

Gunung Mulu National

Clive Jermy

In 1977/78 the Royal Geographical Society sent one of the largest expeditions it has ever mounted to Sarawak to study and survey the newly gazetted Gunung Mulu National Park. The expedition was carried out with the full cooperation of the Sarawak Government particularly the Forest Department under whose care the National Parks in Sarawak reside. Over a period of 15 months 115 scientists spent 10,000 man-days in this wonderfully rich area: over 2500 plants have been identified, 60 mammals, including the world's smallest, Savi's pygmy shrew, over 260 birds, including all Borneo's eight hornbill species, and 320 fish. Insects may number 12,000 species and fungi over 8000.

Gunung (Mount) Mulu, at 2376 m, is the second highest mountain in Sarawak. A sandstone and slate block, highly dissected by many small streams and gullies, with two adjacent limestone mountains, Gunung Api and G. Benarat, it is of outstanding interest, and has high potential as a national park. Gazetted by the Sarawak State Government in October 1974, and covering 52,864 ha (204 sq miles), it was at that time Sarawak's fourth and largest national park, and differed from the others—Baku, Niah and Lambir Hills—in that it was the home of some 300 nomadic Penan people, as well as being used for hunting by local Berawan, Kenyah and Kelabit peoples living near the park. The Penan move around the park in search of their staple food, the

wild sago palm *Eugeissona utilis*. They also hunt wild pig *Sus barbatus*, sambhur deer *Cervus unicolor*, barking deer *Muntiacus muntjak*, mouse-deer *Tragulus cf. javanicus*, and leaf monkeys *Presbytis* spp., macaques *Macaca* spp. and the Bornean gibbon *Hylobates muelleri*. They collect nuts and fruits, and also rattans, *Calamus* spp., to make baskets and sleeping mats. Two adult Penan who visited the Kuching Herbarium and Arboretum identified with vernacular names some 50 palms and a similar number of trees (Kedit, 1982). Their knowledge and use of the forest is considerable; they are in fact an integral part of the ecosystem and, because their present and future lives depend on it, they crop these natural resources sensibly. Using the traditional blowpipe, they hunt for food and not for sport, killing old and infirm animals rather than young breeding adults. It is important for these people that the National Park Declaration allows for them to continue their traditional ways of hunting pig and deer and also collecting jungle produce and plant foods. Other tribes are also allowed to hunt deer and pig in traditional ways, but only within the catchment of the river valleys where they live.

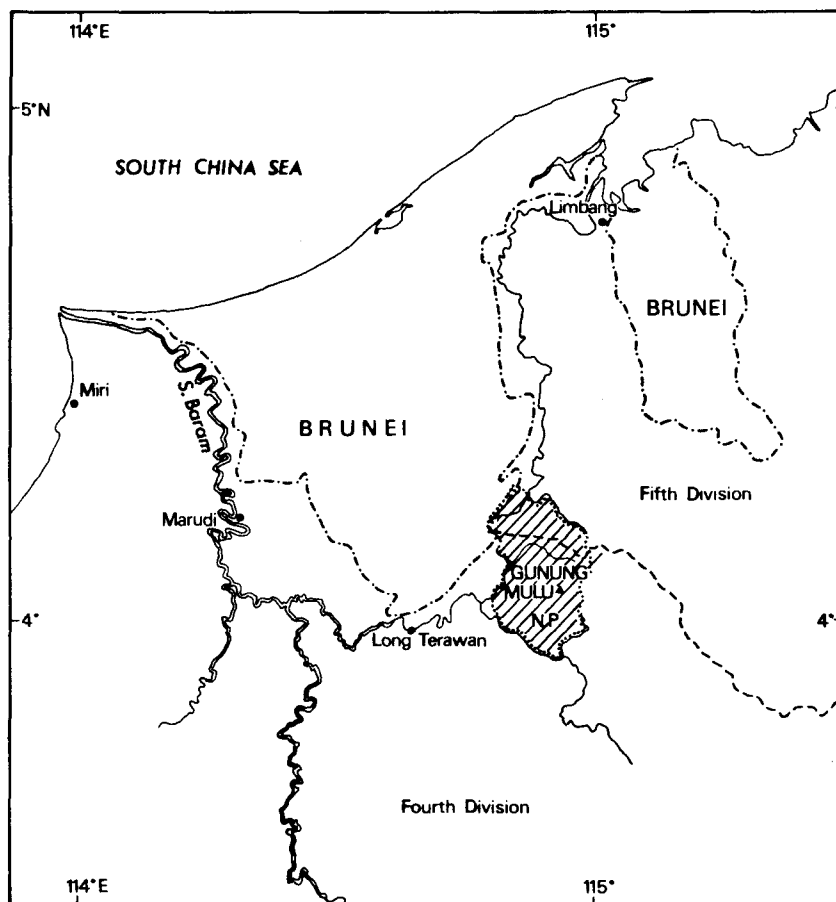
The rocks of Gunung Mulu were laid down in Tertiary times, folded into the present form in the Pliocene and later uplifted. The park is crossed in a NNE–SSW line by a mountainous block of hard limestone, over 2000 m thick, thinning to nothing at either end. This is the highest limestone between North Thailand and New Guinea, and it has spectacular gorges and cliffs, pillar and pinnacle karst formations, and some of the largest underground caverns and cave-systems so far discovered anywhere in the world. Vegetation ranges from lowland through to upper montane

Park, Sarawak



Gunung Mulu: lower montane forest (*Clive Jermy*).

