

# *Chapter 1*

## **INTRODUCTION**

### **Sarawak's Legislative Framework for Conservation**

Fringing the western coast of the Island of Borneo, the Malaysian State of Sarawak occupies a land area of some 12.4 million ha. Its capital city Kuching is situated just several degrees north of the equator. Its common border with Kalimantan Indonesia consists of a long range of rugged mountains that runs through the heart of the island in southeast-northeast direction. Its northern neighbours are Brunei Darussalam and the other East Malaysian State of Sabah.

Sarawak is blessed with rich forest resources that have played a key role in the economic development process especially in the past five decades. Forest Department Sarawak, established in 1909, is responsible for the overall management of the forest resources. The Statement of Forest Policy for forest management was introduced in 1955.

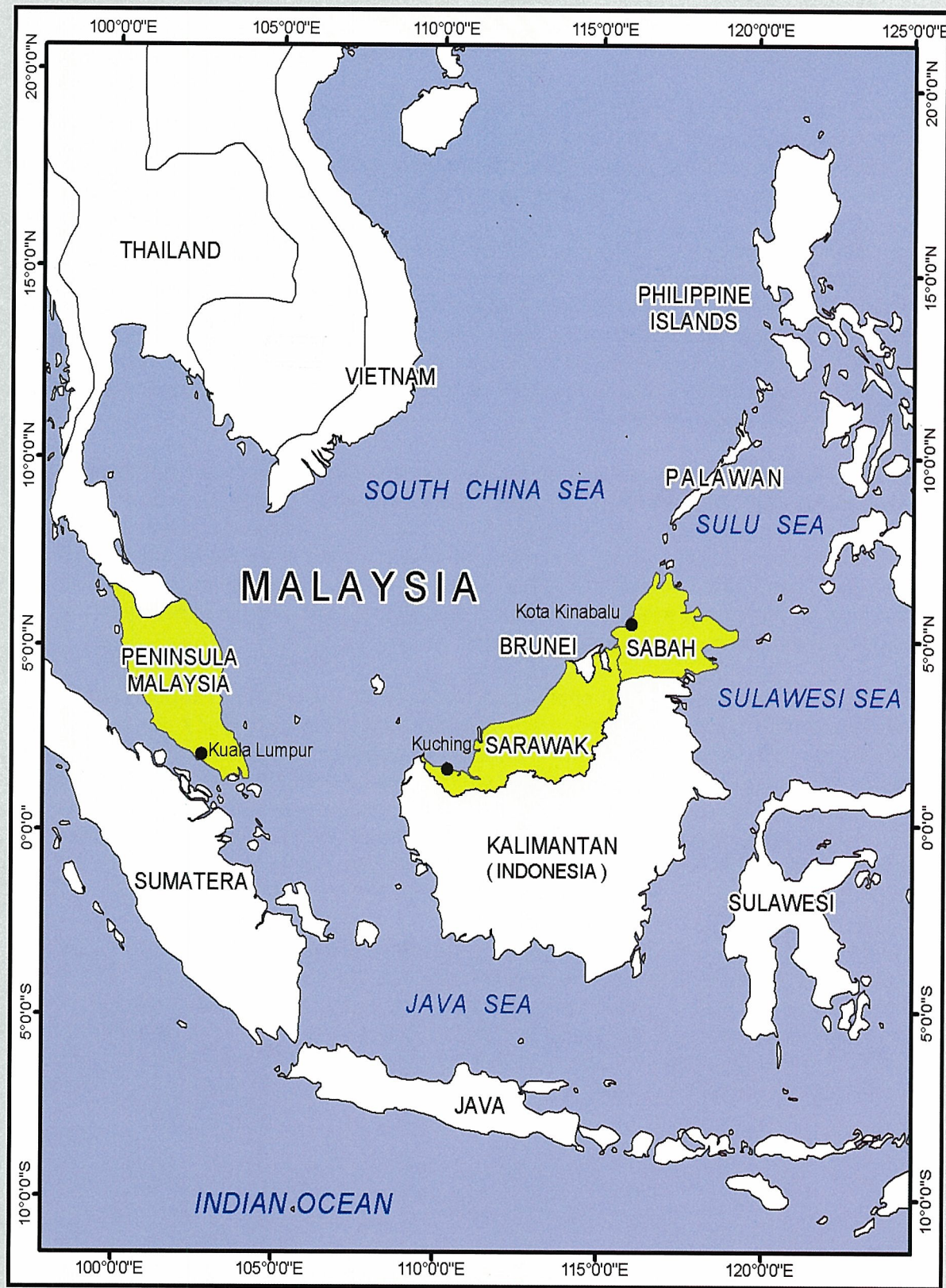
The Policy requires the government to (i) manage the forest resources “in perpetuity for the benefits of the people of Sarawak by maintaining a balance between protection and commercial use”, and (ii) to “preserve permanently for the benefits of the present and future inhabitants forest land sufficient for the assurance of the sound climatic and physical conditions of the country; the safeguarding of soil fertility, and of supplies of water for domestic and industrial use, irrigation and general agricultural purposes; and the prevention of damage by flooding and erosion to rivers and to agricultural land.”

