 580534  
Plant of Ecuador  
Herbarium of the University of California, Berkeley  
1958  
C. S. Gentry  
Ecuador, Napo Province, ...  
4-11-60



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C. S. Gentry  
Ecuador, Napo Province, ...  
4-11-60

# A Closer Look at the Lucid *Anthurium* Key....

The screenshot displays a digital key interface for *Anthurium*. It is divided into four main panels:

- Top Left Panel: Features Available: 72**
  - Primary lateral veins
  - Basal veins
    - Presence of basal veins
      - absent to not clearly visible
      - clearly visible
    - 6 - 7 Basal veins number
    - 1 - 2 Basal veins free to base
  - Collective vein
    - origin
      - absent
      - arising from one of the lowermost basal veins
      - arising from the primary lateral veins
      - arising from one of the uppermost basal veins
      - forming the only basal vein
    - number of collective veins porphyrochitonium
    - Distance from margin
  - Inflorescences
    - Length in proportion to leaves
    - Peduncle
    - Spathe
    - Spadix

- Top Right Panel: Entities Remaining: 4**
- benktsparrei Croat
- incurvum Engl.
- nitidum Benth.
- velutinum Engl.
- Bottom Left Panel: Features Chosen: 10**
- Ecology
  - Geographic distribution
    - Colombia
    - Ecuador
  - Genus Section
    - Cardiolonchium
- Leaves
  - Blades
    - 22 cm Blade overall length (medial segment length when -sect)
    - 10.5 - 11.5 cm Blade overall maximum width (medial segment width when -sect)
  - Basal veins
    - Presence of basal veins
      - clearly visible
    - 6 - 7 Basal veins number
    - 1 - 2 Basal veins free to base
  - Collective vein
    - origin
      - arising from one of the lowermost basal veins
- Bottom Right Panel: Entities Discarded: 1228**
- abelardoi Croat
- acaimense Croat
- acanthospadix Croat & Oberle
- acaule (Jacq.) Schott
- acebeyae Croat
- achupallense Croat
- aciculare Croat
- acutangulum Engl.
- acutibacca Croat & M.M.Mora
- acutifolium Engl.
- acutissimum Engl.
- acutum N.E.Br.
- affine Schott
- aguaricoense Croat
- aguilariae Croat
- alatipedunculatum Croat & R.Baker
- alatum Engl.
- albanese Croat

At the bottom of the interface, there are navigation buttons for "Trees", "Lists", and "Images".



# Describing a New Species

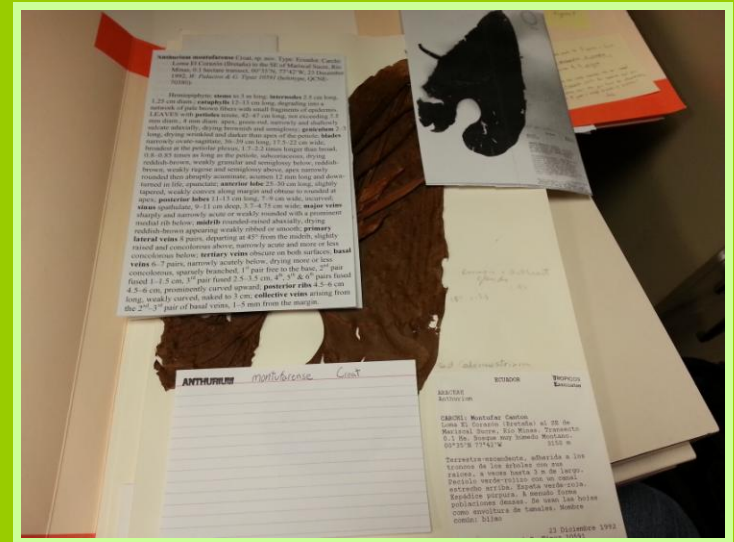
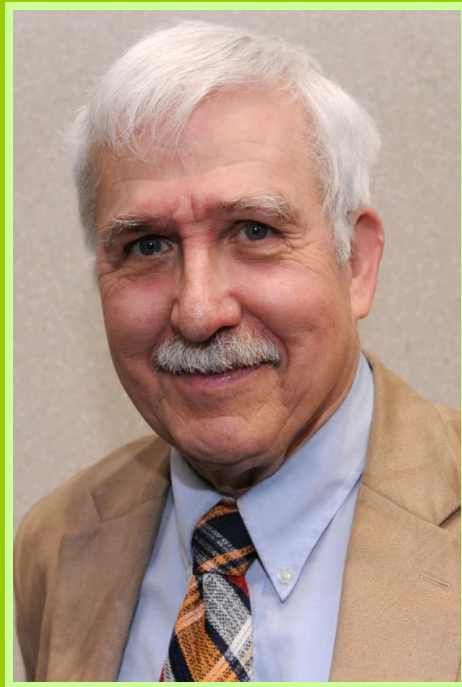
- Type information
- Description
- Life zone(s)
- Discussion
- Ex siccatae

