Botanical Exploration of the Cordillera del Cóndor Region, Ecuador

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The Cordillera del Cóndor is an eastern outlier of the main Andean chain which extends about 150 km from north to south, rises to a maximum elevation of about 2900 m, and forms part of the international border between Ecuador and Peru. For over 160 years, that part of the border was in dispute, leading to armed conflict between the two countries in 1941, 1981 and 1995. Following the 1995 border conflict, the two countries began diplomatic negotiations, resulting in a peace treaty in 1998 that established the precise location of the international border.

Botanists from Missouri Botanical Garden, together with colleagues from the National Herbarium of Ecuador (QCNE) and the indigenous Shuar Federation, are currently carrying out botanical inventories in the Ecuadorian portion of the Cordillera del Cóndor region, with financial support from the National Geographic Society. We carried out the first field trips of this project in December 2000 and March 2001.

The Cordillera del Cóndor is a region of great interest to biologists; it may well have the "richest flora of any similar-sized area anywhere in the New World" (Schulenberg & Awbrey, 1997) and it almost certainly has one of the highest concentrations of vascular plant species yet unknown to science of any place on earth. The border conflict, however, prevented a thorough biological survey of the region for decades. The limited botanical exploration that was carried out in the region during the early 1990s resulted in the discovery of many species new to science and also revealed an unexpected biogeographical link between the Cóndor and the Pantepui region of the Guyana highlands, 3000 km to the northeast.

The high ridges of the Cordillera del Cóndor are composed of nutrient-poor sandstones, similar to (but much younger geologically than) the sandstone buttes (tepuis) of the Guayana Highlands region (Berry et al., 1995); at least eight plant genera that are "nearly endemic" to the Guayana region have now been found in the Cordillera del Cóndor region – some on the Peruvian side of the border, others on the Ecuadorian side. These genera include *Stenopadus* (Asteraceae), *Everardia* (Cyperaceae), *Euceraea* (Flacourtiaceae), *Phainantha* (Melastomataceae), *Pterozonium* (Pteridaceae), *Perissocarpa* (Ochnaceae), *Bonnetia* (Theaceae) and *Aratitiyopea* (Xyridaceae). Species level disjunctions between the Venezuelan tepuis and the Cóndor range are also known, such as *Podocarpus tepuiensis*. Further botanical exploration of the region will certainly result in the discovery of many more endemic species new to science, and may reveal more disjunctions and biogeographical links to the Guayana Highland region.

The geology of the Cóndor region is known only in general terms (Neill, 1999). The entire region is composed of marine and continental sediments deposited during the Cretaceous and early Tertiary, and uplifted from the Miocene onwards to its present elevations. The lowermost strata along the Nangaritza River are Cretaceous shales with abundant fossil ammonites. These strata are overlain by limestone, which in places has eroded into karst formations. The uppermost strata are sandstones, which form flat-topped ridges and table-mountains. Oligotrophic sandstone substrates are unusual in the Andes. We believe that the geological composition of the Cordillera del Cóndor is an important key to understanding its

unique floristic composition and its putative biogeographic links to the Guayana Highlands.

The Cordillera del Cóndor region is within the territory of the Shuar ethnic group, the second-largest indigenous group in Ecuador with a population of about 80,000 distributed in 400 villages in the Amazonian provinces of Pastaza, Morona-Santiago and Zamora-Chinchipe (a relatively small proportion of the Shuar inhabit the Cóndor region) and organized politically by the Shuar Federation.

