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ISCHIGUALASTO-TALAMPAYA NATURAL PARKS ARGENTINA

These two parks, extending over 275,369 ha of desert in the rainshadow of the Andes on the western border of the Sierra Pampeanas of central Argentina, preserve one of the world's great palaeontological sites: the most complete sequence of Triassic fossils known. Six sedimentary formations contain the remains of a wide range of ancestral dinosaurs, ancestral mammals and plants which reveal the evolution of vertebrates and the nature of palaeo-environments over the entire 50 million years of the Triassic Period. They occur among spectacular red cliffs, wind-carved and petroglyph-carved rocks.

COUNTRY

Argentina

NAME

Ischigualasto-Talampaya Natural Parks

NATURAL WORLD HERITAGE SERIAL SITE

2000: Inscribed on the World Heritage List under Natural Criterion viii.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]

The UNESCO World Heritage Committee issued the following statement at the time of inscription:

Justification for Inscription

Criterion (viii): The site contains a complete sequence of fossiliferous continental sediments representing the entire Triassic Period (45 million years) of geological history. No other place in the world has a fossil record comparable to that of Ischigualasto-Talampaya which reveals the evolution of vertebrate life and the nature of palaeoenvironments in the Triassic Period.

IUCN MANAGEMENT CATEGORY

Talampaya National Park II National Park
Ischigualasto Provincial Park II Provincial Park

BIOGEOGRAPHICAL PROVINCE

Monte (8.25.7)

GEOGRAPHICAL LOCATION

The two parks lie on and across the border between the provinces of San Juan and La Rioja in north central Argentina, 400 km northwest of Córdoba. Ischigualasto Provincial Park is centred on coordinates 29°55'S to 68°06'W; Talampaya National Park is centred on 30°02'S to 67°48'W.

DATES AND HISTORY OF ESTABLISHMENT

1971: Ischigualasto Provincial Park designated by San Juan Provincial Law No.3.666;

1975: Talampaya Provincial Park designated by La Rioja Provincial Law 3.803;

1980: Talampaya re-classified as a National Park by National Law 24.846;

1997: Ischigualasto declared a National Historic Paleontologic Site.

LAND TENURE

All properties are publicly owned: Talampaya by the National Parks Administration (APN), Ischigualasto by San Juan Province. Administration is by the Regional Director, National Park Administration and the San Juan Subsecretariat for the Environment.

AREA

Total area 275,369 ha: Talampaya National Park 215,000 ha (no buffer zone);
Ischigualasto Provincial Park 60,369 ha (includes a buffer zone).

ALTITUDE

1,200m (average, Ischigualasto); 1,500m (average, Talampaya) to $\pm 3,000$ m (Sierra Morada).

PHYSICAL FEATURES

The Ischigualasto-Talampaya Parks are in the arid El Monte rainshadow desert on the western border of the Sierras Pampeanas of central Argentina, Talampaya lies in the dry Rio del Alto valley between the two barren ranges of the Sierra Morada and the Sierra de Sañogasta on the east. Ischigualasto lies on one side of the wide dry valley of the Rio Bermejo on its southwest. Talampaya has steep cliffs and is deeply eroded by watercourses usually dry but subject to flash floods that can move large boulders. Ischigualasto has rugged badlands of bizarrely shaped multicoloured rocks, notably horizontal strata and a floor of barren grey-white volcanic clay given the name the 'Valley of the Moon'. There is almost no available water which has hindered exploration. Soils in the area are immature: sands and gravels of various grades. Owing to the high evaporation, they are usually quite saline.

The Parks cover almost the whole sedimentary basin of the Ischigualasto-Villa Unión Triassic geologic basin formed over the length of the Triassic Period from approximately 250 to 200 million years ago and exposed during the Andean uplift 60 million years ago. The Middle Triassic remains are the best representatives of that age known anywhere (Dingwall, 2000). The basin reveals an unparalleled undisturbed and complete sequence of six layers of continental fossiliferous sandstone and mudstone sediments deposited by rivers, lakes and swamps. The earliest of the six geologic formations that make up the basin, are the red sandstone Talampaya and the Tarjados formations that forms the impressive 200m brick red cliffs and canyon of Talampaya National Park. The remaining floodplain formations with overbank and crevasse splay sediments indicate rapid flooding, probably after violent monsoonal storms which buried and preserved the animal and plant life. Three of the eight formations contain the abundant vertebrate fossils that document key changes in terrestrial fauna; five formations contain the abundant fossil flora that documents climatic changes and animal dietary conditions. The three formations are: 1) Ischichuca-Chañares: the ancient lake bed of Ischichuca plus the shallow water beach of Chañares which are immensely fossil-rich; 2) Ischigualasto: which includes the striking white and variegated sediments of the valley of Hoyada de Ischigualasto formed from the lush meadows and flood plains of an ancient east-flowing river; and 3) Los Colorados, the last in the series.

