

# The Story of *Shuaria ecuadorica* – the Discovery of a New Genus in the Gesneriaceae and the Challenge of its Conservation

---

John L. Clark <jlc@ua.edu>  
University of Alabama, Tuscaloosa, Alabama, USA  
David A. Neill  
Fundación Jatun Sacha, Quito, Ecuador

Ecuador is so rich in plant species that are not yet known to botanists that it is not at all an unusual occurrence to find new species on our botanical expeditions in that country. In fact, during our fieldwork we find a new species nearly every other day. On average, about 150 plant species are discovered in Ecuador and published in the scientific literature each year, and this rate of discovery and publishing has been fairly steady for the past three decades (but sometimes a number of years may pass from the time a species is first "discovered" in the field until the scientific name is formally published).

Discovering a new genus of plants (something that is very different from any other known species) however, is not so common: an occurrence of once every decade or so. With our Ecuadorian colleagues we have discovered a new genus that is a tree from the Cordillera del Cóndor and Amazonian regions of southeastern Ecuador.

The first "live encounter" with this tree was by David Neill in March 2001 during an exploratory research expedition to the Cordillera del Cóndor, a mountain range that forms part of the international border between Ecuador and Peru. Biologists had always wanted to carry out studies in that region before then, but historically the area was off-limits to civilians due to a border dispute. Ecuador and Peru disagreed on the precise location of the international border, and both countries' armies guarded the "de facto" border, a situation that resulted in the three-week "Cenepa War" in 1995 and many deaths of soldiers from both sides. After several years of negotiations, a treaty that resolved the border issue was finally signed and ratified by both countries. After that the area became demilitarized, which opened opportunities for exploration, research, and development.

The Cordillera del Cóndor is very interesting botanically because it is made up in part of sandstone where the soil is very poor in nutrients and highly acidic. Since most plants cannot grow in those conditions, the species that do grow there are very unusual and many species on the sandstone mountains are found nowhere else.

During the March 2001 exploratory research expedition, a large quantity of plants were discovered on top of a sandstone mountain near Tinkimints, an indigenous Shuar village accessible only by a chartered plane (that landed on the village's grass airstrip) or by a hike of several days from the nearest road. Located near the campsite was a small tree, about 10 feet tall, with sprays of small white flowers. At first it looked like something in the coffee family, Rubiaceae, a group that includes many species of small trees with white flowers.



Mature inflorescence of *Shuaria ecuadorica*

A week or so later, when the specimens had been dried in the National Herbarium of Ecuador, and months later, when it was possible to study them in the herbarium of Missouri Botanical Garden in St. Louis, it was realized that the tree with white flowers had been collected a few times before in eastern Ecuador. The specimens looked similar to *Peltanthera floribunda*, a small tree in the Buddlejaceae family that occurs sporadically in tropical forests from Costa Rica south to Bolivia. But again, on closer examination, the specimens did not fit into that genus or species either. The specimens were then stored in the "mystery plant" cabinets at the herbaria in Quito and St. Louis. For several more years, while we did not forget about this mystery plant, we did not make much progress in accurately determining where it belonged. Dried herbarium specimens were sent to specialists with expertise in the families Gesneriaceae (Smithsonian Museum of Natural History) and Buddlejaceae (Stetson University). There was reluctance to assign it to a family, but it was agreed that it did not belong to any known genus.

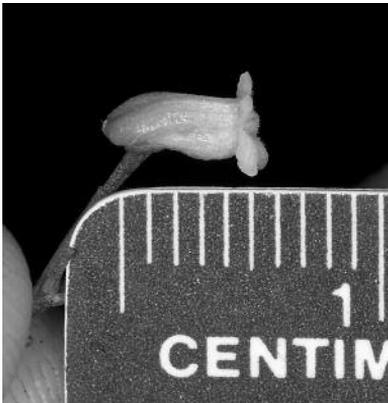
Then, more than five years later in October 2006, an abundant population of the tree was discovered in flower in a different part of the Cordillera del Cóndor region. This time we obtained a sufficient quantity of specimens to be able to examine the flower structure closely. We also obtained material of the leaves and dried them to specifications in order to extract the DNA from the leaves and enable a molecular-based phylogenetic analysis to determine its closest relative. We began to form the hypothesis that this tree was an "undescribed" genus, i.e., not formally designated with the scientific name of the genus, and that it belonged in the Gesneriaceae. This was a surprise because most Gesneriaceae from the Andes are herbs, and our mystery plant was a tree.

In September 2007 we returned to the same site as the year before and made a more thorough search. We found a population of about 30 trees of the new genus in the shade of larger trees on about a half-acre of forest on a steep slope. We made more collections, and this time it was the "type" col-

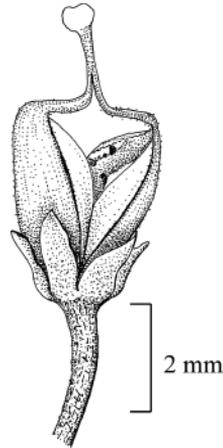
lection – the specimens that officially form the basis for the scientific name of the new genus and species. We collected about 15 duplicates, enough so that a number of herbaria in North and South America and Europe would receive one of the "type" specimens.