History of Botanical Explorations of the Cordillera del Cóndor

We initiated botanical explorations in the region in 1990, when David Neill, Walter Palacios, Benjamin Øllgaard and Jaime Jaramillo collected plants in the upper Nangaritza River valley on a 10-day trip, including brief forays to the high ridges forming the border. Palacios returned in 1991, as leader of an international expedition sponsored by the Amazon Pact and UNESCO with participating botanists from other Amazonian countries. To date, about 30 plant species new to science have been published from the 1990-1991 collections Alwyn Gentry and colleagues on a trip organized by Conservation International in 1993, gained access to the high ridges with helicopter support provided by the Ecuadorian military and made collections for the first time in the "bromeliad meadows" of the high sandstone ridges. Henk van der Werff and Efraín Freire made further collections in the Nangaritza valley in early 1994. Robin Foster and Hamilton Beltrán carried out botanical inventories on the Peruvian side of the border in 1994, on a second trip sponsored by Conservation International. Collections of orchids in the region were made at various times by Alexander Hirtz and Carlyle Luer. Following the armed conflict in January 1995, biological exploration of the region became impossible. José Manzanares and Eduardo Cueva were perhaps the first botanists to visit the area after the 1998 treaty was signed, with a brief visit in May 1999 to collect Bromeliaceae.

With support from the National Geographic Society, Missouri Botanical Garden and the National Herbarium of Ecuador initiated a series of plant inventory expeditions to the Ecuadorian portion of the Cordillera del Cóndor in December 2000, visiting sites where no biologist had set foot before, such as Cerro Ijiach Naint, in the Coangos River watershed. These recent field trips have yielded a number of plant species new to science, not seen on any of the previous trips to other localities in the Cordillera del Cóndor. This work is carried out with the collaboration of the Shuar Federation.

Altogether, about 4,700 plant specimens have been collected from the Ecuadorian portion of the Cordillera del Cóndor. Given the richness of the flora and the high degree of endemism, a much more thorough floristic inventory of the entire region is warranted. With the resolution of the border conflict, it is now possible to continue with field studies in the Cóndor range, on both the Peruvian and Ecuadorian sides of the international border.

Although relatively few botanical collections have been made on the upper slopes of the Cordillera del Cóndor on the Peruvian side, the lower portions of the Cenepa and Santiago River valleys in Peru, below 1000 m elevation, and adjacent areas along the Marañón River, have been sampled much more thoroughly. Rodolfo Vásquez of the Missouri Botanical Garden – with participation from other botanist colleagues -- is currently writing a flora of the Cenepa-Santiago-Marañón region of

Peru, to be published in Spanish, based on about 16,000 collections, with an estimated total of 3,000 species of vascular plants for the lower Cenepa region.

Conservation in the Cordillera del Cóndor Region

Conservation International, working with government agencies and other organizations in Ecuador and Peru sponsored the "biological assessment" expeditions to the Ecuadorian side of the border in 1993 and the Peruvian side in 1994; the results of these studies, with recommendations for conservation in the region, were published by Conservation International (Schulenberg & Awbrey, 1997).

Gold and other precious minerals are known to occur in the Cordillera del Cóndor, and the government of Ecuador has granted exploratory mining concessions to several private firms. These mining concessions have generated conflicts with the Shuar who inhabit the region. The Shuar Federation is currently establishing a natural resources management unit, within the administrative structure of the Federation, to deal with mining and other resource and conservation issues in the Shuar territory. The Cordillera del Cóndor is not protected by Ecuador's system of national parks and reserves, except for a small area that was declared as a "peace park" in Ecuadorian and Peruvian territory, as part of the 1998 border treaty. A regional plan for conservation of the Cordillera del Cóndor is urgently needed, but any such conservation initiative will be successful only if the Shuar communities and the Shuar Federation have major decision-making authority as well as technical capacity in land-use management.

An Ecuadorian non-governmental organization dedicated to conservation, Fundación Natura, carried out a diagnostic study of sociopolitical and biological aspects of the Cordillera del Cóndor (Fundación Natura et al., 2000). The Fundación Natura is currently initating some conservation programs with the Shuar Federation, including agroforestry development in the Santiago River area.

On the Peruvian side of the border, the government of Peru has established the Santiago-Comainas Reserved Zone, a protected area of 2.2 million acres.

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