In the same year, the National Parks Ordinance (1955) was enacted and came into force the following year. This Ordinance provides for the constitution of national parks and their subsequent management by a Board of Trustees. The Board was later abolished and the Forest Department took over the responsibility of park management. In 1998, the Ordinance was amended as National Parks and Nature Reserves Ordinance.

The Wild Life Protection Ordinance was passed in 1957, giving the government the power to constitute wildlife sanctuaries for the protection of wildlife. This Ordinance was also amended in 1998.



# Location Map of Malaysia





The national parks and wildlife sanctuaries are collectively described as Totally Protected Areas (TPAs). Ecotourism development is allowed in national parks but not in the wildlife sanctuaries.

Sustainable forest management (SFM) is the tool used to maintain a balance between commercial use of the forest and environmental protection. The total area of production forest is six million hectares, including one million hectares of forest plantations. Totally protected forest makes up another one million hectares.

About 500,000 hectares of TPAs has already been secured, consisting of 24 national parks, four wildlife sanctuaries and five small nature reserves. The largest of these TPAs are Lanjak Entimau Wildlife Sanctuary, Pulong Tau National Park and Gunung Mulu National Park, which altogether occupy some 300,000 hectares and represent the richest and most diverse primary rain forest that can still be found in Sarawak. Many more new national parks and wildlife sanctuaries, including extensions to many existing ones have been proposed.