Then, in the process of getting ready to publish, we had to come up with an appropriate name for the new genus. All of the collections that we had seen are from the ancestral territory of the Shuar indigenous group in south-eastern Ecuador. Other plant genera have been named after Indian tribes that live in the regions where they grow, such as *Zapoteca* in Mexico, *Araucaria* in Chile and *Shoshonea* in the northern Rockies. We decided to name the genus *Shuaria* after the Shuar and, in this case, one of the co-authors is a Shuar botanist, Tuntiak Katan. He was one of four Shuar in a conservation biology training program carried out by the Missouri Botanical Garden in Ecuador. He is now finishing his university studies in applied ecology at the Universidad San Francisco de Quito in Ecuador's capital city. The full name of the new genus and species is *Shuaria ecuadorica*.

The most surprising result of the molecular phylogenetic study is that *Shuaria* was most closely related to *Anetanthus* and *Tylopsacas*. *Shuaria* is a tree and its closest relatives are small herbs. *Tylopsacas* is a small terrestrial herb with leaves in a basal rosette and contains a single species (*T. cuneatum*) geographically isolated to the highlands of the Guiana Shield (Venezuela and Guyana). *Anetanthus* is a small prostrate herb that is rarely collected, but widespread in the Andes and lowland Amazonia. Despite the extremely different habit and disjunct distribution of these three genera, there are a number of similarities that had not been described or understood in a phylogenetic context. For example, the three genera (*Shuaria*, *Tylopsacas*, and *Anetanthus*) are the only known members of the New World Gesneriaceae with dry capsular fruits with septical dehiscence (the fruits split open through the septa and between the locules). The more common fruit dehiscence in the Gesneriaceae is loculicidal (the fruits split open through the locules).



Mature flower



Mature capsule (lateral view) showing septical dehiscence and persistent style



Apex of leafy branching shoot showing phyllotaxy changing from alternate at base, then opposite, then alternate, then opposite near apex

Another novelty that is remarkable about *Shuaria* is the presence of both opposite and alternate leaves. The phyllotaxy (leaf arrangement) on some pressed specimens is entirely alternate and on others entirely opposite. Our fieldwork has confirmed that many branches of *Shuaria* have mostly opposite leaf arrangement interrupted by alternate leaves. The presence of both opposite and alternate leaves in *Shuaria* represents a unique pattern not known in other Gesneriaceae and rarely found in other families. Please see the figure of the leafy shoot showing the leaf arrangement changing from alternate at base then opposite then alternate then opposite near the apex.

One important point in this story, however, is that the only population of *Shuaria ecuadorica* that we know exactly where to find and we can readily return to see the plants again is a site where all of the vegetation may be removed in a few years to make way for a huge open-pit copper mine. In recent years, very substantial gold, silver, and copper deposits have been found in the Cordillera del Cóndor region, in the geological formations beneath the sandstone layers where the unusual and endemic plants are found. This particular mining concession has been developed by a Canadian mining company, Corriente Resources, based in Vancouver BC, and its Ecuadorian subsidiary, Ecuacorriente. Unlike Peru, Ecuador has not had much mining industry until now, but the petroleum reserves in the Amazon region of Ecuador (which have sustained the economy of the country since the early 1970s) are running out, and the government of Ecuador would like to develop new sources of revenue. The prospect of large-scale mining and the participation of multi-national companies, however, is a controversial issue in Ecuador and is opposed by some environmental organizations and indigenous groups. Part of our work (esp. David Neill) in Ecuador includes environmental impact studies that, by law, must be carried out prior to development projects such as mines, oil wells, and roads. In the case of *Shuaria ecuadorica*, if one population of this unique plant is destroyed by the devel-

opment of an open-pit copper mine, we need to find and survey other sites where the new genus occurs, and can be protected, as part of the environmental "mitigation" that the mining company must undertake – to establish a reserve that is similar in habitat with the same species as the area that will be destroyed by the mining operation.

*Shuaria ecuadorica* was published in the journal *Systematic Botany* (2010, 35: 662-674) and includes the following five co-authors: John L. Clark, David A. Neill, Anton Weber, Jennifer A. Gruhn, and Tuntiak Katan. The authors of the new genus and species are David Neill and John Clark, with the full citation *Shuaria ecuadorica* D.A. Neill & J.L. Clark.



John L. Clark (right) and Wilson Quizhpe standing under the branches of a mature tree of *Shuaria ecuadorica* (photos by John L. Clark)

## The Shopping Mall

**"OZARK"** Sinningias, African Violets and other Gesneriads. Email: <plantman@ipa.net> (no catalog). Dave's Violets, 1372 S. Kentwood Avenue, Springfield, MO 65804 (417) 887-8904 <[www.davesviolets.com](http://www.davesviolets.com)>.

**OUT OF AFRICA**, Blooming Streptocarpus. Send \$1 for catalog. Gary S. Mikita, 2842 Brown St., Portage, IN 46368. Phone (219) 763-4861. E-mail garymikita@cs.com <[www.garys-out-of-africa.com](http://www.garys-out-of-africa.com)>.

**MRS STREP STREPS** – Streptocarpus, Chiritas, and other Gesneriads. Email for list of available plants. Kathy Spissman, 4086 Brownlee Dr., Tucker, GA 30084. Phone (770) 939-5289. Email: [mrsstrepstrels@comcast.net](mailto:mrsstrepstrels@comcast.net).

**PAT'S PETS**, Gesneriads and African Violets. Send \$2.00 for catalog. Pat's Pets, 4189 Jarvis Rd., Hillsboro, MO 63050. Phone (636) 789-3604. E-mail PATSPETS@sbcglobal.net. Internet Home Page (catalog) <http://www.patspets1.com>.