

Discovering *Anthuriums*: Floristics of
Section *Polyneurium* of Carchi Province



Project outline

- This study of the Araceae in Carchi Province will contribute to our understanding of ecology of Ecuador.
- It will also be a direct benefit to the completion of the Araceae treatment for the Flora of Ecuador.



Anthurium pulverulentum Sodiro in its natural habitat.

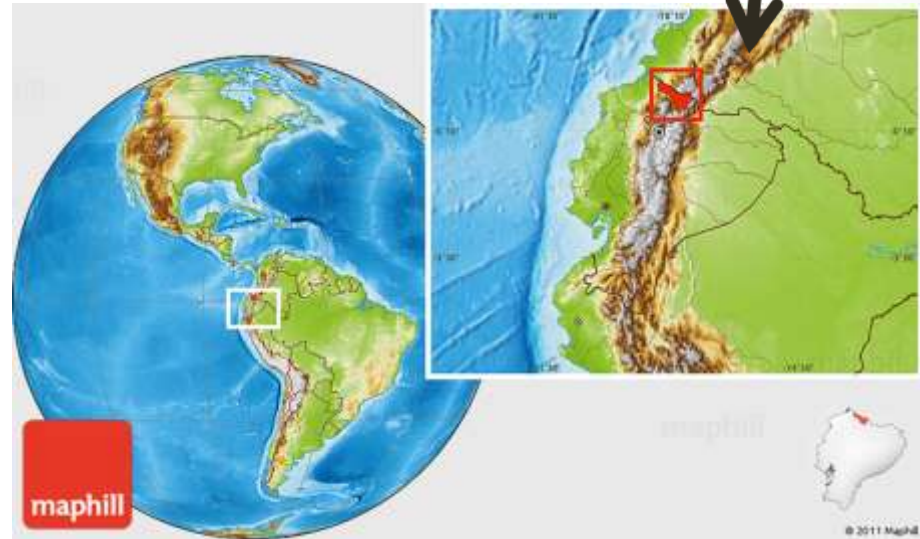
MBG Mentor

- Dr. Tom B. Croat
- Taxonomist, a Teacher, and a world traveler.
- Worked at the garden for 47 years.



The Flora of Ecuador

- Ecuador lies in the heart of the tropics on both sides of the equator.
- With warm temperature and wet climate makes it fit among the richest areas on earth for the study of Araceae.