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forest and ericaceous shrubbery, with endemic screwpine *Pandanus leptophilus* on the summit ridges. Gesneriads, especially *Monophyllaea* with its characteristic single spathe-like leaf, adorn the wetter cliffs, and seven of the eight species here are newly described and not known anywhere else.

The floodplains of the Melinau, Tarikan and Medalam rivers are covered with more or less uniform alluvium and a rich alluvial forest in which the Bornean ironwood *Eusideroxylon melangakai*, which may exceed 250 cm girth, and other dipterocarps are common. Riparian vegetation includes species characteristic of unstable and disturbed conditions, such as *Macaranga* spp., ebony *Diospyros diepenhorstii*, and two fast-growing industrial timbers, *Octomeles sumatrana* and *Pometia pinnata*, and also the river sentul *Sandoricum borneense*, an endemic fruit tree, whose seeds are said to be swallowed and dispersed by fish. There is an abundance of enormous large-leaved banyans surviving after the total disappearance of their

host; figs provide abundant food for arboreal vertebrates and ground dwellers such as bearded pig.

In the north-west of the park, Pleistocene terraces of white sand bear a tropical heath or *kerangas* forest of mainly medium or small straight pole-like trees mostly under 200 cm in girth. Palms, pandans and pitcher plants are frequent and the lower tree-boles are covered in moss. In places, a higher forest is found with *Shorea albida*, *Casuarina nobilis* and *Agathis dammara* as principal dominants. Here too, between the Tarikan and Medalam rivers, is a peat swamp forest which is similar in structure to the vast coastal swamp forests found elsewhere in Sarawak.

The lower slopes of Gunung Mulu are predominantly a mixed dipterocarp forest. On the steeper slopes the soils may be low in nutrients, but the forest soil is rich: in three sample plots, totalling 1.2 ha, 284 species of trees were recorded exceeding 30 cm girth. At 800 m the lowland dipterocarp forest passes through a more

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Limestone pinnacles tower 30 m above the forest canopy on Gunung Api, Gunung Mulu N.P. (Clive Jermy).

or less broad transitional zone to lower montane forest and nowhere on the mountain are boundaries well demarcated. The slopes lead up to spurs which bear dense root-matted, reddish-brown, raw humus and a flora which is structurally between mixed dipterocarp forest and *kerangas*. At 1200 m upper montane forest appears on Mulu (see Table). Here there is a preponderance of the oak family (where *Lithocarpus hatuimae* is common) and the conifers *Dacrydium beccarii* and *Phyllocladus hypophyllus*. The summit is covered by a small-tree and shrub layer in which Ericaceae—pink *Diplycosia*, large salmon or orange-flowered *Rhododendron* and *Vaccinium*, with sprays of white bells—dominate, and the scrambling pitcher plants *Nepenthes lowii*, *N. muluensis* and *N. tentaculata* are obvious. The steeper land-slipped slopes are dominated by ferns *Dipteris novo-guineensis*, *Gleichenia* spp. and *Matonia pectinata*.

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The RGS expedition therefore had good baseline data for the comprehensive management and development plan that they were asked to draw up. After the national park was gazetted, the Forestry Department continued to survey the vegetation, and a VSO student who joined the team wrote a substantial report on the montane forests (Martin, 1977). The work of the expedition was divided into 50 projects (Hanbury-Tenison and Jermy, 1980) in five programmes: forest ecology and nutrient cycling; geomorphology and cave survey; botanical or zoological inventories; vegetation survey; and management plan. The first of a two-part Special Issue of the *Sarawak Museum Journal* has just been published giving a detailed account of this initial survey (Jermy and Kavanagh, 1982). The management plan recently cleared for publication is available at the RGS (Anderson *et al.*, 1982). What the survey showed above all was the wonderful richness of the park: an estimate of



Penan family group: these people are an integral part of the ecosystem; cropping the natural resources sensibly they hunt a variety of animals for food, collect fruits and nuts and harvest wild sago (*Nigel Winser*).

