

World Heritage Sites

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TSINGY DE BEMARAHA STRICT NATURE RESERVE MADAGASCAR

Tsingy de Bemaraha Reserve covers karstic landscapes and a limestone upland plateau carved into an impressive forest of pinnacles (tsingys). There are also the spectacular canyon of the Manambolo river, high peaks and rolling hills. The undisturbed forests are the habitat of rare and endangered lemurs, and the nearby wetlands for rare birds.

COUNTRY Madagascar

NAME Tsingy de Bemaraha Strict Nature Reserve (*La Réserve Naturelle Intégrale de Tsingy de Bemaraha*)

NATURAL WORLD HERITAGE SERIAL SITE

1990: Inscribed on the World Heritage List under Natural Criteria vii and x.

IUCN MANAGEMENT CATEGORY

Tsingy de Bemaraha Strict Nature Reserve: Ia (Strict Nature Reserve)
Tsingy de Bemaraha National Park: II (National Park)

BIOGEOGRAPHICAL PROVINCE

Malagasy Woodland/Savanna (3.09.04)

GEOGRAPHICAL LOCATION

The Reserve is in central west Madagascar on the Bemaraha Plateau, 250 km west of Antananarivo and 60-80 km inland from the west coast. It is located in the northern half of the Antsingy region of the plateau, north of the Manambolo River gorge between 18°17' to 19° 06'S and 44° 36' to 44° 58'E.

DATES AND HISTORY OF ESTABLISHMENT

1927: The area established as a *Réserve Naturelle Intégrale*; protected under Decree 66-242 of 1966;

1937: The Manambolo gorge, ancient cemeteries in the gorge and the *forêt et rochers*, which includes the Reserve, all decreed Natural Monuments & Sites;

1939: All three sites classified as National Heritage by an *Arrêté*, a designation which does not confer any degree of management or protection;

1997: The northern half of the Reserve designated a National Park by decree 97-1045.

LAND TENURE

State, in Centre Ouest province, in the Fivondronana d'Antsalova and the Faritany de Mahajanga. The Reserve is administered by the *Service de la Protection de la Nature*, the National Park, by the *Parcs Nationaux de Madagascar* (PNM), both in the Ministry of Waters and Forests.

AREA

152,000 ha: Strict Nature Reserve, 85,370 ha; National Park, 72,340 ha (PNM,2000)

ALTITUDE

150m to 934m.

PHYSICAL FEATURES

Tsingy de Bemaraha means the pinnacles of the Bemaraha plateau. The area is a karstic section of a Jurassic and early Cretaceous limestone plateau in the west of the island. This extends north-south 100 km by 5 to 15 km wide, bounded on the east by the steep 300 to 400m Bemaraha Cliff above the Manambolo River valley. The western side of the plateau falls away west in rolling savanna-covered hills. In the north, undulating country alternates with limestone outcrops. In the south the karst plateau is deeply eroded into a forest of sharp fluted limestone pinnacles amongst dolines, swallowholes and canyons which make access difficult. This area is known as Tsingy (tip-toe), the Madagascan term for pillar karst, and is divided into the large tsingy and small tsingy. The pinnacles are needle-pointed, some reaching 30m high and marine fossils are visible. The northern side of the 20 km Manambolo River Gorge lies within the Reserve, with cliffs 100m high. Both seasonal and permanent rivers flow on the plateau, draining in the west to lakes and marshy plains at the foot of a large sandy depression. Numerous permanent springs rise on both sides of the base of the Tsingy which is an important water catchment for surrounding lands, particularly those to the west. The Reserve covers the northern half (54.5%) and the National Park the southern half of the site.

CLIMATE

Rainfall is seasonal, with a warm dry season of six months, and a hot wet season from late November to April. Annual rainfall on the plateau is between 1000-1500mm; in the western forest it is between 500-1000mm. The mean annual temperature is between 26°C and 28°C, and mean monthly temperatures remain above 20°C. Extremes of 38°C and 9°C have been registered in December and July respectively,

