

Discovering the Lost World: Canaima National Park and World Heritage Site, Venezuela

Resumen

El Parque Nacional Canaima está ubicado en el macizo Guayanes y presenta muestras de la biota montana típica de los Tepuis. Canaima se presenta como ejemplo de los paisajes montanos con alto endemismo y con una fauna que está aun por catalogar. La presencia de los grupos indígenas Pemón, de cuyo idioma se ha tomado el nombre de Tepui, que literalmente significa meseta, reflejan una adaptación cultural específica a dichos ambientes; también la descripción de los ecosistemas sabaneros asociados a los alrededores de Canaima se discuten dentro de un marco de manejo integral para la conservación del Parque.

Introduction

Canaima National Park is located in the southeast of Venezuela, in the state of Bolívar, close to the borders with Brazil and Guyana. The park protects the northwestern section of the Guyana Shield, an ancient geological formation shared with Brazil, Guyana, and Colombia. The park was established in 1962 with an area of 10,000 sq km, but its size was increased to 30,000 sq km in 1975 in order to safeguard the watershed functions of its river basins. At that time it became the world's largest national park, its area being equivalent to that of Belgium in Europe, or larger than the state of Maryland in the USA. In recognition of its extraordinary scenery and geological and biological values, the park was accorded World Heritage status in 1994, forming one of a select list of natural and cultural sites worldwide. Canaima actually fulfilled all four of UNESCO's criteria for qualification as a World Heritage property. Ironically, the name of the park derives from the novel *Canaima* by Venezuelan author Rómulo Gallegos, according to whom it means "spirit of evil" in the language of the Pemón, local inhabitants of the park.

A Unique Landscape Formed by the Oldest Rocks on Earth

The best-known features of Canaima National Park are its

characteristic flat-topped mountain formations, known as *tepui*s from the local indigenous name. These mountains were popularized in sev-

eral novels from the early part of this century, the most widely recognized of which is *The Lost World* by Sir Arthur Conan Doyle, author of the Sherlock Holmes novels. It describes the ascent of a South American plateau inhabited by prehistoric plants and dinosaurs.

The geological history of the area is only superficially understood. There are three main geological formations. The oldest is an underlying igneous-metamorphic basement formed some 1.2-3.6 billion years ago whilst South America was joined to Africa as the super-continent Gondwanaland. Between 1-1.6 billion years ago, this was overlain with a sedimentary cover. The first of these formations is too deeply buried to be visible within the park, but the second one (known as the Roraima Group) forms the basis of the area's extraordinary topography (Huber 1995). It consists of quartzite and sandstone strata which were probably laid down in shallow seas or large inland lakes (Briceño et al. 1990) during the Pre-Cambrian period. Lastly, during Palaeozoic and Mesozoic times magma repeatedly penetrated the existing sediments forming intrusive rocks which are typically diabbases, and to a lesser extent granites.

The tepui formations, not unlike those found in the deserts of northern Arizona, came into being by a process of erosion of the surrounding lands over millions of years. The tepuis are sandstone massifs, and it is thought that what are today mountains once formed harder or less-

faulted strata which were more resistant to erosion.

There is an impressive array of different soil types. The low mineral content of the parent rocks of the Guyana Shield, the high rates of weathering that occur in tropical climates, and the age of the sediments has produced soils which are generally acid and nutrient-poor. Only where there are more basic igneous intrusions are the soils capable of supporting luxuriant forests or cultivation.

One Third of Plants are Found Nowhere Else

The vegetation of the Canaima national park is quite strikingly divided between the mainly savanna-forest mosaic of the eastern sector of the park, known as the *Gran Sabana*, and evergreen forest in the west. It is still not clear what causes this difference and, in particular, how the savanna originated. While some authors are inclined to believe the savanna to be a product of a rainfall shadow caused by the eastern *tepuis*, others consider the formation to be entirely anthropogenic, being a product of repeated burning by indigenous peoples. The truth undoubtedly lies in a combination of the two (Schubert and Huber 1989). The presence of 107 plant species found only in these savannas (Picón 1995), demonstrates that they have existed at least long enough to allow new species to form.