Table. Main vegetation formations seen in Gunung Mulu National Park (after Anderson and Chai, 1982)

Land type/altitude	Vegetation formation
1 Gunung Mulu sandstone/shales massif	
(i) Low altitude to 800 m	Mixed dipterocarp lowland forest
(ii) 800–1200 m altitude	Lower montane forest
(iii) 1200–1900 m altitude	Upper montane forest (tall facies)
(iv) 1600–2177 m altitude	Upper montane forest (short facies)
(v) 2177–summit	Upper montane forest (summit facies)
2 Limestone (Api/Benarat)	
(i) Scree slopes	Limestone scree forest
(ii) Cliffs	Limestone cliff vegetation
(iii) Slopes, low altitude to 800 m	Lowland limestone forest
(iv) 800–1200 m altitude	Lower montane limestone forest
(v) 1200–summit	Upper montane limestone forest
(vi) Caves	Limestone cave vegetation
3 Alluvial plains	
(i) Alluvium	Alluvial forest
(ii) Quaternary terraces	<i>Kerangas</i> (tropical heath) forest
(iii) Peat swamps	Peat swamp forest
4 Setap shales/Mentawai drainage	
(i) Setap shale formation	Mixed dipterocarp forest
(ii) Mentawai drainage	<i>Kerangas</i> (tropical heath) forest



The Base Camp for the 15 month multi-disciplinary scientific research project of the tropical rain forest, situated on the edge of Gunung Mulu National Park (Nigel Winser).



Nepenthes bicalcarata, a pitcher plant found in the peat forest (Clive Jermy).

20,000 animal species, mostly insects, possibly 3500 plants, half of them trees, and over 8000 fungi. Fruiting trees abound—e.g. 30 species of *Garcinia*, 50 of *Eugenia*—containing genes for possible desirable morphological characters, and also for the qualities that enable them to grow on marginal and relatively infertile land—the sort of land that may have to be utilised in the future. And some species will have useful pharmaceutical products. The expedition's forest ecology programme, under a full-time director, Dr J. Proctor, of Stirling University who was on site for the whole 15 months, compared the nutrient balance and litter and vegetation breakdown of four forest formations: lowland mixed dipterocarp, lowland limestone, alluvial and *kerangas*, investigating with Dr Jo Anderson of Exeter University the soil fauna and fungal flora that play an important part in litter breakdown. If Sarawak scientists can continue this work it could be valuable to land use studies and silviculture in Sarawak.

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Three other aspects should have priority in future scientific work. First, studies are needed of the animals and plants restricted to fragile habitats such as ridges, pinnacle zones and mountain tops, and it is important that the cutting of vegetation or collecting of flowers and fruit is strictly prohibited, especially along trails in the montane zones and limestone of Gunung Api, where the rhododendrons, pitcher plants and orchids are particularly attractive to visitors. These plants are also slow-growing, so that even occasional collecting could sometimes lead to extinction, as well as disturbing a fragile habitat.

Second, the effect of the Penan hunter-gatherers on the wild sago and larger mammals needs investigation. As forest around the park is felled and shifting cultivators invade, the nomadic Penan's territory decreases. More and more people will hunt and gather in the park, to the detriment of both the park ecosystems and the Penan. They are aware of this, and so is the Sarawak Government whose policy it is to encourage them to

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Nepenthes ampullacea, a pitcher plant common on the kerangas forest floor and often the home of mosquito larvae and frog tadpoles (*P. Leworthy*).



Coelogyne muluensis, an orchid recently described from the montane forest (*Mark Collins*).

settle. But settlement and cultivation are alien to them. They are an integral part of the forest ecosystem and their effects, both good and bad, need to be studied.

Third, the limestone caves are some of the most spectacular and outstanding anywhere in the world (Brook and Waltham, 1978; Eavis, 1981) and speleologists throughout the world will want to visit them, but cavers themselves and their research projects need to be strictly monitored if damage is to be avoided.

Gunung Mulu is closed to visitors for the foreseeable future, but the most significant future development will be the construction of the north-east link of the Pan-Sarawak Highway from Beluru to Limbang which must pass *through* the park. This will totally change the access, and long-term development must be framed with the road in mind. The road will be an asset only if the Director of the Forest Department is fully consulted about its route through the park, if its construction is controlled to minimise damage, and if park regulations are fully respected. Further, once the road is established strict patrolling must be maintained to keep out shifting cultivators.

The RGS survey showed that the park's alluvial forest contains the richest and most varied communities, but that many species exist at very low density. Hence comparatively large areas are needed to support populations adequate to ensure their survival. This is true particularly of the larger vulnerable animals—bear, deer, hornbills—but also applies to many smaller creatures

and to many plants, including the specialised herbaceous groups of high interest. It is doubtful if the present comparatively small area of this habitat is sufficient, and a 12,500 ha extension is proposed in the north-east of the park. This contains a broad band of alluvial forest together with a magnificent limestone hill, Bukit Buda, the most north-easterly part of the Melinau limestone massif. The area is already a legally constituted Government reserve—the Medalam Protected Forest—and it is very much hoped that the Sarawak Government will enhance its good record and consolidate the value of Gunung Mulu National Park.

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