VEGETATION

Madagascar's flora is rich, especially in endemic species: 430 species of plants have been recorded in the site, 85% of them endemic (PNM, 2000). The region is one of semi-arid to warm sub-humid vegetation. The dominant vegetation is typical of the calcareous karst of western Madagascar: dense dry deciduous forest dominated by *Dahlbergia-Commiphora* and *Hildegardia* communities with leguminous and myrtaceous species. There are extensive anthropogenic savannas throughout. In the tsingys there are islets of vegetation within the stone forests and humid evergreen forest occurs in sinkholes, canyons and river galleries in the west. There have been few studies, and the flora is not well known. Many species are unique to this formation, including west coast ebony *Diospyros perrieri*, *Delonix regia* (VU), and *Musa perrieri*, the only wild banana in Madagascar. Baobabs *Adansonia digitata* are found here, and xerophytes such as species of *Aloe*, *Euphorbia*, *Kalanchoe* and *Pachypodium*. Other notable families include Flacourtiaceae, Orchidaceae, Annonaceae, Bombacaceae and Moraceae. The aquatic *Aponogeton fenestrata* occurs in some of the rivers.

FAUNA

Madagascar has a relatively low number of mammal and bird species but among these there is a very high degree of endemism. The fauna of the region has not been studied in detail and further study may reveal more species. The catlike viverrid fossa *Cryptoprocta ferox* (EN) with 11 species of lemur, 13 amphibians and 50 reptiles are found in the area. The 11 or more species of lemur include Verreaux's sifaka *Propithecus verreauxi deckeni* (VU), Coquerel's mouse-lemur *Mirza coquereli* (VU), western woolly lemur *Avahi occidentalis* (VU), western gentle lemur *Hapalemur griseus occidentalis* (VU), pale fork-marked lemur *Phaner furcifer pallescens*, brown lemur *Eulemur fulvus rufus*, Milne-Edwards sportive lemur *Lepilemur edwardsi*, fat-tailed dwarf lemur *Cheirogaleus medius* and grey mouse-lemur *Microcebus murinus*. There is an unconfirmed report of aye-aye *Daubentonia madagascariensis* (EN) being seen just outside the reserve near Bekopaka. Other species include the Malagasy ringtailed mongoose *Galidia elegans occidentalis* (VU) and the endemic nesomyine rodent *Nesomys rufus lambertoni*, a subspecies which may warrant full species status since Tsingy is the only protected area where it is known. It is also the only known location for the Antsingy leaf chameleon *Brookesia perarmata* (VU), recorded from a few specimens only and threatened by habitat destruction and poaching for sale.

90 species of bird are known from the site, 39 being endemic to Madagascar (PNM, 2000). They include the Madagascar fish eagle *Haliaeetus vociferoides* (CR), Madagascar harrier *Circus macroscyles* (VU), Madagascar marsh harrier *C. maillardi*, Madagascar sparrowhawk, *Accipiter madagascariensis*, Henst's goshawk *Accipiter henstii* and Schlegel's asity *Phillipitta schlegeli*, giant coua *Coua gigas*, Coquerel's coua *C. coquereli*, redcapped coua *C. ruficeps* and sickle-billed vanga *Falcullea palliata*. This is the only western dry forest site known for the Kiolooides grey-throated rail *Canirallus kiolooides*. Occasional visitors to the river valleys from the wetlands just west of Bemaraha might include Madagascar grebe *Tachybaptus pelzelinii* (VU), Madagascar heron *Ardea humbloti* (EN), Madagascar pond-heron *Ardeola idae* (EN), Madagascar crested ibis *Lophotibis cristata* and Madagascar teal *Anas bernieri* (EN),

CULTURAL HERITAGE

A number of ancient cemeteries occur on the plateau and in a cave in the Manambolo Gorge which has petroglyphs doubtfully attributed to the proto-Malagasy Vazimba people.

LOCAL HUMAN POPULATION

The local people are the Sakalava du Menabe. At the time of designation several families lived within the Reserve illegally, and many parts of the site, especially in the centre and southwest, are still heavily affected by the incursions and activities of people living nearby, especially by cattle-grazing.

VISITORS AND VISITOR FACILITIES

Eco-tourism could potentially be important in this region, although access to the Strict Nature Reserve is currently limited except for scientific purposes and guided tours. There is a good network of access tracks. Visitation is restricted to short day and overnight guided trips to caves and pinnacles from the adjacent village of Bekopaka in the south or to the forests in the north from the nearby town of Antsalova and other villages. The southern margin and gorges can be approached by canoe along the Manambolo river, and the north by canoe on the river Tsiribihima. May to October is the season to escape the regular floods. The nearest large hotels are in Morondava 150 km to the south where there is an airport. There are also air-strips for light aircraft at Antsalova and Bekopaka. There are guesthouses and campsites at Bekopaka and Andoany, and bungalows on the Manambolo (PNM,2000).