The drab grey horizontal fossil-bearing strata of Ischigualasto document the transition from Early Triassic mammalian ancestors to the earliest known dinosaur remains in the Late Triassic of 228mya (Sill, 2000). The lake and swamp deposits of the Los Rastros formation contain large numbers of fossil plants, some forming coal seams, others preserved as actual mummified species, an extremely rare form of preservation known from very few localities. In the late Triassic the area was overshadowed by active volcanoes associated with the break-up of Gondwanaland, and was dominated by rivers but in a drying climate. Within the sediments are frequent layers of volcanic ash which allow radiometric dating of the formations and contribute to the mineral content of the sediments. By comparison, Triassic sites on other continents, including some with notable dinosaur fossils such as the Chinle Formation in Arizona, are generally small and scattered with limited abundance of fossils which represent only a part of the 50 million years of Triassic time (SENATUR, 1999).

CLIMATE

The present site is in the long rainshadow of the Andes some 160 km to the west. It has a dry climate, with a humidity usually no higher than 20% which has preserved the fossil-bearing beds. The average annual rainfall is between 150 and 200mm, largely in the summer between December and March when rain sometimes causes flash floods and rapid erosion. Long droughts occur, there are constant winds, intense solar radiation and high evaporation. Temperatures tend to be extreme, up to 50°C in summer and -10°C in winter in Ischigualasto, 40.5°C and -8°C in Talampaya. The climate in

the Triassic was hot and dry though swept by violent strongly seasonal monsoon-like storms that caused the floods which buried large numbers of animals in the mud which has preserved their bones. Weathering of iron deposits left the desert soils red.

VEGETATION

The El Monte is warm scrub desert and the present vegetation is sparse, covering only 10-20 percent of the land though it is richer in sheltered canyons. 172 species are so far known. It is characterised by xeric shrubs, cactus and such trees as Argentine mesquite *Prosopis alba*, *P. chilensis* and *P. nigra*, a hackberry *Celtis spinosissima*, quebracho *Aspidosperma quebracho-blanco*, chañar *Geoffroea decorticans* and *Jodina rhombifolia*. The main Monte vegetation is creosote bush scrub (*Jarilla*) dominated by *Larrea cuneifolia* and thorny scrub with halophylls and cactuses (APN, n.d.). Six species are regarded of national value, including chilca *Baccharis trinervis* and verdolaga *Halophytum ameghinoi*. The vegetation has been broadly mapped throughout and an inventory of plants in Ischigualasto Park has been completed.

The plant fossils of the site provide an invaluable understanding of the mass extinction that took place at the end of the Permian Period when approximately 80% of the world's flora and fauna disappeared and the survivors began a new development. Some 100 species of fossil plants have been identified and more are being added as research continues. The site contains huge petrified tree trunks of *Protojuniperoxylon ischigualastianus* more than 40m high, which attest to a very rich Triassic vegetation. The affinities of these trees are unknown, but their wood resembles that of the Araucariaceae. Fossil ferns, such as *Cladophlebis* spp. and horsetails *Equisetum* spp. have also been found. Much of this vegetation became coal measures (SENATUR, 1999).