*Anthurium tufinoense* Croat, Ecuador, Carchi, Along road between El Chical and Tulcán, 34.2 km E of El Chical, 22.1 km E of Maldonado, 0.8 km E of El Laurel, 46.9 km W of Tufiño, 3000 m, 00°52'48"N, 78°02'24"W, 10 August 2004, *T. B. Croat & G. Ferry 93195* (holotype, MO-5885123-25; isotypes, AAU, B, CAS, COL, F, HUA, K, NY, S, SEL, US, USM).

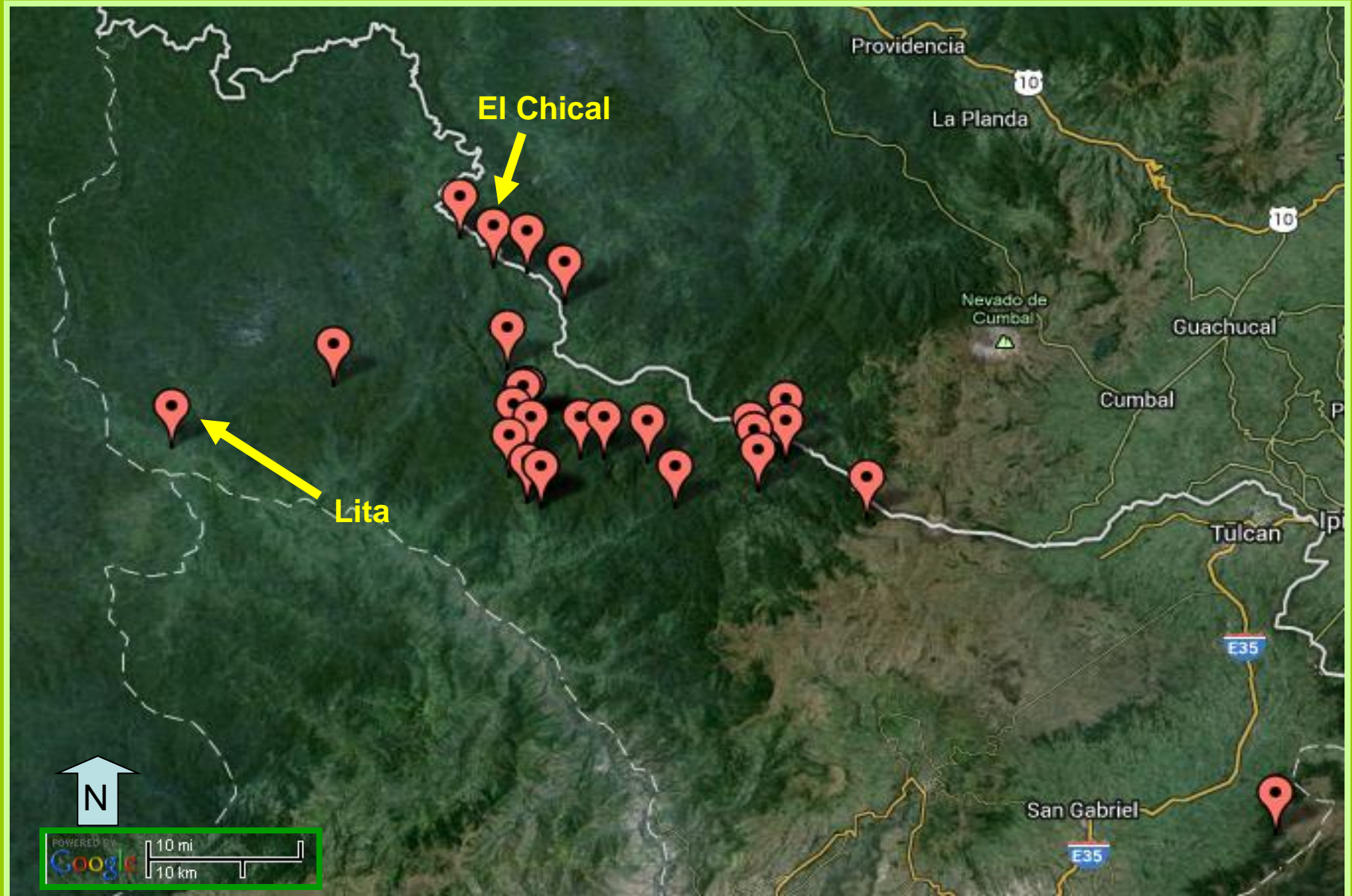
*Anthurium tufinoense* is known only Ecuador in Carchi Province at 3000 m in a *Lower montane wet forest* life zone.

