

A Preliminary Analysis of *Anthurium* (Araceae) from Carchi Province, Ecuador

Thomas B. Croat
P.A. Schulze Curator of Botany
Missouri Botanical Garden
P.O. Box 299, St. Louis, MO 63166
Thomas.croat@mobot.org

Geneviève Ferry
Conservatoire et Jardins
Botaniques de Nancy
France

ABSTRACT

A preliminary survey of *Anthurium* (Araceae) Carchi Province, Ecuador is provided with a total of 146 named species, including seven taxa and 72 as yet unnamed species. More than 60% of all species are deemed to be new to science. The region is particularly rich in section *Cardiolonchium* (with 34 species and 2 taxa) and section *Calomystrium* with 29 species. Both are most abundant at middle to lower elevations. Section *Belolonchium* with 26 species is especially abundant at higher elevations. Even larger and found at middle to lower elevations is section *Polynurium* (38 species), followed by section *Porphyrochitonium* (20 species) and section *Xialophyllum* (17 species), section *Tetraspermium* (6 species totaling 8 taxa); section *Digitinervium* (with 7 species), section *Multinervium* (with 12 species) and section *Decurrentia* (8 species).

KEY WORDS

Anthurium, sectional distribution, Araceae, Carchi, Ecuador.

INTRODUCTION

The Araceae is one of the larger families of flowering plants in the neotropics but remains the most poorly known taxonomically. Ecuador is one of the richest areas in the world for Araceae and the far northeastern corner of the country which abuts Colombia is replete with undescribed species. The region has been the subject of recent studies and this paper is the first report on the findings.

A total of four expeditions were made to the Department of Carchi, two of them funded by the National Geographic Society. The region has proven to be an area

of high endemism. The far western areas of Ecuador are now much more well-known owing to these National Geographic sponsored studies in Carchi Province but some of the more remote areas are still poorly known. Many of the collections included in this report clearly appear to be new to science but are either sterile or incomplete and eventually must be recollected to be described.

The flora of Ecuador is one of the richest in the Neotropics. The Flora of Ecuador checklist (Croat, 1999) reported 404 published species of Araceae (many of which are still poorly known) but it is estimated that the total aroid flora contains about 1500 species and many areas contain a high percentage of endemic species with 60% or more of the species considered to be undescribed.

The Araceae is the most poorly known plant family in the Neotropics and is reknown for high species diversity and a large percentage of endemic species (Croat, 1971, 1991, 1992a, 1992b, 1994, 1997, 1998). Ecuador, which lies in the heart of the tropics on both sides of the equator is among the richest areas on earth for the study of Araceae (Croat, 1995). This study of the Araceae in Carchi Province will not only contribute to our understanding of the biogeography of Ecuador but will be a direct benefit to the completion of the Araceae treatment for the Flora of Ecuador.

History of Studies of Araceae in Carchi Province

The earliest collections from the region were made on an expedition by Dr. Michael Madison, Libby Besse and Tim Plowman, operating out of Selby Gardens in Sarasota, Florida. At that time a road went from Tulcán on the Colombian border through the Paramo del Angel to the village of Maldonado. Madison and his group walked on to the village of El Chical, located at 1200 m then on down in the lowlands, passing through Piedras Blancas, then San Marcos. Another expedition was carried out by Scott Hoover who also collected in the region, especially at Cerro Golandrias. By the time of Hoover's expedition the road had been completed to El Chical.

The senior author did not visit the area until 2004 when, after spending many years of working extensively in the Lita-San Lorenzo region, he made a trip with Geneviève Ferry to El Chical to compare the flora of that area with that of Lita-San Lorenzo. We expected to find few species in this region that were different from those found in the Lita-San Lorenzo area. It was surprising to found that we did not recognize many species in the region. Many of the species that were seen in the area have proven to be new. It was on this trip that we met Elisa Levy, a young local woman who had a great interest in plants. Elisa helped us collect plants and helped press plants. She went on to pursue a biology degree from the Universidad Catolica and has served as our Ecuadorian

collaborator on the National Geographic Expeditions to the region.

A return trip to El Chical in February 2005 was made with Geneviève Ferry and Chris Davidson. On these first two trips the main road from Tulcán extended past El Chical to Peñas Blancas which consisted of a single farm house but one that served as a stop-off point on the trek to the lower elevations and the many indigenous communities such as San Marco. It was the original home of Elisa Levy's mother who incidentally met and later married Peace Corps Volunteer, James Levy who was working with the indigenous communities of the Awa and frequently overnights at the house while making many treks back and forth to Maldonado.

In those days another road led from near the Río El Chical where it departed the main El Chical to Peñas Blancas Road heading south in the direction of Gualchan. Road construction had begun but was abandoned owing to many landslides but it gave us access to wonderful forests.

In 2012 the National Geographic Society provided support for an extensive trip to the region and we again used El Chical as a base of operations, staying at the home of Elisa Levy's family. On this trip the crew included in addition to Tom Croat & Geneviève Ferry, David Scherberich from the Lyon Botanical Garden in Lyon, France, Claudia Henríquez from Washington University in St. Louis, Missouri and Elisa

Levy. The region had recently been augmented by an additional road that extends from El Chical to La Virginia (El Limonal). This area had just been open to exploration and has proven to have many new species. As is true of all newly opened roads there is usually limited time to explore the region to collect the new species before the forest is decimated and turned into agricultural units. Already much of the area has been converted into pasture.