Map of Ecuador

Carchi Province

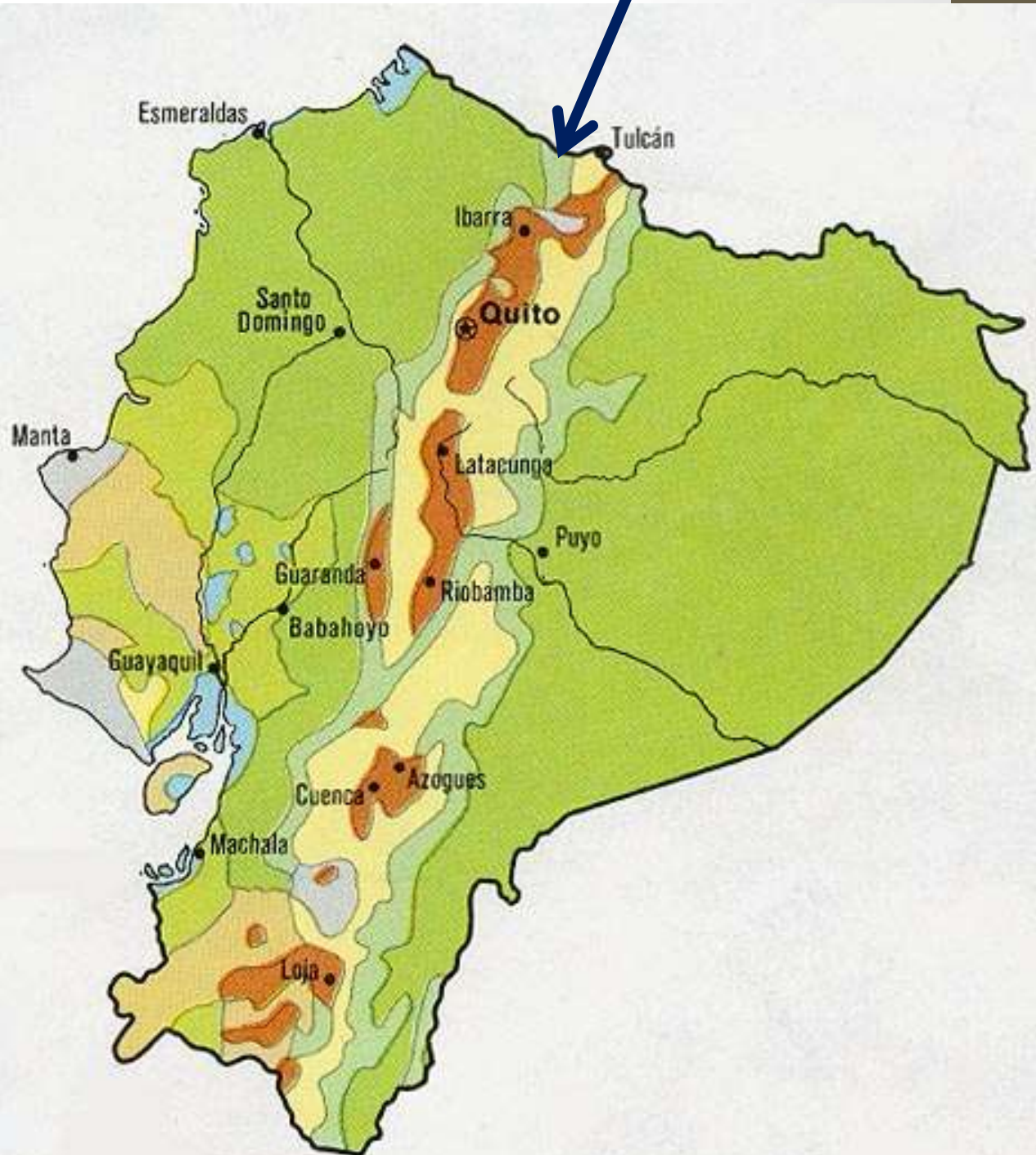
- Carchí is one of Ecuador's twenty-four provinces
- It is seated in the northwest corner of Ecuador, straddling the Andes and bordering Colombia.
- The Andes holds one of the most diverse Araceae habitats world wide.



Ecuador

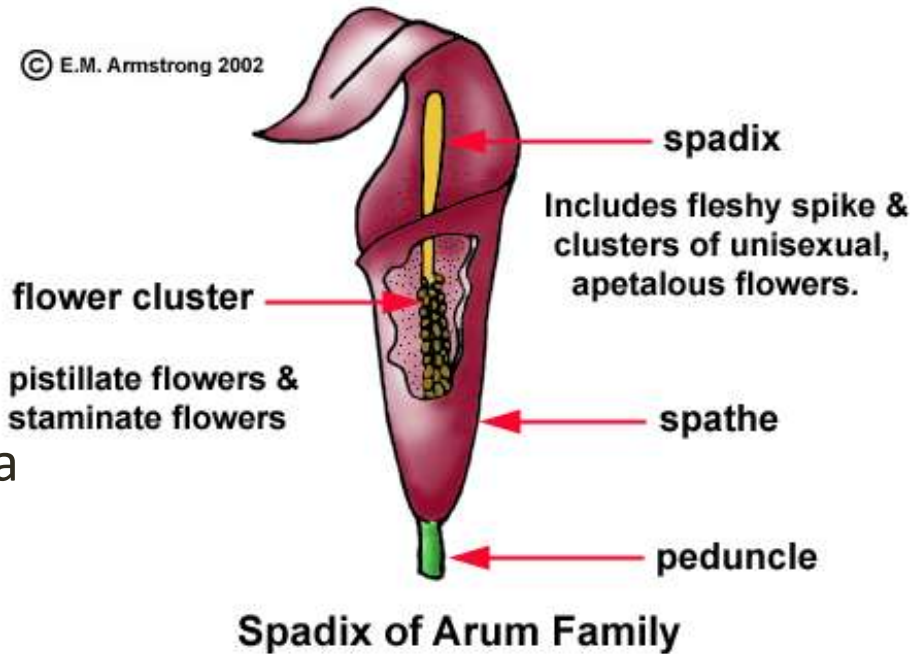
Vegetation

- Rain forest
- Deciduous forest
- Mountain forest
- Dry forest
- Inter-Andean agricultural land
- Highland scrub (páramo)
- Desert
- Swamp and marsh



Araceae

- The Araceae are a family with approximately 125 genera and about 3750 species.
- Araceae flowers are borne on a type of inflorescence called a spadix, sometimes partially enclosed in a spathe or leaf-like bract.
- Also known as the arum family, members are often colloquially known as aroids.