The species is named for the type locality near Tufiño a village located between Maldonado and Tulcan in Carchi Province.

# Review, Processing & Filing



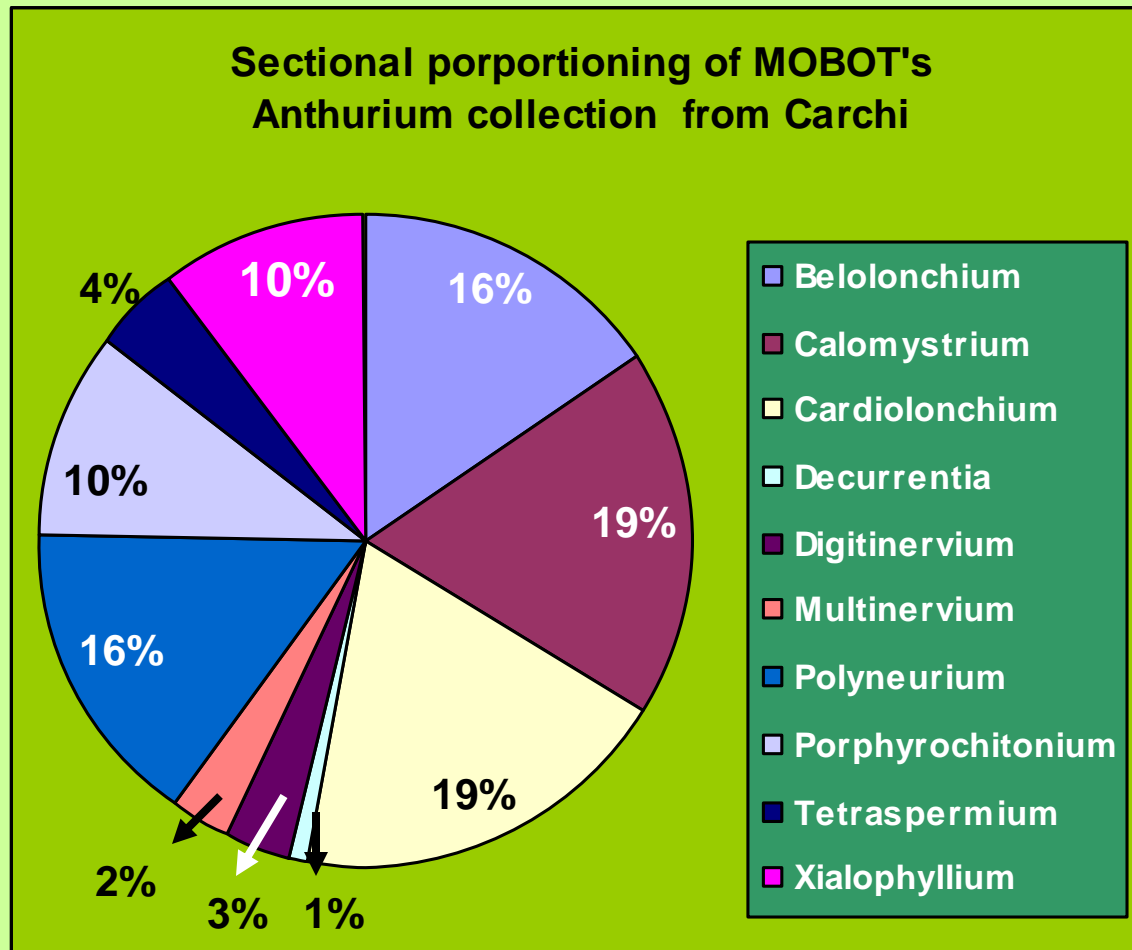
# Distribution of Described Species



# Breakdown by section

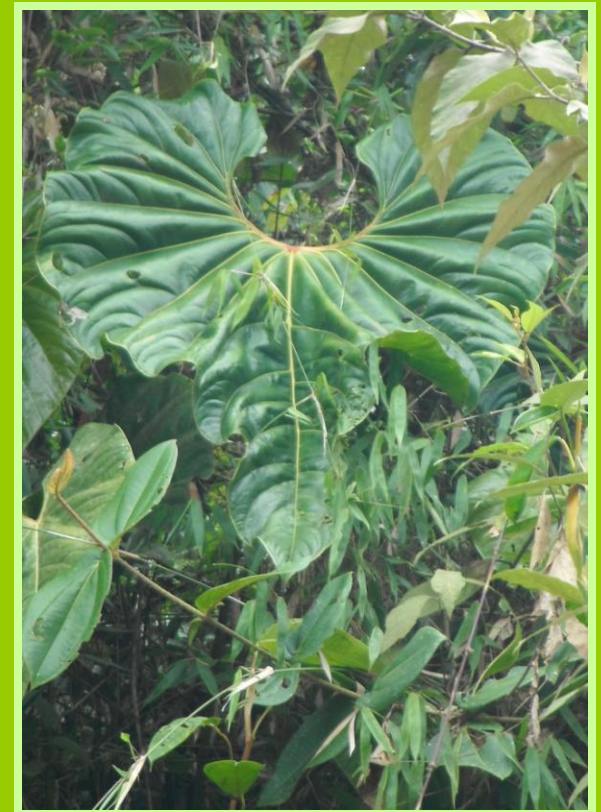
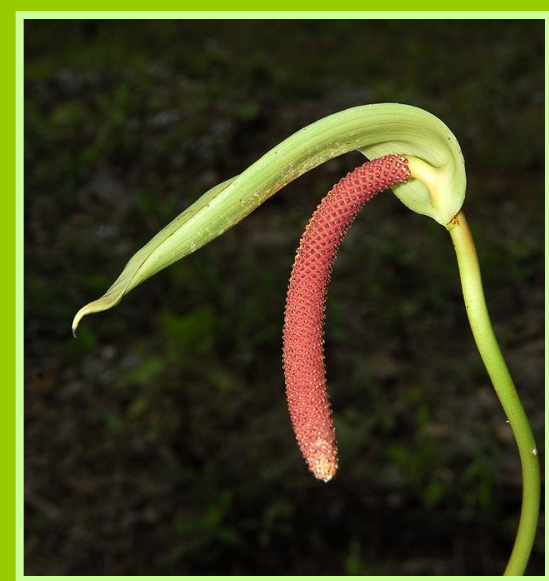
- 4 sections account for 70% of species
