

## World Heritage Sites

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## GUNUNG MULU NATIONAL PARK MALAYSIA

*Gunung Mulu National Park is the most intensively studied area of tropical karst in the world. It is dominated by Gunung Mulu, the second highest mountain in Sarawak, and is exceptionally scenic, with rainforested mountains, wild rivers in deeply-incised canyons, sheer limestone pinnacles, long cave passages and immense caves. Its 295 kilometres of caves show classic underground geomorphological features which reveal an evolutionary history of more than 1.5 million years. They include one of the world's finest examples of collapse in karst terrain and the Sarawak Chamber, the largest cave chamber known. Both above and below ground the Park has a wide range of endemic animals and plants in seventeen vegetation zones. The caves house millions of swiftlets and bats and provide outstanding scientific opportunities to study the origins of cave faunas.*

### COUNTRY

Malaysia

### NAME

Gunung Mulu National Park

### NATURAL WORLD HERITAGE SITE

2000: Inscribed on the World Heritage List under Natural Criteria vii, viii, ix and x.

### STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]

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

#### Justification for Inscription

**Criteria (vii), (viii), (ix) and (x):** The concentration of caves in Mulu's Melinau Formation with its geomorphic and structural characteristics is an outstanding feature which allows a greater understanding of Earth's history. The caves of Mulu are important for their classic features of underground geomorphology, demonstrating an evolutionary history of more than 1.5 million years. One of the world's finest examples of the collapse process in Karstic terrain can be also found. GMNP provides outstanding scientific opportunities to study theories on the origins of cave faunas. With its deeply-incised canyons, wild rivers, rainforest-covered mountains, spectacular limestone pinnacles, cave passages and decorations, Mulu has outstanding scenic values. GMNP also provides significant natural habitat for a wide range of plant and animal diversity both above and below ground. It is botanically-rich in species and high in endemism, including one of the richest sites in the world for palm species.

### IUCN MANAGEMENT CATEGORY

II National Park

### BIOGEOGRAPHICAL PROVINCE

Borneo (4.25.13)

### GEOGRAPHICAL LOCATION

The site is in the mountains of northern Sarawak and a part borders the state of Brunei about 100 km south of Bandar Seri Begawan the capital. It lies between the headwaters of the Tutuh River and the Medalam River, a tributary of the Limbang River, between 3°56' to 4°16'N and 114°47' to 115°00'E.

### DATES AND HISTORY OF ESTABLISHMENT

1974: The National Park created under Notification 2852 of the National Parks Ordinance of 1956;

1984: Designated an ASEAN Heritage Park;

1985: The Park opened to the public;

1998: A governing Ordinance under the Sarawak State Parks Act superseded the national legislation.

## **LAND TENURE**

State owned.

## **AREA**

52,864 hectares. The Medalam Protected Forest (12,500 ha) in Sarawak and the extensive lowland Labi Forest Reserve in Brunei are contiguous.

## **ALTITUDE**

28m to 2,376m above sea level (Gunung Mulu, the second highest mountain in Sarawak).

## **PHYSICAL FEATURES**

The Park consists of a western lowland (38% of the area) and an eastern mountain section of two northeast-southwest ranges, limestone and sandstone, lying parallel in the geosynclinal belts of northwest Borneo which contain all the major lithological units of the country (Sweeting *et al.*, 1980). Its landforms include rugged summits, steep ridges and escarpments, sheer cliffs, gorges, karst towers, caves and terraces, hot springs on the Terikan River, floodplains and many waterfalls, particularly in Melinau Paku valley. Gunung Mulu itself is a high pinnacle of sandstone karst and the parallel limestone ranges are said to be the most cavernous mountains in the world with pinnacle karst larger in scale and in more natural condition than the stone forest of Lunan in southwest China.