Anthurium Schott

- The genus *Anthurium* is the largest genus in the family.
- 950 species listed, 2000 expected
- There are 18 sections within the genus *Anthurium*.
- Native to Central and South America.



Anthurium andreanum Linden , popular in the cut flower industry. Originally from the Andes.

Anthurium Schott

- The first system of subgeneric classification was that of H. W. Schott published in 1860, in which he classified *Anthurium* into 28 sections.
- A more recent revision of the genus by Engler (1905) the species are divided into 18 sections
- Then later by Croat & Scheffer (1983)



Section *Polyneurium* Schott

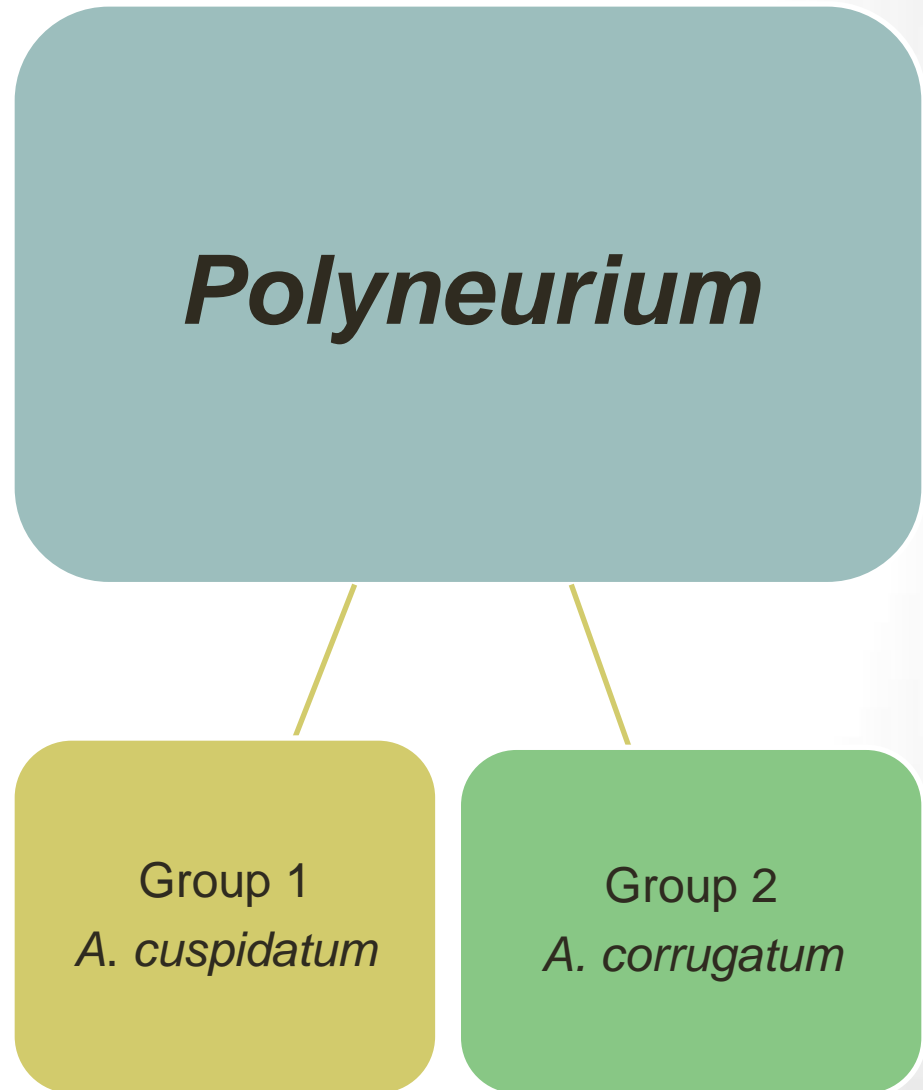
- The focus of our study concentrated on Section *Polyneurium*, which ranges from Nicaragua to the mountains of western Venezuela and Peru.
- The section *Polyneurium* has approximately 160 species.