- 10 out of 18 sections represented

- *Decurrentia* is the most depauperate
- *Cardiolonchium* is the most species rich (by 1 taxa)



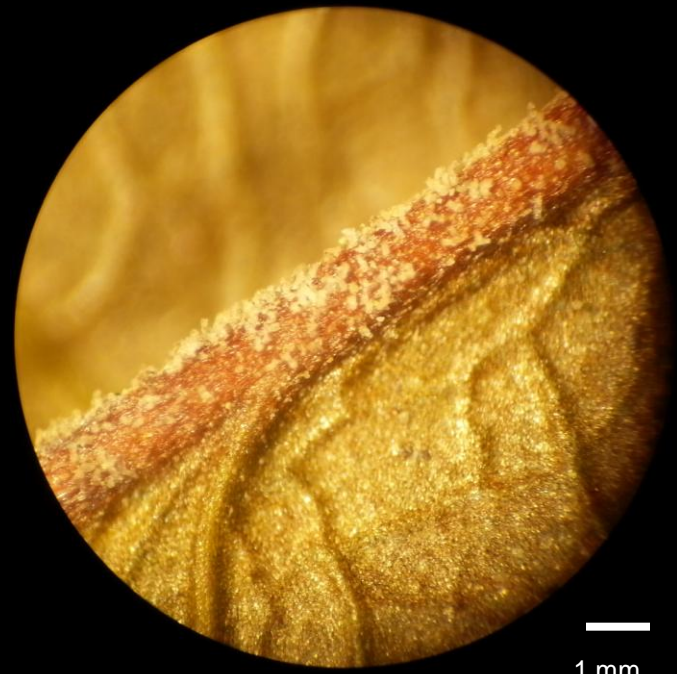
# *Belalolochium*

- Short internodes
- Cataphylls persisting as a network of fibers
- Spathe hooding with a pendent spadix
- Concave lateral margins
- Granular or wing-ribbed major veins