The geology consists of a slightly metamorphosed sedimentary sequence of Palaeocene-Miocene age. Much of the 2,376m mountain is formed of the 4,000-5,000m thick Mulu Formation of Palaeocene-Upper Eocene interbedded sandstone and shales which emerge over the whole southwest of the Park. Parallel on its western flank is the 40-km long range of karstic limestones forming the Southern Hills and the three peaks of Gunung Api (1,750m), Gunung Benarat and Gunung Buda, separated by the Melinau and Medalem gorges respectively. This formation is younger, dating from the Upper Eocene-Lower Miocene, and is over 2,000m thick. It is in this band that the vast cave system developed. The limestone is extremely pure white or grey calcitite massively bedded and jointed. 900m up the north side of Gunung Api is a mass of 50m-high grey blade-edged pinnacles, spectacular remnants of extreme weathering. The Setap Shale Formation which dates from the Middle to Upper Miocene forms a line of hills in the northwest of clay-shales in the valleys and siltstones and quartzite sandstone on the scarps. Soils range from peaty-podzolic through red-yellow podzolic to a shallow black organic soil overlying limestone and a humus podzol.

The Park's wealth of caves is a result of geological uplift of the karst 2-5 million years ago, and the still very active erosion of the karst by water. A result of the complex alluvial history of the Melinau river and its tributaries has been the development of passages at many levels. The caves are superb examples of tropical river caves, and some are the largest found anywhere in the world. They reveal classic features of underground geomorphology over a period of more than 1.5 million years: sequences of flood wall notches and layered sediments, also elliptical tubes linking different levels, and speleothems which include spectacular examples of argonite and calcite needles. Over 295 kilometres of cave passages have been explored and mapped, a number of them globally unique. Deer Cave (*Gua Payau*) 120-150m wide is the world's largest natural passage cave. On the southeast slope of Gunung Api, the Sarawak Chamber (*Gua Nasib Bagus*) is the world's largest natural cavern. It measures 600m long, 415m wide and 80m high and could contain 16 football fields. The Clearwater Cave system is 108 km long, and may be the eleventh longest cave system in the world; it contains the longest cave in Asia and the largest windblown stalactite (>1m long). Stromatolites are common at all the cave entrances. Exploration of the cave systems is ongoing.

## **CLIMATE**

The climate is dominated by the Indo-Australian monsoon system, with the wet northeast monsoon from December to March and the slightly drier southwest monsoon from May to October. Rainfall is generally high, with seasonal averages ranging between 4,000 and 5,000mm. It shows distinct seasonality, being highest in April-May and October-November, and lowest between August and September though there is no marked dry season. Mean and maximum temperatures in the Melinau lowlands range from 23°C to 26°C and on Gunung Mulu between 14°C to 18°C.

## VEGETATION

These mountains of montane vegetation resemble islands in a sea of dipterocarp forests. Lowland forests cover 40% of the park area and montane forests 20% (IUCN, 2000). The steep altitudinal gradient creates a wide range of microclimates and soil and seventeen vegetation zones are recognised with over 3,500 plant species and 1,500 flowering plants. Although the vegetation is mostly tropical forest, it ranges from lowland peat swamp to stunted summit scrub. The vegetation in the alluvial plain is the Park's most complex formation, with lowland alluvial forest, tropical heath forest, peat swamp and riparian forest. In the peat swamps strangler fig trees are common. Some emergent species there are 40m high, with maximum girths of 250m and massively buttressed trunks.

On the Gunung massif the multi-storied mixed lowland dipterocarp forest, one of the most diverse in Malaysia, grows up to 800m: in three plots totalling 1.2 ha, 284 tree species have been measured. Common species include *Shorea*, *Durio*, *Garcinia*, *Calophyllum* and *Eugenia* which are becoming endangered elsewhere in Sarawak as a result of rapid deforestation for palm-oil plantations. Between 800m and 1,200m the lower montane forest is dominated by *Quercus subsericea*. Upper montane forest displaces it between 1,200 and 2,170m although this is further sub-divided with altitude into tall facies, short facies and the stunted summit facies. The canopy is between 10 and 20m and epiphytes become more abundant. The small tree and shrub layer has four species of *Rhododendron* and *Vaccinium* and the pitcher plants *Nepenthes lowii*, *N. tentaculata* and *N. Muluensi*, all endemic to Gunung Mulu.

On the Melinau limestone substrates montane conditions occur at lower elevations. Many types of limestone forest with many endemic calcareous species grow there. These include scree forest, cliff vegetation, lowland montane forest, upper montane forest and cave vegetation. The limestone flora is one of the most diverse and best preserved in southeast Asia. Examples of such species include Gesneriaceae such as *Monophyllae beccarii*, *M. horsfieldii*, *Cytandra* spp., and the palm *Calamus neilsonii*. The endemic palm *Salacca rupicola* occurs on limestone ledges and sills.