FAUNA

The present fauna of Ischigualasto-Talampaya is typical of the arid region of western Argentina, with 27 species of mammals, 77 birds, 20 reptiles and 2 amphibians (ANP, n.d.). There are several endemic, near threatened or culturally valuable species such as the three herds of wild guanaco *Lama guanicoe* in the Ischigualasto Valley numbering at least 60 animals. Other animals are white-bellied opossum *Didelphis albiventris*, the endemic pink fairy armadillo *Chlamyphorus truncatus*, Patagonian mara or *Dolichotis patagonum*, southern mountain viscacha *Lagidium viscacia*, plains viscacha *Lagostomus maximus*, ashy chinchilla *Abrocoma cinerea*, puma *Puma concolor*, Argentine grey fox *Pseudalopex griseus*, pampas fox *Pseudalopex gymnocercus*, the weasel-relative southern grison *Galictis cuja* and Molina's hognosed skunk *Conepatus chinga*. Reptiles include boa *Constrictor occidentalis*, Argentinian coral snake *Micrurus pyrrhocryptus* and land tortoise *Chelonioides chilensis*. Among birds, there are several culturally valuable species such as Andean condor *Vultur gryphus*, the near threatened greater rhea *Rhea americana* and lesser rhea *Rhea pennata*, found in the surrounding alluvial plains; also the endemic Steinbach's canastero *Asthenes steinbachi*, white-throated cacholote *Pseudoseisura gutturalis* and sandy gallito *Teledromas fuscus* are native. There are seven species of hawk and three vultures.

The site was nominated mainly for its Triassic fossils. Currently, some 56 genera of fossil vertebrates have been found at the site, including fish, amphibians, and a great variety of reptiles and direct mammalian ancestors. Most of them come from three of the six geologic formations, although in 2000 it was noted that around 60% of the area was still largely unexplored. In the Ischichuca-Chañares formation fossil vertebrates are particularly abundant in the Chañares section, mostly therapsids, an ancestral mammal group. Also present are fossils of the Archosauria, an ancestral dinosaur group, so by extension, the ancestors of birds, crocodiles and lizards. In the Ischigualasto formation literally thousands of specimens have been collected: reptiles, amphibians, therapsids and a great number of plants. Vertebrate specimens contain the earliest dinosaur *Eoraptor lunensis* and its more advanced contemporary the carnivorous archosaur *Herrerasaurus ischigualastensis*. Los Colorados is the last in the series and reveals the beginning of the Age of the Dinosaurs. Most of the fossils are found in the top levels of the formation and consist almost entirely of archosaurs, including large herbivorous and carnivorous species, true primitive crocodiles and primitive rat-like true mammal species.

CONSERVATION VALUE

Ischigualasto-Talampaya is one of the great scientific treasures of the world, of great importance to palaeontology and evolutionary biology. The sites have the only complete, undisturbed and abundant sequence of Triassic fossil flora and fauna known, with remains of plants, ancestral mammals and the ancestral dinosaurs.

CULTURAL HERITAGE

Radio-carbon dating has revealed human occupation of the area between 2,590 and 950 years ago. At Ischigualasto, six rock art sites have been discovered along with cave and rock-overhang living sites, burial sites, campgrounds and tool-making areas. The petroglyphs are dated to between 500 to 1,000 years ago. Much of the rock art is of geometric human figures and scenes with animals. Geometric designs include simple, zigzag and curved lines, various rectangular forms, circular forms, a so-called 'sand clock' and a radiating sun figure. The repertoire of human figures includes isolated figures, pairs and groups, some static, some active. Some have decorations on the head or around the body. Animals are represented by individual species, especially guanaco in groups of two or more. Some are in dynamic positions, but most are static. Some animal figures appear to represent masks worn by dancers or important members of the group. Animal and human footprints are also common in the rock art. Among the animal prints are found puma, rhea and guanaco. Some additional scenes combine animal and human drawings showing a direct relationship between the human and the animal (SENATUR, 1999, references).

Before the period of Spanish conquest the area was inhabited by several aboriginal groups, of semi-nomadic hunters and gatherers. The cultural value of Ischigualasto-Talampaya is of great significance. The site lies on the southernmost area of late Inca influence. Close to the two parks is Mount Famatima, the highest peak in South America outside the Andes, and a place the Inca mined for gold. In Talampaya 32 easily accessible sites have been unearthed, and in Ischigualasto, 6 sites, but detailed study of the rock art, artefacts and archaeology has been subordinated to palaeontological research and has only recently begun. Cultural artefacts have been discovered from the ancient cultures of the Cultura de la Fortuna and Cultura de la Aguada dating from 600 BC to about 1000 AD, up to the time of the Spanish conquest when tribes of the Diaguita and Huarpe cultures lived there.