SCIENTIFIC RESEARCH AND FACILITIES

Little work has been done in the region apart from a few collecting expeditions. The Reserve was surveyed in the 1930s, the vegetation was reported on around 1970 and there were studies of the lemurs and birdlife during the 1990s. Studies of prosimians made in similar forests in other areas are reported on by Petter *et al.* (1977) and Charles-Dominique *et al.* (1980), and of birds by Milon *et al.* (1973). In mid-2005 DEFRA (U.K.) initiated a 3-4 year study of small vertebrates. The Tsingy is considered an important area to research, but there are some 25 other areas to which the government assigns even higher priority. There are no research facilities.

CONSERVATION VALUE

This remarkable karst landscape of pinnacles is a refuge for rare and endangered species, especially lemurs. Its dense dry deciduous forests are characteristic of the western Madagascar limestone plateaux and because of its inaccessibility, large size and relatively low surrounding population, the Reserve is the single most biologically important protected area in western Madagascar (IUCN,1990). It is also the principal source of water for much of the surrounding region (Nicoll & Langrand, 1989). It lies within a Conservation International-designated Conservation Hotspot, a WWF Global 200 Eco-region, a WWF/IUCN Centre of Plant Diversity and is one of the world's Endemic Bird Areas.

CONSERVATION MANAGEMENT

The Reserve is the largest in Madagascar and, as in other special reserves, hunting, fishing, grazing the collection of natural resources and the introduction of animals is forbidden. There is a need for a masterplan covering ecotourism and rural development as well as conservation. A WWF project to improve protected area management within the country made several recommendations on management of the area (Nicoll & Langrand, 1989). A national workshop on the conservation of the Reserve recommended the development and implementation of a management plan as the main priority. This plan should define the objectives of the Reserve and review its management (Gouvernement Malgache,

1989). The nomination states that the forests and lakes west of the Reserve are diverse enough to justify protected area status.

MANAGEMENT CONSTRAINTS

The pinnacle region to the south is relatively well protected through its barrenness and inaccessibility, but the rest of the Reserve is often seriously threatened by fire. Several tracks traverse the Reserve or run north-south through it, and fires are set along them throughout the dry season as right of passage along these paths is legally recognised. In addition to grassland burning, forest edges are deliberately damaged or destroyed by fire, and rocky areas are frequently burnt, denuding the surface, to allow cattle access to the sparse grass between exposed blocks of limestone. Forests on buffer areas in the north and east are being pushed back and village agriculture on the eastern boundary has encroached into the Reserve. Cattle damage also occurs throughout much of the accessible forest, and may locally reduce regeneration. Charcoal burning is a problem and some timber exploitation occurs near the villages, but its effects appear to be limited, as do the effects of hunting. An abandoned all-weather oil exploration service road from Antsalova penetrates approximately 30 km into the Reserve, crossing the Tsingy, opening the forest up to selective logging and wood-cutting. This access could be of value to the Reserve's management, but is currently heavily used in the dry season by villagers entering the Reserve for building and fire wood, medical plants, honey and hunting, as well as providing easy access for their cattle.

Despite the age of the Reserve, no comprehensive resource inventory is available, there is no management plan or zoning, there are no facilities, boundaries are not marked, and there is no resident staff or budget. No effort is made to patrol the Reserve or prevent legal infractions, including burning. This is partly a result of its relatively large size, but also because there are insufficient personnel and a lack of transport and camping equipment. In addition, no public awareness or education programmes have been instigated in surrounding settlements in any attempt to reduce damage to the Reserve, and it is likely that most people in the region do not realise that it exists. However, forest plants and fauna continue to be collected for commerce and lemurs are hunted. Despite these problems, Petter and Rajery (1987) indicate that the degradation of the natural environment is considerably less than in many other regions of Madagascar, and that the potential is high.

STAFF

The *Chef de la Réserve* lives in Antsalova. At least one auxiliary guard lives in Bekopaka.

BUDGET

Little information is available. Studies have been funded by the E.U, and in 2005 DEFRA (U.K.) initiated a £161,000 (US\$280,000) research grant.

LOCAL ADDRESSES

Service de la Protection de la Nature, Direction des Eaux et Forêts, B P 243, Antananarivo 101, Madagascar.

Parcs Nationaux de Madagascar, Direction des Eaux et Forêts, B P 243, Antananarivo 101.

Service Provincial des Eaux et Forêts, B.P. 27, Mahajanga

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