Gunung Mulu National Park is one of the richest sites in the world for palms with 111 species and 20 genera recorded. Notable species are wild sago palm *Eugeissona utilis*, occurring on the steep slopes of Gunung Mulu, *Iguanura melinauensis* and *Licuala lanata* which are endemic to the alluvial plain, and *Areca abdulrahmanii*, which grows on the Setap shales. 170 species of orchids, 10 species of pitcher plants, 1,700 species of liverworts and mosses and some 8,000 types of fungi are recorded. Endemic mosses include *Stereodontopsis flagellifera*, *Coryphopteria andersonii*, *Hyphodendron beccarii* and *H. vitiense*. The very rare bog-moss *Sphagnum perichaetiale* can be found in rain gullies in the high forest. There is also a great number of spore-producing Pteridophytes; 442 species have been identified to date, many of which are ferns. A floral inventory is given in Anderson *et al.* (1982).

## FAUNA

A wide range of animals is recorded, including 200 species of cave fauna: 81 mammal species, 270 birds, 55 reptiles, 76 amphibians, 48 fish and some 20,000 invertebrates, including 281 species of butterflies and 458 species of ants. This is certainly less than the total number of species present.

The mammals include Sunda pangolin *Manis javanica* (EN), 28 species of bats, two endemic Borneo squirrels, tufted ground squirrel, *Rheithrosciurus macrotis* (VU), and least pigmy squirrel *Exilisciurus exilis* and the smallest mammal in the world, the Savi' pigmy shrew, *Suncus etruscus*, weighing only 2 grams. Mammals include silvery Javan gibbon *Hylobates moloch* (EN), grey-leaf and maroon-leaf monkeys *Presbytis hosei* and *P. rubicunda*, western tarsier *Tarsius bancanus* (VU), greater slow loris *Nycticebus coucang* (VU), Malayan sun bear *Helarctis malayanus euryspilos* (VU), yellow-throated marten *Martes flavigula*, palm civet *Paradoxurus hermaphroditus*, sambar *Rusa unicolor* (VU) and muntjac *Muntiacus muntjac*. Deer Cave contains 12 species of bats, the largest number in any cave, and approximately three million wrinkle-lipped free-tailed bats *Tadarida plicata* live there in one of the world's largest colonies of free tailed bats. The Malayan tail-less leafnosed bat *Coelops robinsoni* (VU) and the bronze tube-nosed bat *Murina aenea* (VU) have not been seen anywhere else in Borneo. At dusk every day, from some cave mouths millions of bats stream out to forage at the same moment as the great flocks of swallows and swiftlets return to them. At dawn, the reverse occurs.

270 species of birds (37% of Malaysia's total) have been recorded in the Park, including 26 of Borneo's 29 endemics. 171 of the lowland species are not found above 900m and over 1,300m only 12 species are found (Loucks, 2001). Notable species include Storm's stork *Ciconia stormi* (EN), Kinabalu serpent-eagle *Spilornis kinabaluensis* (VU), Wallace's hawk-eagle *Nisaetus nanus* (VU),

wattled pheasant *Lophura bulweri* (VU), crestless fireback *L. erythrophthalma* (VU), black partridge *Melanoperdix niger* (VU), large green pigeon *Treron capellei* (VU), short-toed coucal *Centropus rectunguis* (VU), blue-banded kingfisher *Alcedo euryzona* (VU), straw-headed bulbul *Pycnonotus zeylanicus* (VU), hookbilled bulbul *Setornis criniger* (VU), Bornean wren-babbler *Ptilocichla leucogrammica* (VU) and largebilled blue flycatcher *Cyornis caerulatus* (VU). There are also all eight of Sarawak's hornbills including the near threatened wrinkled *Aceros corrugatus*, helmeted *Rhinoplax vigil* and rhinoceros hornbills *Buceros rhinoceros*. Several million cave swiftlets *Collocalia linchi*, the largest colony in the world, have been recorded from one cave. This is the species whose nests are harvested. The other cave fauna is abundant, with over 200 species recorded, many being endemic, and 41 being on the list of endangered species. Many of the invertebrates are endemic to the site and the Lepidoptera are represented by 80 percent of Borneo's recorded species.