The **savannas** are dominated by grasses, typically *Trachypogon*

plumosus and *Axonopus pruinus*, and such fire-resistant sedges as *Bulbostylis paradoxa*, which forms a small cushion on which it raises itself above the ground to avoid the worst of the savanna blazes. Stunted shrubs like *Palicourea rigida* are also found at low densities. The **high meadows**, on the other hand, are composed of typically Guyanan herbs such as the broad-leaved species of the genus *Stegolepis*, a member of the Rapataceae, a family found only in the Guyana Shield and with one genus in West Africa; members of the Xyridaceae and Eriocaulaceae are also typical. The **shrublands** are usually composed of shrubs and bushes up to two metres tall, most of which are hard-leaved (coriaceous) and pertaining to several genera, including *Bonnetia* and *Clusia*. The **evergreen montane forests** are often humid and luxuriant and include tree species of the families Leguminosae, Lauraceae, Vochysiaceae, Myristicaceae, Rubiaceae, Burseraceae and Annonaceae.

The **tepui tops** themselves are sometimes forested, with dwarf forests with members of the Theaceae (particularly *Bonnetia roraimae*), Araliaceae, Ericaceae, Compositae, Melastomataceae, and Rubiaceae being prominent. In other cases, meadows prevail on the tops, typically with the composite *Chimantea*. One feature of these extremely nutrient-poor environments is the presence of carnivorous plants, such as pitcher plants *Heliamphora* and sundews *Drosera*, which trap and digest insects as a

supplement to mineral uptake through the roots. **Pioneer vegetation** is found on rocky outcrops, with the bromeliads *Brocchinia*, *Lindmania*, and *Tillandsia* being frequently observed (Schubert and Huber 1989).

An important formation in the lower altitudes closer to the rivers and shallow valley bottoms of the Karuai, Apanwao, and Yuruaní basins are the seasonally flooded palm savannas, or *morichales*, which are dominated by the "moriche" palm *Mauritia flexuosa*. A species-rich herb layer of grasses and sedges, as well as other plants of the lower stratum, are found within these formations (Huber 1995).

Some 9,400 species of higher plants have been recorded from the Venezuelan Guyana, of which 2,320 are registered from the tepuis. This includes more than 700 species of orchids. The flora is highly endemic with two endemic families (Tepuianthaceae and Sacciofoliaceae) and 23 unique genera, including *Quelchia*, *Achnopogon*, and *Chimantea* of the Composite family, the *Connelia* bromeliads, the *Tepuia* heaths, the melastome *Mallophyton*, and *Coryphothamnus* of the bedstraw family. At the species level, approximately 33% of the tepui species are endemic to the region, with 99 species endemic to Chimantá alone (Huber 1995).

The Fauna Needs to be Catalogued

Animal life is generally scarce all over the park and in all habitats, per-

haps because of the extremely nutrient-poor soils, which are unable to support a large biomass (Schubert and Huber 1990). In addition, there are relatively much fewer studies of animals than there are of plants, and thus our knowledge remains sketchy.

Reptiles and amphibians are poorly known. Amongst the frogs there is an endemic genus *Oreophrynella* with several species on the summits of the tepuis. Some 536 bird species have been recorded from the park (Goodwin and Salas 1997). Of these, 42 are endemic to the tepui region. Examples include the Roraiman nightjar *Caprimulgus whitleyi*, which is restricted to a few mountains in the southeast of the park, or the tepui tinamou *Crypturellus ptaritepuensis*, which is known from only two mountains within the park and has not been recorded for two decades. Near 120 species of mammals have been recorded, but a further 92 are expected to occur in the area (Ochoa et al. 1993). One of the few endemics is a small rodent *Podoxymys roraimae* from the summit of Roraima.