# *A. granulinervium* Croat sp. nov.

- Granular-puberulent major veins
- Sulcate and distinctly ribbed petiole
- Broadly concave anterior lobe



# Newly described *Belolonchium*s

- *A. aspericostum* Croat →
- *A. chilmabajense* Croat →
- *A. erubescataphyllum* Croat
- *A. flabellatum* Croat
- *A. hippocrepiformum* Croat
- *A. latesinuatum* Croat
- *A. montufareense* Croat
- *A. pleipleurum* Croat
- *A. rawlinsii* Croat
- *A. teretiusculum* Croat
- *A. tufiñoense* Croat



# *Calomystrium*

- Cataphylls persisting completely intact
- Blades often dark-punctate and short pale-lineate
- Petioles usually terete
- Spadix and spathe usually colorful
- odorous inflorescence



*Anthurium andreaeanum* Linden



# Newly described *Calomystrium*s

- *A. gualpimedense* Croat
- *A. hartleyi* Croat
- *A. longipedical* Croat →
- *A. rotunditriangulum* Croat



# Newly described *Cardiolonchium*s

- *A. atrinspergendum* Croat
- *A. granulatepalum* Croat
- *A. inopinatum* Croat →
- *A. tertiprominens* Croat



Newly described *Porphyrochitonium*  
*A. penasense* Croat



# Identified Species

- *A. cymbispathum* Sodiro (*Belol.*)
- *A. dolichostachyum* Sodiro (*Cardio.*)
- *A. giganteum* Engl. (*Belol.*)
- *A. pluviaticum* R.E. Shultes (*Cardio*)
- *A. teisheri* Croat (*Belol.*) →
- *A. trishafrankiae* Croat  
(*Cardio.*)
- *A. versicolor* Sodiro  
(*Cardio.*)

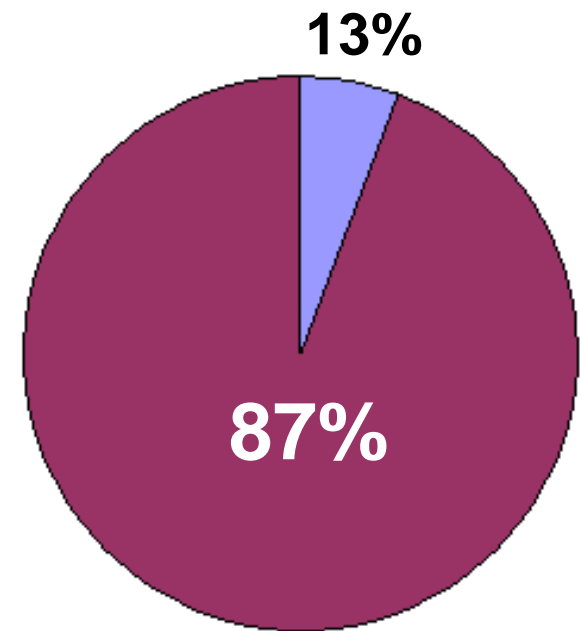


# Estimates of Progress

<b>Section</b>	<b># of described species</b>	<b># of identified species</b>	<b>% of section completed</b>
<i>Belolonchium</i>	11	3	43.75
<i>Calomystrium</i>	4	1	13.16
<i>Cardiolonchium</i>	3	3	15.38
<i>Decurentia</i>	0	0	0
<i>Digitinervium</i>	0	0	0
<i>Multinervium</i>	0	0	0
<i>Polyneurium</i>	0	0	0
<i>Porphyrochitonium</i>	1	1	9.52
<i>Tetraspermium</i>	0	1	11.11
<i>Xialophyllum</i>	0	0	0

# Future Directions

- 2013 expedition
- Publish new taxa
- Araceae flora of Carchí



# Thank you!

- Dr. David Bogler
- Dr. Tom Croat
- Justin Zweck
- National Science Foundation
- Missouri Botanical Garden
- Steve Aylward
- Carla Kostelac
- The Croat Lab Volunteers
- Ron Liesner
- Peter Stevens
- Steve Wolff
- 2013 MBG REU Cohort



¿Questions?