Among 25 snake species are regal python *Python reticularus*, and the reed snakes *Calamaria borneensis* and *C. melanota*. Poisonous snakes include the striped coral snake *Calliophis intestinalis*, the red headed krait, *Bungarus flaviceps* and the white-spotted cat snake *Boigo drapiezii*. 27 species of lizard have been recorded. Two-thirds of all known Bornean amphibians are found on the site, including Wallace's flying frog *Rhacophorus nigropalmatus*, *Philautus erythrophthalmus* (VU) which breeds only in the fluid of a pitcher plant, and hole-in-the-head frog *Huia cavitympanum* which lives in rushing streams and is capable of ultrasonic vocalisation (Arch, 2008). The insects are especially abundant and diverse. Faunal inventories are given in Anderson *et al.* (1982) and the nomination document.

### CONSERVATION VALUE

The site provides unique tropical cave, karst features and ecosystems in a relatively undisturbed state alongside a diverse assemblage of plants and animals showing very high endemism, all valuable for baseline ecological studies of the humid tropics. The Park lies within a Conservation International-designated Conservation Hotspot, a WWF Global 200 Freshwater Eco-region, a WWF/IUCN Centre of Plant Diversity and a BirdLife-designated Endemic Bird Area.

### CULTURAL HERITAGE

Excavations from Wind Cave by the Sarawak Museum have revealed artefacts and human remains believed to date between 3000 to 500 years old. The cave may have been used as an ancient burial site, many artefacts being identical to those found at similar sites in the region. The Punan and Berawan indigenous people who live beside the boundaries retain both hunting and collecting privileges. The tribesmen wear traditional feather hats, loincloths and tattooed arms, chest and necks. Some women carry small tattoos on their bodies, others have earlobes elongated to their shoulders

### LOCAL HUMAN POPULATION

Amongst the local inhabitants are the Orang Ulu, Kiput, Kenyah, Kayan, Mulut and Punan tribes. The Punan people are semi-settled and nomadic groups living next to the Park and two of their long houses exist on the southwest perimeter at Batu Bungan and Long Iman. A small nomadic group of the tribe lived in the eastern Park but some 300 more have rights to gathering and pig and deer hunting in subsistence hunting zones within the boundaries.

### VISITORS AND VISITOR FACILITIES

Over 15,000 tourists visit Gunung Mulu National Park annually, fifty percent being foreigners. All visitors need a permit to enter the Park, and must be accompanied by a Park guide. They are not allowed to enter the traditional use and wilderness zones. The Park Headquarters on the left bank of the Melinau River in the southwest include a visitor registration building, interpretation centre, audio-visual room and washroom facilities. Only four easily explored caves are shown to the public: Clearwater, Wind, Deer and Lang's caves. They have been developed with cement and timber walkways and electric lighting. For the show caves, group size is limited to ten, visiting at 20 minute intervals. Seven wild cave trails are also open to groups of six for adventure caving if guided and properly equipped. 37.9 kilometres of hiking trails have been developed in the Park where additional facilities are located. There is a 480m skywalk through the canopy. The popular trail to the pinnacles is not easy. The long trail to the summit is dotted with wooden shelters. Also possible are rock climbing, kayaking and mountain biking. Accommodation includes the 188-room Royal Mulu Resort - an air-conditioned longhouse, a guest house, four cabins and a hostel, all near the Park entrance. Road access is not possible. The Park is reached by air from Miri, 100 km northwest, Limabang or Bandar Seri Begawan, also by a day-long boat trip up the Baram and Tutuh Rivers from Marudi.

## **SCIENTIFIC RESEARCH AND FACILITIES**

Botanical collections have been made in the area since 1961, specimens from which are housed in the Forest Herbarium at Kuching. The 1.5 million years of layered sediment sequences and flood wall notches are a valuable data source for geo-climatic fluctuations during the Pleistocene, and the hill foot caves demonstrate the processes of lateral planation in karst (IUCN, 2000). The combination of alluvial, sandstone and limestone ecosystems is unique in southeast Asia and provides opportunities to understand long-term ecosystem dynamics, landscape ecology and the impacts of visitors on tropical protected areas. Caving expeditions started in 1977-78 when the Royal Geographical Society made a 15-month long expedition to the Park, discovering and surveying over 44 caves in the southern section with almost 200 km of passages - probably less than a third of all the caves in the mountains. Substantial research has been done on prehistoric remains and into cave fauna, providing valuable insights into troglodite food-webs and ecosystem processes of the humid tropics of southeastern Asia.