The park, being a large, relatively intact area, is important for the survival of tropical animals that are naturally found at very low densities and are elsewhere threatened with extinction. Thus, it is a refuge for large mammals such as puma *Felis concolor*, jaguar *Panthera onca*, tapir *Tapirus terrestris*, giant anteater *Myrmecophaga tridactyla* and giant armadillo *Priodontes maximus*. Likewise, avian top predators, like the

legendary harpy eagle *Harpia harpija*, are also still to be found within the park.

Much more research is still needed in order to classify the full range of species found within the park, let alone to truly understand the complex interrelationships of these basic elements and, therefore, the ecology of the area. This reflection has prompted entomologist Paul Spangler to comment of the tepui flora and fauna that "many of the experts who will study and classify these materials are not yet born" (in George 1989).

The Pémon:

Traditional Inhabitants of Canaima

The traditional inhabitants of the southeast of Venezuela, including Canaima National Park, are the Pemón indigenous people, part of the Carib linguistic group. Their entire population approaches 20,000, with about three quarters of these people leaving within the national park.

The date of first occupation of the Gran Sabana is not known, but the Pemón are thought to have immigrated into the region some 200 years ago (Thomas 1980), although there are archeological remains of human settlements which date back 9,000 years (Schubert and Huber 1989). Perhaps this 'late colonisation' of the Gran Sabana is a function of its poor soils: there is certainly some evidence to suggest that low productivity is responsible for the relatively low population density of its present-day inhabitants in relation to the indigenous inhabitants of, for example, the Ama-

zonian lowlands (Huber and Zent 1995). Despite this short history of settlement, the Pemón have an intimate relationship with their landscape. The names of rock formations, waterfalls, rapids, lakes, and streams all have their origins described in myth. Some of these names date from the time of the culture heroes; some from other mythological sequences (Thomas 1982). In particular, the Pemón relationship with the tepuis (actually the Pemón denomination of "table mountain") is complex and profound. The tepuis are sacred mountains for the Pemón. They are the "guardians of the savanna" where the "Mawari"—'spirits in the form of men who may steal the souls of the living' (Thomas 1982)—make their home, and for this reason they are not to be ascended, according to the norms and traditions of Pemón society. Only in the last two decades, with the increase in tourism, have some Pemón begun to disregard these traditional beliefs by taking hikers to some of the more accessible tepuis, such as Roraima, Matawi (Kukenan), and Auyantepuy.

The traditional subsistence activities of the Pemón are swidden agriculture, hunting, and fishing. Today there is increasingly more work to be found in mining and tourism. The settlement pattern of the Pemón has changed since the Catholic missions arrived at the beginning of this century. Formerly living in dispersed communities along watercourses (Thomas 1980), they now tend to concentrate in larger groups of 100-

2,000 people. The new road through the Gran Sabana has also attracted larger settlements. This concentration has brought about many changes in lifestyle, some of which affect their relationship with the environment. The traditional swidden plots, for example, once sited only on the richer, more alkaline diabase outcrops where forest regeneration is apt to be swift, are now often cut on poorer acidic soils. The result is that in some areas forest is being lost to secondary scrub or savanna (Fölster 1995).

The formation of savanna is also accelerated by the traditional practice of burning amongst the Pemón. Burning is practised for a number of sociocultural reasons, including communication, maintaining clear paths, eliminating dangerous animals (i.e., rattlesnakes), hunting, removing weeds, stimulating new growth of pasture for grazing, and—more recently—as a protest against unpopular management decisions. Although burning is more frequent in savanna, fire often reaches forest, shrublands, or scrub. Where there is extensive burning of this type of vegetation, the poor soils impede regeneration and a savanna or secondary scrub results (Fölster 1995).

According to some Pemón, burning is today practised with less awareness of its environmental consequences than in the past. The cultural aspects of burning in the Pemón have not been studied, but it would be interesting to ascertain the extent to which burning is influenced by the effects of transculturation which have

occurred since the 1930s.

Management: Reconciling Needs with Conservation Goals

The Canaima National Park was created to safeguard the geological, biological, and cultural values described above, but its major economic importance has been the production of water for the Guri Dam, which provides some 77% of the nation's electricity.