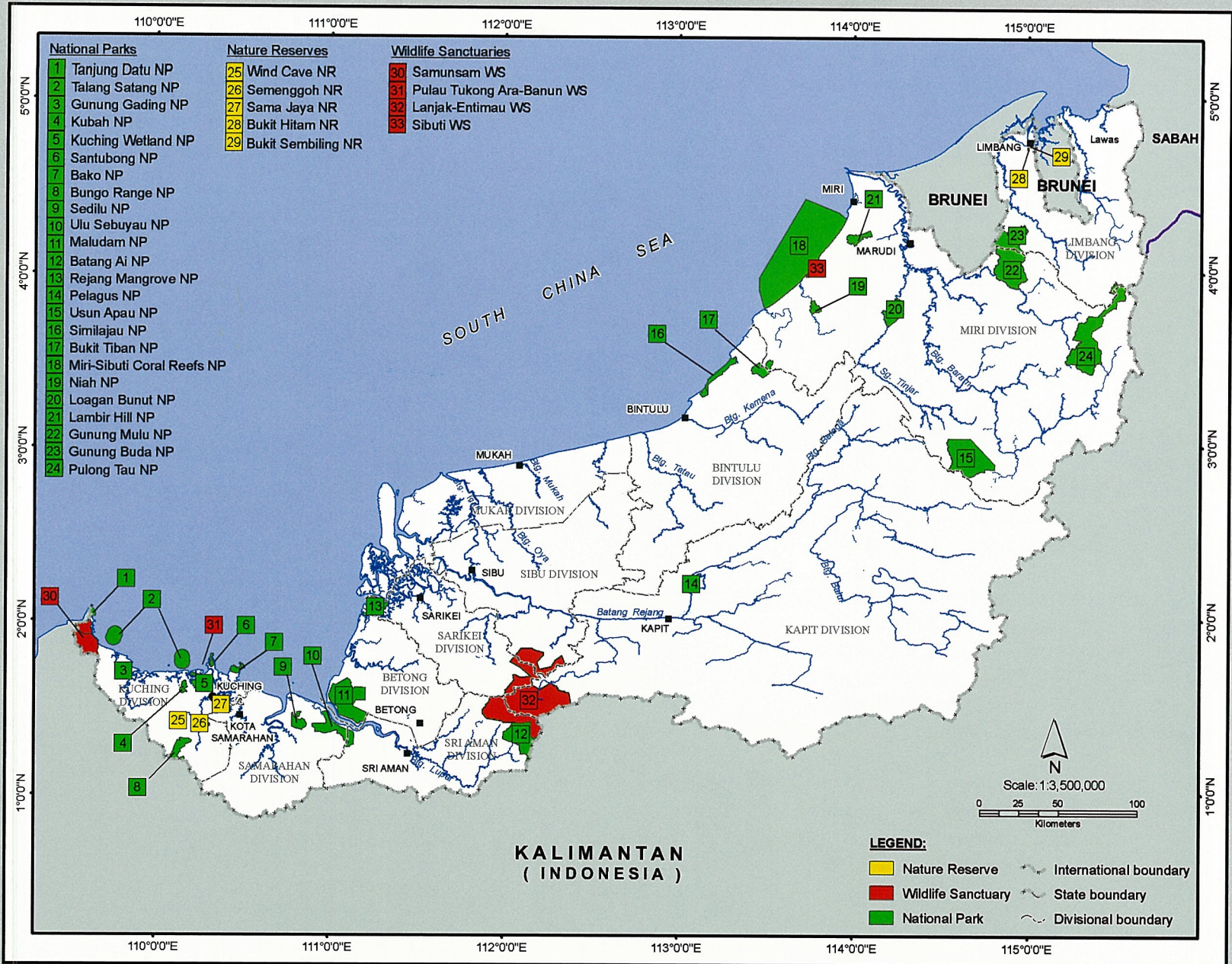
The TPAs are of immense conservation value because they have been deliberately chosen to cover a complete range of forest ecosystems and habitats that occur in the State, from mangrove and peat swamp forests in the coast to limestone, kerangas and mixed dipterocarp forests inland; and montane forest on the summits of the highest mountains. The Gunung Mulu National Park in Ulu Baram is especially unique because it contains all the inland forest formations including the peat swamp forest, with the exception of the forest on igneous-derived soil.

TPA management poses many challenges because of their large number, remote locations, mostly without proper road access, and close proximity to logging concessions and human settlements. There is the potential danger of encroachment because of the rich resources present, on which local communities also depend to a varying extent. In several of the parks and wildlife sanctuaries, special privileges have been granted under the National Parks and Nature Reserves and Wild Life Protection Ordinances to enable local communities to collect timber and forest produce for their own consumption.

The timber licensees and local populations can play very useful roles in conservation management by preventing illegal encroachment into the national parks and wildlife sanctuaries as the ever-present eyes and ears of the authorities on the ground. Park management also requires good local knowledge of the forest which the local people possess. Their engagement as park or wildlife rangers can help to make up for the lack of management presence in many of the TPAs.



# Existing Totally Protected Areas of Sarawak







### **About this Book**

This documentary book is produced to commemorate the work of the International Tropical Timber Organization (ITTO) and Sarawak Forest Department in the Lanjak Entimau Wildlife Sanctuary over the past 18 years, and to celebrate the International Year of Forests 2011. It is also to pay tribute to the local Iban people who have contributed to the project's success in many ways.

The ITTO-assisted project that was implemented there since 1993 is entitled "Development of Lanjak Entimau Wildlife Sanctuary as a Totally Protected Area." The project's overall objectives are to promote biodiversity conservation and transboundary cooperation, and people engagement in conservation. Transboundary cooperation with the Betung Kerihun National Park in West Kalimantan began in 1994.

The book describes the conservation efforts of the Sarawak Government, the activities of the ITTO project, and the positive participation of the local Iban communities in sustainable utilization of resources to improve their livelihoods and reduce dependence on forests. Lessons learnt from the project have led to the development of new strategies on totally protected area management by building partnerships with local communities and timber licensees.