## **MANAGEMENT**

The first two management plans were compiled from 1982 on, by the Royal Geographical Society and the Sarawak Forest Department. An updated integrated development and management plan was prepared in 2000, implemented by a joint management committee headed by the Sarawak State Secretary and involving local stakeholders such as the indigenous Berawan and Penan and other communities. These have hunting, fishing and resource-use rights accorded when the National Park was created. Their leaders are members of a Special Park Committee, and Park staff are drawn largely from their tribesmen (UNESCO, 2010). Under the management Plan high density, low density, traditional use and wilderness zones were designated. High density zones are concentrated around the Park Headquarters, the four show caves and four others. Small visitor groups are restricted to paths; strict rules for behaviour are imposed to minimise disturbance to the caves and their fauna. Low density zones include the trails and caves open for adventure caving. The carrying capacity for both zones is held at 60 people per day. Traditional zones are for subsistence hunting and gathering of forest produce. Wilderness zones include 95% of the site's caves. The general public is not allowed access to either zone, and research is only allowed with permission from the Director of Forests.

Extensions to the site totalling 45,747 ha have been proposed by the state government: the Medalam extension to the north in a new Gunung Buda National Park covering 6,235 ha which will enclose important caves; the Ubung extension on the eastern boundary protecting the Tutuh River covering 16,177 ha, and the Lutut extension on the western boundary which will protect the Lutut River, a tributary of the Melinau. If designated, these areas would form buffer zones for the Park. Five potential dam locations next to or near the Park were identified in the 1980s but the projects will not be built if they might jeopardise the property (UNESCO, 2010).

## **MANAGEMENT CONSTRAINTS**

Potential threats to the integrity of the site come from development next to the boundaries and logging which silts the rivers and by degrading the forest creates a more fire-prone landscape. Some logging has occurred just inside the boundary but is hard to detect. Such development in and outside the Park has resulted in pollution of parts of the Melinau River and severe riverbank erosion due to forest clearance for housing and rice cultivation. The Park management authority realises that there is a need to increase foot and helicopter boundary patrols by up to four times a year. During 1997-1998 there were substantial man-made forest fires in Sarawak, set by local farmers and aggravated by a severe drought caused by El Niño. Gunung Mulu was not affected by this but natural forest fires destroyed a considerable area of Gunung Api, Gunung Benarat and Gunung Buda in 1997. Such natural fires have historically played an important role in the regeneration of the area's vegetation. Other natural disturbances such as flooding, damage to the forest by tropical storms and landslides also occur periodically.

In June 2008, local conservationists warned that the Sarawak State Government had planned hydropower projects for 2008-2020 including the Tuoh dam which would flood part of the property, lands of the indigenous Berawan communities. As the state government is not required to submit a Federal Environmental Impact Assessment (EIA) no public consultation is to take place. Conflict has also developed between the Berawan, the site management and tourism developers over lack of compensation for traditional land taken to expand a hotel and for development in adjacent lands, and because they will not be employed as tourist guides or share in the benefits of tourism and World Heritage designation (UNESCO, 2009).

## STAFF

Where possible, staff have been recruited directly from the local community, including the Punan and Berawan indigenous groups. The Park in 2000 employed 47 people, 40 of whom were local. In 2009, there were 94 members of staff, 84% from the local communities who provided 74% of the park guides. (UNESCO, 2010)

## BUDGET

In 1998 over US\$157,916 per year was spent by the government on salaries and local contracts. Additionally, US\$394,789 was spent on redevelopment and maintenance projects in the Park.

## LOCAL ADDRESS

The Director of Forests, Bangunan Wisma Sumber Alam, Jalan Stadium, Petra Jaya, 93660 Kuching, Sarawak, Malaysia.

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The principal source for the above information was the original nomination for World Heritage status. The 1982 Management Plan has an exhaustive list of references.

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## **DATE**

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