There were no management activities until 1981, when EDELCA, a government electricity company, began a fire-fighting programme. Only in 1990 did the park receive its first park warden, and it remained with only one staff member until 1992 when eleven more staff were assigned and a zoning and use plan for the eastern sector was approved.

Thirty-five years after the creation of Canaima National Park, the area continues to be managed on a shoestring budget: the operational management allocation for the eastern sector during 1996 was \$1,171. Although the conditions for staff have improved in the last five years, the budget does not cover even the most basic management necessities: for example, the Gran Sabana has one vehicle in poor condition and there is no radio system. The western sector of the park is still lacking a zoning and use plan.

Active park management has become more of a necessity in recent years given the growing threats to Canaima. These threats have been analysed in participatory rural ap-

praisal run by a non-governmental organization together with several Pemón communities and parks agency personnel. A résumé of threats is shown in Table 1.

The main pressures on the park come from two sources. On the one hand, the demands of the Pemón population resident in the park have increased. The Pemón population has increased five times over the last twenty years, and there is clearly a demographic effect of sheer numbers, which has brought about increasing demands on the park's natural resources. However, the situation is more complex, as changes in settlement pattern have led to new land-use regimes and changes in resource consumption. The best management approach must surely be found in adjusting to recent patterns of resource use by addressing the underlying causes of current resource use and identifying ways in which resources can be more sustainably used, rather than prohibiting undesirable activities. On the other hand, the tourism industry, which almost doubled between 1991 and 1995, continues to develop within the park without adequate planning control. As the Pemón have become more dependent on income generated from tourism, the problem of tourism management has increased, as have its environmental and cultural impacts. Two urgent priorities are to develop management guidelines for tourism in the national park, and to strengthen the capacity of the Pemón to manage and take advantage of

Table 1. Current threats to the Canaima National Park by component, identified through workshops with local communities and parks agency staff (Rodríguez 1996)

Park Component	Threat
Tepuis	Tourism: accumulation of garbage, faecal pollution, extraction of flora, extraction of crystals, introduction of exotic plant species, deforestation for firewood, burning to clear trails
Rivers and waterfalls	Tourism: faecal pollution. Mining: pollution Deforestation: flow reduction Burning and wildfires
Palm savannas (morichales)	Overexploitation of <i>Mauritia</i> palm Burning and wildfires
Forests	Felling for agriculture Wildfires Mining (potential)
Fauna	Overhunting Wildfires
Savanna	Wildfires Tourism: opening of new trails, erosion
Pemón	Population increase Increase in requirements Loss of traditional knowledge Change in settlement pattern
Management	Institutional weakness Lack of management programmes National government policy incompatible with conservation and park management Bureaucracy

tourism in a way compatible with the conservation objectives of the area.

In addition to this is the latent threat of gold and diamond mining. Mining is one of the major activities in the lands adjacent to the park, and it is well known that the park itself has

considerable mineral wealth. Although mining is currently prohibited, there have been sudden illegal 'booms' in, for example, the Kamarata Valley in 1994. The physical presence of mining operations on the park's borders provides a constant

reminder to the park's inhabitants of what may be obtained from their lands in the short term. With government policy now aimed at promoting mining throughout the region, the park will require increased vigilance to safeguard its natural resources over its 3 million hectare extent.

One particular project which is shortly to be realised is the construction of a high-tension power line through the national park in order to supply electricity to mining operations to the north and south of the park. Although the project is opposed by local inhabitants and considered unwise by conservation scientists, it seems likely to succeed due to the powerful lobby whose interests it

serves.

With moves to open Venezuelan protected areas to mining already under way, perhaps the legend of El Dorado will finally come true in the Canaima National Park as mining proponents would wish. However, standing in this, one of the world's last remote wildlands, surrounded by vistas of table mountains, one cannot help but feel that the riches conserved by Canaima National Park are worth incalculably more than all the gold or diamonds that can be extracted from its sub-soil. It is to be hoped that the efforts of the many individuals and organizations dedicated to conserving Canaima will ensure that future generations will not blame us for having lost the "Lost World."

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