A final trip was made to the region in August 2013, this time with the support of two Colombian graduate students, Alejandro Zuluaga from the University of Wisconsin in Madison, Wisconsin and Natalia Castaño, from the Universidad Nacional in Bogotá, both specialists on Araceae.

Using El Chical as our base of operations allowed easy access to all parts of the region. El Chical is centrally located and provides a good drive to most localities approachable by road. This project has sampled Araceae in all accessible areas. While there are few roads in the western Carchi region, it benefits by being an area relatively narrow with a long road running throughout much of the region. The area between El Chical and Gualchan proved particularly rich in undescribed species. Collections were transported to Quito and dried at the Herbario Nacional in Quito (QCNE). Collections were field pressed and preserved in alcohol since drying facilities in the area do not exist. Herbarium collections, including duplicates of all numbers and all

unicate collections were deposited at the National Herbarium of Ecuador (QCNE).

The number of species that have proven to be new in this very wet region is extremely high. For example the Lita-San Lorenzo region with over 250 species of Araceae has proven to have nearly one half of its species being new to science and the situation in the northern perimeter in the valley of the Río San Juan has proven to be equally species-rich. New access by road is also now available in the Río Baboso area near Lita which lies near the boundaries of both Imbabura and Esmeraldas Provinces.

Recent Field work in Carchi Province

The Maldonado-El Chical-Peñas Blancas region and the El Chical to La Virginia were extensively surveyed and the portions of southern Carchi Province near Lita were also studied owing to new access over the Río Mira near Lita. Collections were also made along a trail along the Río San Pedro south of El Chical and on the slopes of Cerro Obscuro. The region between Peñas Blancas and San Marcos on the south side of the Río San Juan has been much degraded but still has remnants of disturbed virgin forest. A provisional road now extends for a considerable distance into the lowlands but is frequently closed to vehicular traffic by landslides. Nevertheless our expedition was able to get down to as low as 600 m and find several very interesting areas of forest.

Results

A review of the collections of the Carchi Province has shown the region to be exceedingly rich for Araceae with a total of 395 species, 247 of which are now named. The remainder all appear to be distinct species but the collections are not yet determined. Some are sterile or are inadequate to serve as type specimens even though they mostly appear to be undescribed species. Seventy-four of the named species represent species which are new to science and most of the other collections without names probably will prove to be undescribed species. If this proves to be the case the total number of new species would be 146 species which would represent 44 percent of the total flora.

Anthurium, the subject of this present paper, is the largest genus in the flora with approximately 146 named species (including 7 taxa) and 72 unnamed species. The region is particularly rich in section *Cardiolonchium* (with 34 species and 2 taxa) and section *Calomystrium* with 29 species. Both are most abundant at middle to lower elevations. Section *Belolonchium* with 26 species is especially abundant at higher elevations. Even larger and found at middle to lower elevations is section *Polyneurium* (38 species), followed by section *Porphyrochitonium* (20 species) and section *Xialophyllum* (17 species), section *Tetraspermium* (6 species totaling 8 taxa); section *Digitinervium* (with 7 species), section *Multinervium* (with 12 species) and section *Decurrentia* (8 species).

More than 60% of all species are deemed to be new to science.

The Araceae of Carchi Province has proven to be exceedingly rich and in portions of the region, especially at elevations between Tobar Donoso near the border of Esmeraldas and the village of Maldonado but even at elevations up to more than 2500 meters, many new species have been discovered. It is clear that major investigations are required in adjacent areas of Nariño Department in Colombia where even fewer studies have been made.

ACKNOWLEDGMENTS

All of the expeditions to the Carchi region were funded by the National Geographic Society (NGS 9110–12) and the authors gratefully acknowledge this essential support. We also acknowledge the support of Dr. Christopher Davidson who paid for most of the expenses of the expedition to the region to Carchi in 2005.

REFERENCES

- Croat, T. B. 1971. Summit Garden, Panama Canal Zone: its role in botanical research. *Taxon* 20: 769–772.
- Croat, T. B. 1991. A revision of *Anthurium* section *Pachyneurium* (Araceae). *Ann. Missouri Bot. Gard.* 78: 539–855.
- Croat, T. B. 1992a. Species diversity of Araceae in Colombia: a preliminary survey. *Ann. Missouri Bot. Gard.* 79: 17–28.
- Croat, T. B. 1992b. (1994) Taxonomic status of neotropical Araceae. *Aroideana* 17: 33–60.
- Croat, T. B. 1994(1995). Taxonomic status of neotropical Araceae. *Aroideana* 17: 33–60.
- Croat, T. B. 1995. Floristic comparisons of six Ecuadorian florulas. Pp. 489–499. In: S. P. Churchill, H. Balslev, E. Forero, & J. Luteyn (eds.), *Biodiversity and Conservation of Neotropical Montane Forests*. New York Botanical Garden.
- Croat, T. B. 1997. Revision for *Philodendron* of Mexico and Central America. *Ann. Bot. Missouri Bot. Gard.* 84(3): 311–704.

Croat, T. B. 1998. Tropical Aroids: Taxonomy, Diversity and Ecology, pp. 235–286. In: P. Mathew & M. Sivadasan, Eds. *Diversity and Taxonomy of Flowering Plants*. Mentor Books, Calicut.

Croat, T. B. 1999. Araceae. In: P. Jørgensen & S. Leon (Eds.), Catalogue of the vascular plants of Ecuador. *Monogr. Syst. Bot. Missouri Bot. Gard.* 75: 227–246.