A. urbanii Sodiro

Section *Polyneurium*

- It is suspected by Dr. Croat that the Section *Polyneurium* could represent more than one element and is formed of two distinct groups.



Section *Polyneurium* Group 1

- Shown here by its green spadix.
- Leaf blade longer than broad.
- Petioles typically shorter than the blades.



A. cuspidatum Mast.



- Many closely spaced primary lateral veins

Long posterior lobes

A. cuspidatum
Mast.

Section Polyneurium Group 2

- Closer spaced veins, often cordate blades, wider than long.
- Red spadices.



A. corrugatum Sodiro

Methods for describing

- Group specimens based on like features.
- Morphometric analysis of specimen(s).
- Character analysis in Lucid *Anthurium* key.
- Compare specimen (s) with most similar species.

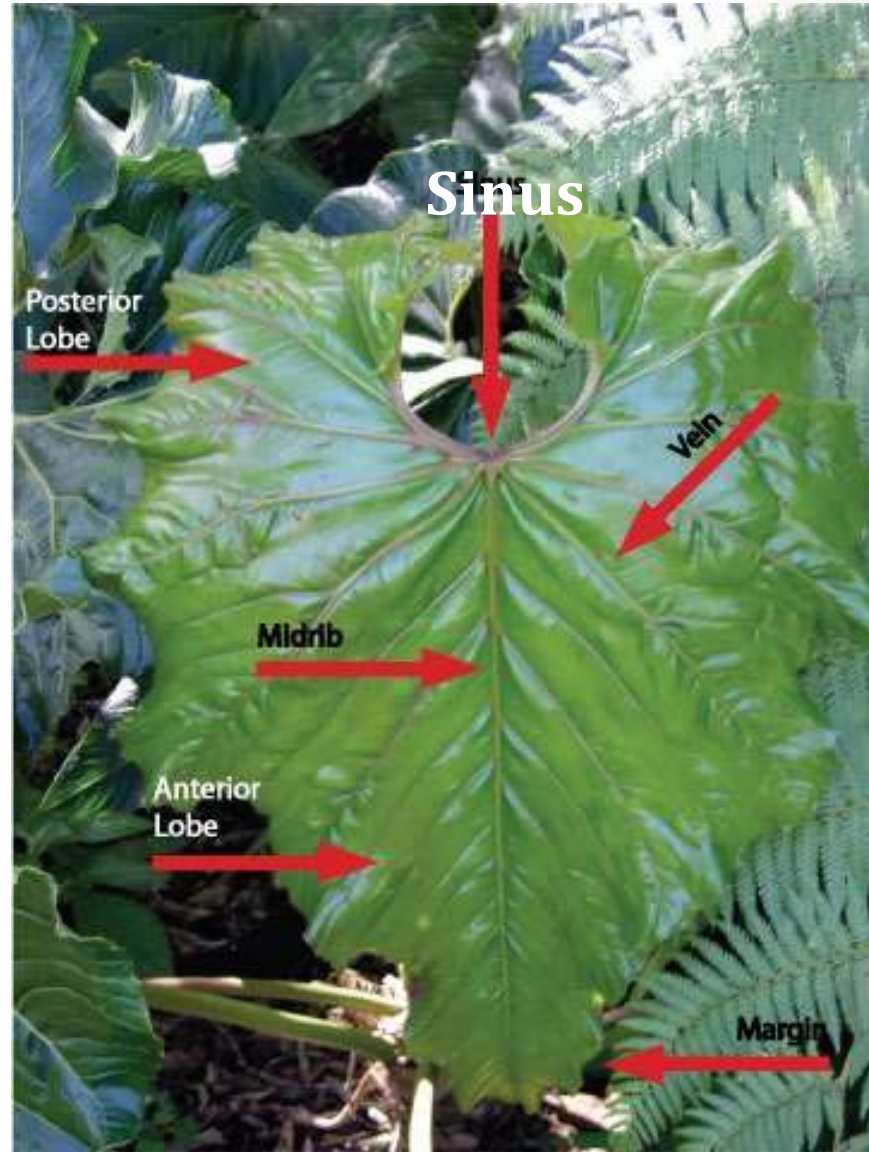


Carchi Specimens at the herbarium

Characters

Measurement of

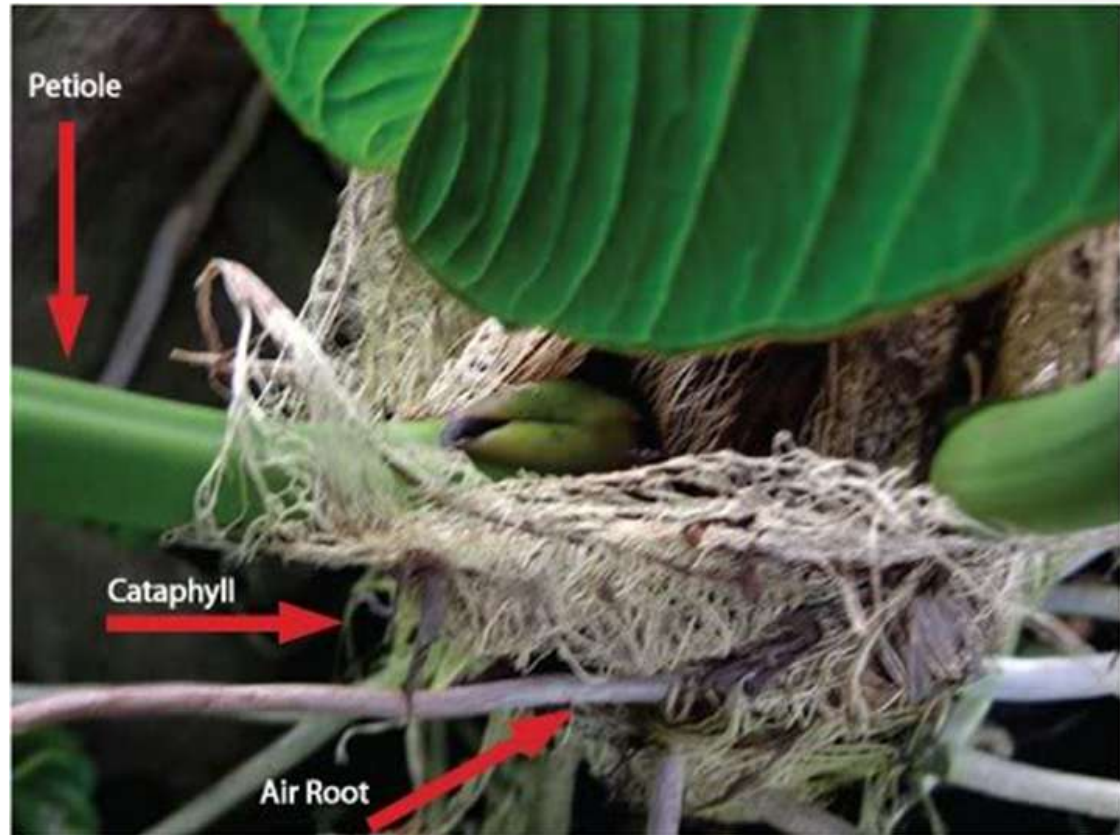
- Sinus- depth, width, shape.
- Midrib- whether it was convex or concave, smooth or rough.
- Posterior & Anterior Lobe- length, width.
- # of Primary lateral veins, angle of departure .