LOCAL HUMAN POPULATION

Early settlements in the area were along the watercourses near the mountains and near natural springs dependant on subsistence farming and cattle raising with some small scale mining. During the last half of the 19th Century cattle drives were organised to deliver beef to the miners across the Andes in Chile. Thousands of cattle were driven from central Argentina across the Ischigualasto-Talampaya area, wintered in the pre-cordilleran area and then crossed into Chile the following summer. Remnants of this activity are found throughout the area in the form of camps, temporary shelters and artefacts. Early in the 20th Century the coal beds of the Los Rastros formation in Ischigualasto were mined, but not for long due to the poor quality of the coal. At present, there are no settlements or private properties within the site. Some 5 km southeast is the small village of Baldecitos with eleven families; 20 km northwest is the village of Pagancillo. Larger towns with populations between 2,000-3,000 people are San Agustín, 87 km south of Ischigualasto and Villa Unión, 70 km north of Talampaya (SENATUR, 1999).

VISITORS AND VISITOR FACILITIES

The site was hard to access until a road in was built in 1979. The combination of scientific value and natural beauty now make the sites a major tourist attraction. Most visitors are drawn by the impressive and unspoiled scenery of the Valley of the Moon and the almost 200m-deep Talampaya gorge. In 1998, 34,000 tourists visited, nearly all going to both sites. A recent study noted that even without improvement in roads or services, the number of visitors will increase to at least 100,000 per year during the next ten years. If lodging and other services are added, the estimated increase might be to 600,000. About 7 percent of tourists come from countries outside Argentina, mostly Brazil, Japan, Europe and USA. Most of the national tourists are from Buenos Aires, Cordoba and Mendoza. In addition, 200 school buses visited the site in 1998 and numerous scientific delegations from universities and research centres from around the world.

In 2000 there were no lodgings at either site. Rough camping is permitted in the buffer zone at Ischigualasto Park which has a small visitor centre with an interpretive display, four toilets and a single ranger's residence. This centre was extended in 2001. Talampaya also has a reception centre, parking area, toilets, and an office for tour guides and concessionaires. Small buffet food services are available at both parks. Walking trails and interpretive signs are scarce. Tourists are accompanied by ranger-guides who can be booked in San Augustin, and are normally carried in park vehicles, Escorted private vehicles are permitted at Ischigualasto although visitor numbers sometimes swamp the service. At present, the economic benefit to the area is limited mainly to

entrance fees. Some secondary benefits accrue to the nearby towns of San Agustín in San Juan Province, and Patquija and Villa Unión in La Rioja Province where there are full service facilities, lodging, commerce and medical care (SENATUR, 1999; Sill, 1999).

SCIENTIFIC RESEARCH AND FACILITIES

The area, first discovered to science in 1873, has been subject of intensive research interest since the beginning of the 20th Century for its evidence of the rise of dinosaurs. Coal mine fossil footprints were first described in 1929 by the German palaeontologist Friedrich Von Huene. Later the Italo-Argentine geologist Joaquin Frenguelli collected the first fossil skull of a cynodont from the Ischigualasto formation and sent it to the La Plata Museum where it was described by the palaeontologist Angel Cabrera in 1944. The true importance and fossil-richness of this region for the study of the transition between dinosaurs and ancient mammals was not fully appreciated until the first joint Argentine-US expeditions to Ischigualasto in 1958, when a team from Harvard University and the Argentine Museum of Natural History made the first expedition to Ischigualasto and discovered the Chañares locality in Talampaya, adding to the scientific value of the site. Later work was carried out by the University of Tucumán under the direction of Dr Oswaldo Reig and José Bonaparte, who also discovered the importance of the upper portion of Los Colorados formation as a fossil site. Beginning in 1970, the universities of San Juan and La Rioja began extensive field work in the area. Some of the resulting studies include Bonaparte (1979), Serena & Novas (1992), Monetta (1995) and Rogers (1997). New finds in the Ischigualasto valley were reported in 2004 by the director of the Natural Science Museum, University of San Juan. They included a prosauropod dinosaur, two ancestral crocodylians, and a mouse-sized mammal-like cynodon, showing a mixture Triassic and Jurassic forms (Anon., 2004).