Anthurium morphology diagram

Characters

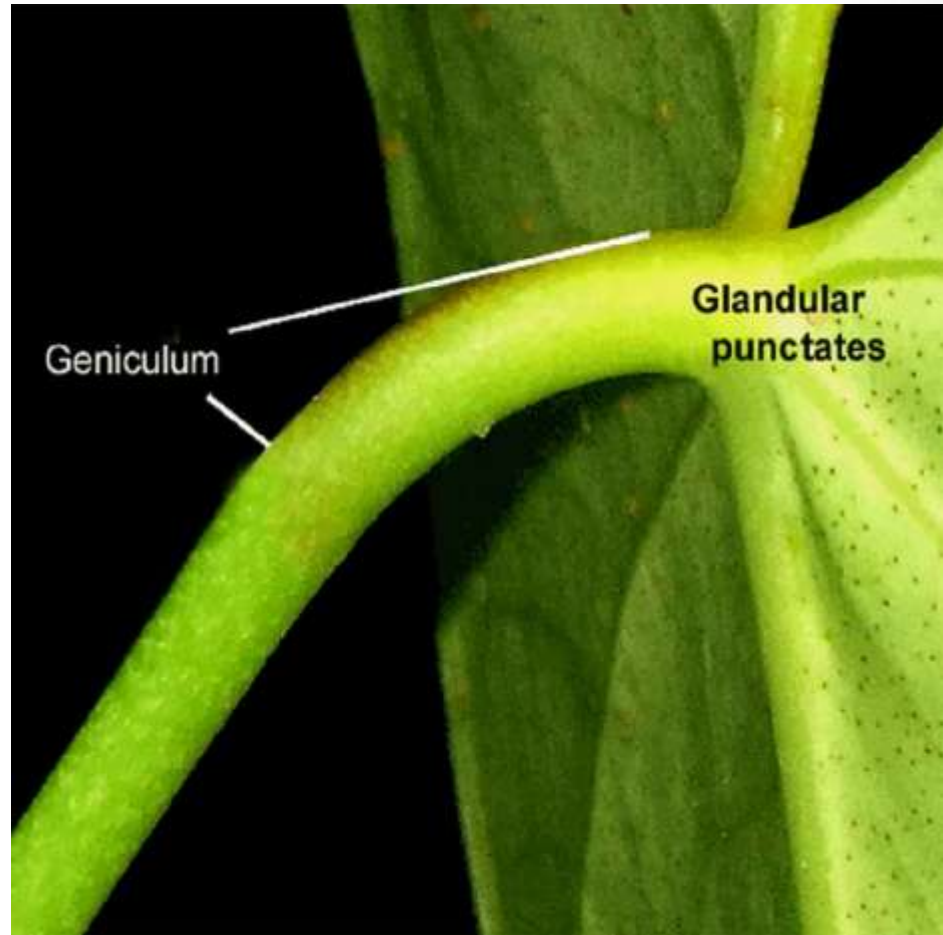
- When a new leaf blade forms it initially is enclosed by a sheath like structure called a cataphyll.
- Whether or not this feature persisted or was deciduous was often a notable feature.



Cataphyll

Characters

- Minute punctuation dot the underside of the leaf are only present on in select species.



Anthurium longipeltatum

Characters (surfaces)

Surfaces were often an important feature, here showing a bullate texture.



A. toisanense --- Lower surface



A. toisanense --- Upper surface

Characters (Inflorescence)

- Count number of florets per spiral.
- Measure tepals width.
- These floral character are crucial for determining speciation.

Tepals



Close up of florets

Characters

- The posterior rib is often used in species delineation.
- This is an example of coalesced basal veins.



Posterior rib of *A. debile-emarginatum*

Characters

- Another example of a vastly different posterior rib where the basal veins are free to the base and have almost no coalescence.



A. maldonadoense Croat

Characters

- Another example of Basal veins not coalesced



A. (#5) Posterior rib/basal veins under 3x magnification.

Characters

- This is the surface showing a smoother texture with some speckling



A. gualpii under 3x magnification under a dissecting scope.

A. elisalevyae

- One the largest and the first species I described.
- Named after Elisa Levy, a local student who went with Dr. Croat on the 2012 Carchi Expedition.



A. mikemadisonii (#5)

- One of the unnamed species.
- Species that were “unnamed” were given a tentative title to help separate them from the other specimens.
- This is one of the smaller plants. Size varies as one can tell.