There are two scientific field stations on the Talampaya site, and specimens, both palaeontological and biological, are fully catalogued and curated by expert staff at the Museum of Natural Sciences in San Juan. This is the principal research and interpretive centre for the Parks, with a major new display of fossils and Triassic palaeoenvironments. Researchers from the University of La Rioja are also active at the site. Specimens are freely available for study, but strict laws control all specimen collecting and all research is supervised by the University of San Juan. 627 scientific papers have been published on the area to 2000. The desert environment contains several rare or threatened endemic species of flora and fauna.

MANAGEMENT

Both components of the site have strong legal protection under national and provincial law. The National Parks Administration management plan for Talampaya National Park is under preparation and requires public consultation. The Park is divided into five different zones. The wilderness area *Zona Intangible* is 70% of Talampaya Park. There are two separate recreational zones, one extensive and one intensive, concentrating all tourist activities. The extensive use zone covers natural areas which can be visited by low numbers of tourists, the intensive use zone an area is where the Park infrastructure is concentrated. There are also a restoration zone for degraded areas and service and buffer zones. Hunting and wood cutting are prohibited and vehicles are limited to designated circuits. The rangers live in the Park and patrol year-round. There is monitoring of ground water, wild and domestic animals, vegetation and tourism.

Ischigualasto Provincial Park in 2000 was studied by the University of San Juan to establish the scientific basis for a comprehensive management plan for the Secretariat of Environmental Planning and the Provincial Tourism Agency (EnProTur). The National Secretariat of Tourism also contributed a wider planning perspective for administering the site. The main objective of the management plans is to preserve and protect the natural scenic and scientific areas. A second objective is to develop means to fulfil visitor needs without degrading the natural system. A third objective is to educate public awareness, although there is already a strong interaction between the Parks and the surrounding communities. The national and provincial authorities are establishing a cooperative management regime for the whole site. There is an agreement specifying common management objectives, planning processes and zoning procedures, integrated staff training, tourism management, control measures and research, (Sylvester & Dellafiore, 2000). A Management Coordination Committee has been created, and there is exchange of information on research and the definition of criteria for permitting future investigations in the two sites.

MANAGEMENT CONSTRAINTS

At present, there are no significant threats to the site. The land is unsuitable for agriculture and local cattle-raising is small scale; there are no industries, though coal was worked in a small way in Ischigualasto. In Talampaya there has been some vandalism of rock art, mainly before the designation, and tourist rock collecting. Because the parks are not fenced, it is possible for poachers to gain access on foot, horse or mule. Despite frequent patrols, the Park staff does not have adequate equipment to detect or intercept these hunters. However, illegal collecting and poaching appear to be minimal. A main problem is the amount of rubbish left and erosion caused by visitors, whose vehicles, owing to heavy visitation, cannot at present be escorted round the sites. Another is the occasional entrance to the site of motorbikes by relatively inaccessible stream beds in outlying areas.

STAFF

National Park staff consists of two highly trained professional rangers, and some 17 unofficial interpreter guides from the local community. There are four guard stations. Scientists from the University of San Juan Museum of Natural Sciences and the University of La Rioja serve as advisors, researchers and environmental monitors. At Ischigualasto the full time staff consists of one ranger and eight certified guides. Supervision is provided by the three management agencies: EnProTur, APN and the San Juan Museum of Natural Sciences. Increased funding, staffing, vehicles and facilities are needed.

BUDGET

The revenues derived from entrance fees totalled almost US\$200,000 a year up to 2000 and are managed by EnProTur and APN. The annual budget for Talampaya is US\$85,000 and for 2001 was US\$95,600. Ischigualasto has no formally assigned budget and there is little operating funding apart from staff wages. Additional funding is provided by subsidies from provincial and national organisations and by research bodies such as the universities working in the area.

LOCAL ADDRESSES

Administración de Parques Nacionales, 690, Santa Fe St., 1059, Buenos Aires, Argentina.

Intendencia, Talampaya National Park, Calle San Martín S/n, 5350, Villa Unión, La Rioja, Argentina.

Regional Director, Administración de Parques Nacionales, 5400 San Juan

Director, Provincial Tourism Agency (EnProTur), Sarmiento 5 Sur, 5400 San Juan, Argentina.

Director, Museo de Ciencias Naturales de San Juan, España 460 Norte, 5400 San Juan.

Subsecretaría de Medio Ambiente de San Juan, Edificio 9 de Julio, 5400 San Juan.

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