List of Species described

Anthurium aciculare

Anthurium alluriquinense

Anthurium atrinsperum

Anthurium bernalii

Anthurium boylei

Anthurium carinatum

Anthurium chuchubiense

Anthurium dalmauii

Anthurium debili-
marginatum

Anthurium elisalevyae

Anth. graciliacuminatum

Anthurium guelpiae

Anth. hebetatilaminum

Anthurium lineolatum

Anthurium longicaudatum

Anthurium melanochlorum

Anthurium misturatum

Anthurium multinervium

Anthurium oreophilum

Anthurium panduriforme

Anthurium pseudonigrescens

Anthurium pulverulentum

Anthurium rivulare

Anthurium testaceum

Anthurium tipazii

Anthurium toisanense

Anthurium umbraculum

Anthurium urbanii

A. #3,4,6

Lucid Anthurium Key

- The Lucid Key consists of an electronic identification and diagnostic key. It allows Lucid keys to be published across the Internet or a shared network.
- The Lucid “Anthurium Key” is managed by Steve Aylward and Susan McQueen and is shared among the other interns and Dr. Croat’s volunteers and is constantly being updated.



Lucid multichotomous key

The screenshot displays a software interface for a multichotomous key. It is divided into four main panels:

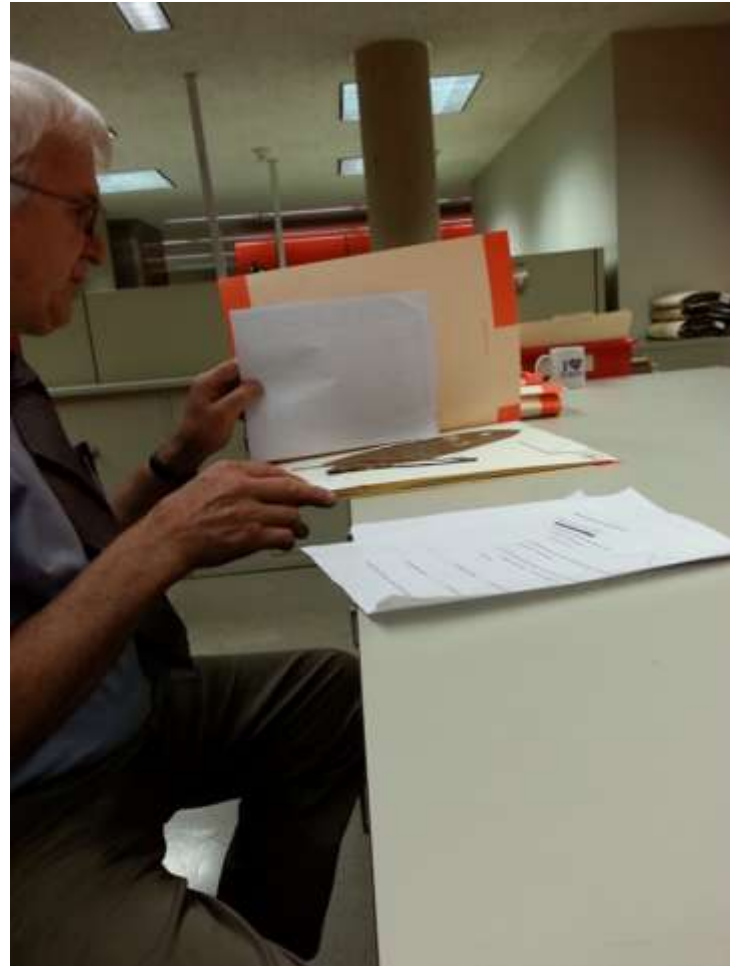
- Top Left Panel: Features Available: 72**
 - Primary lateral veins
 - Basal veins
 - Presence of basal veins
 - absent to not clearly visible
 - clearly visible
 - 6 - 7 Basal veins number
 - 1 - 2 Basal veins free to base
 - Collective vein
 - origin
 - absent
 - arising from one of the lowermost basal 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 & Oberlie
- 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
- agulariae Croat
- alatipedunculatum Croat & R.Baker
- alatum Engl.
- albanese Croat

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

Making a dichotomous key

- After finishing descriptions we began working on creating a key.
- Dr. Croat and I would select what we believed to be key characters of each species, then chose distinguishing feature based on those characters.



Dr. Croat in his natural habitat.

KEY TO SPECIES OF *POLYNEURIUM*

1a. Blades with distinct posterior lobes

2a. Spadix violet-purple at anthesis

3a. sinus parabolic v-shaped

4a. spadix short, cylindroid mostly stipitate

5a. posterior lobes longer than wide---

A. dalmauii

5b. posterior lobes more wide than long---

6a. Blades narrow triangular ovate---

A. allurquiense

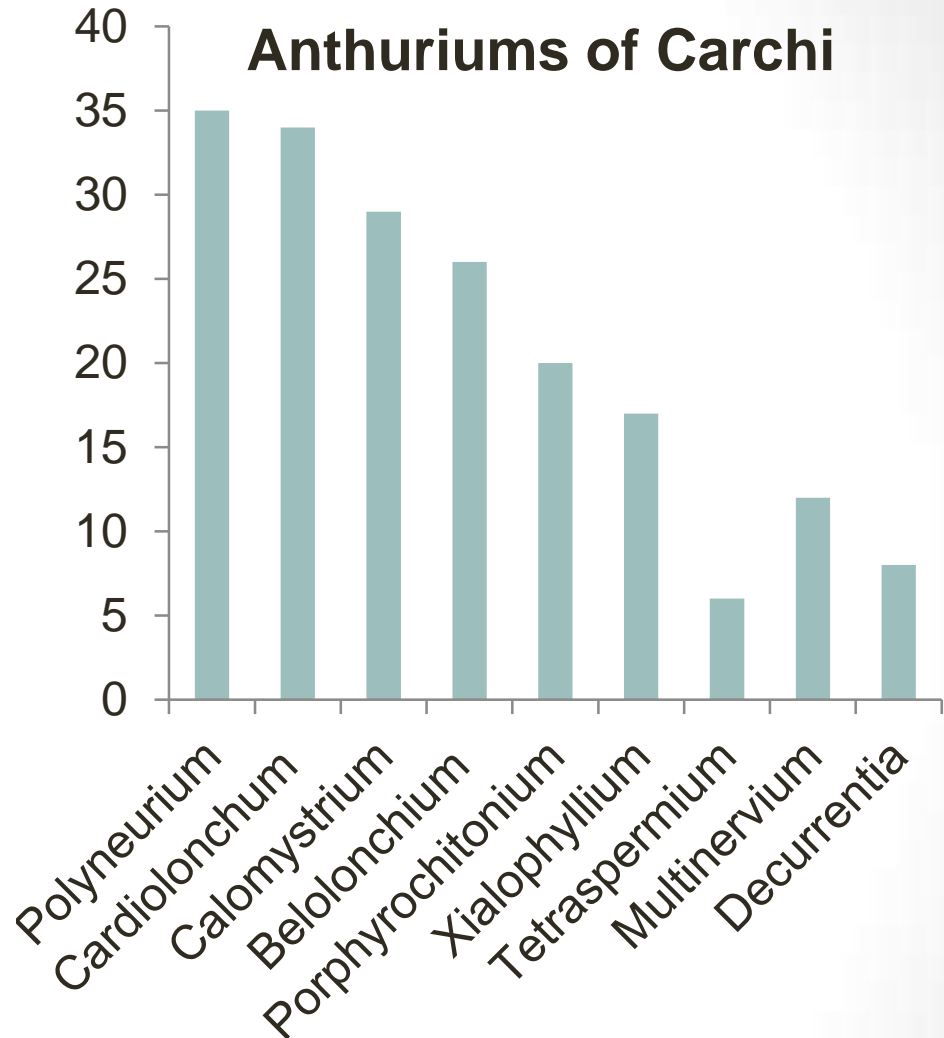
6b. blades cordate/ovate---

7a. cataphylls intact --

A. maldonense

Results

- We are saying that there is 35 species newly found in Carchi, 12 of which were previously undescribed with 4 of those 12 being sterile (lacking inflorescences) and therefore unable to determine true speciation.
- Polyneurium's being the largest section being represented in the Carchi region.



- Future Work

Exploration into Colombia and other areas of the montane wet forest of Ecuador could most likely deliver more new species of *Anthuriums*.

Thanks every one!

- Dr. Thomas B. Croat
- Carla Kostelac
- David Bogler
- Mary McNamara
- My fellow REU'ers
- Steve Aylward
- Emily the aroid caretaker
- Mary Merello
- All the MOBOT staff
- NSF



Questions?