Friends of Lanjak Entimau



## Chapter 2

### THE LANJAK ENTIMAU WILDLIFE SANCTUARY

#### Location

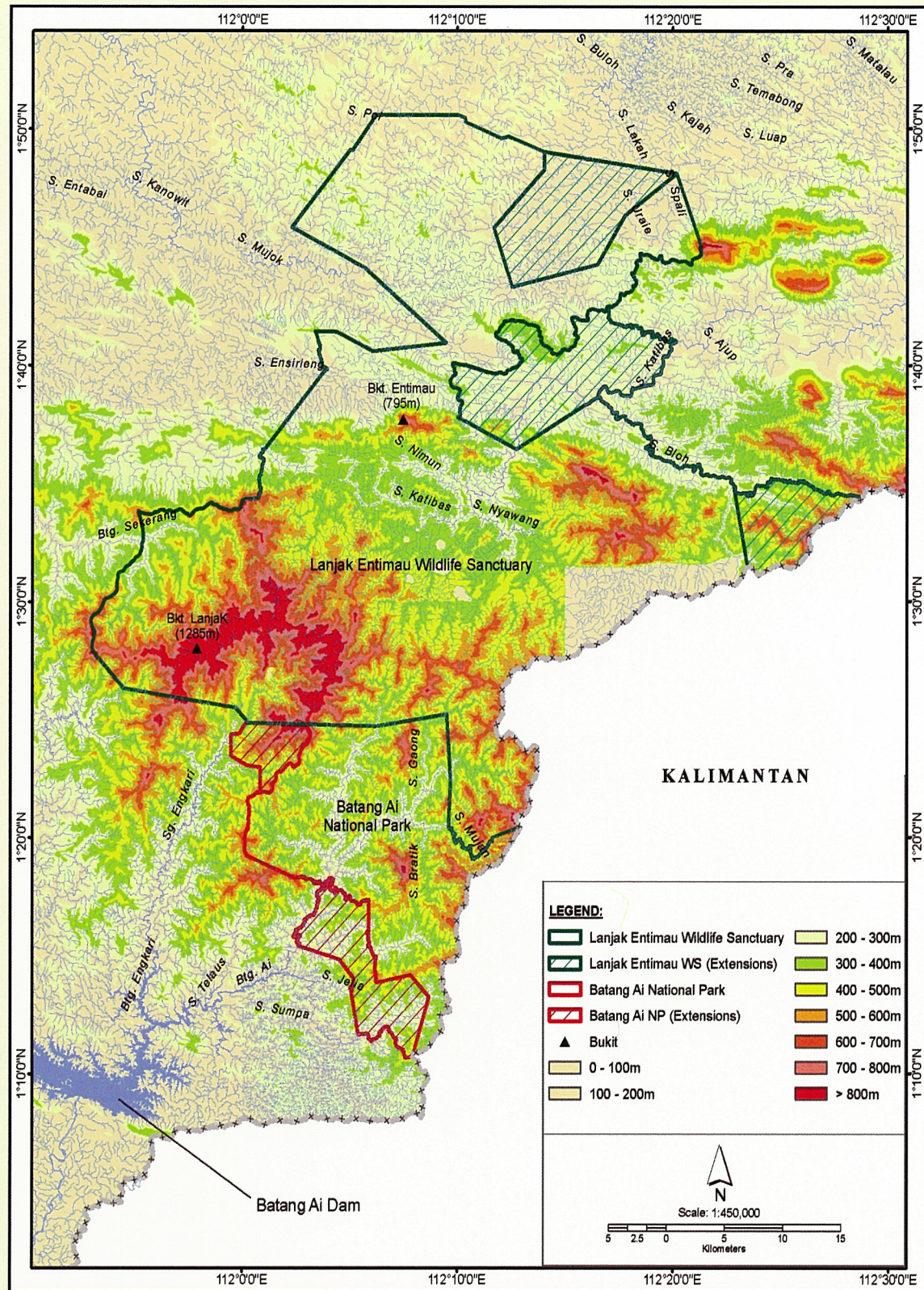
The name Lanjak Entimau is derived from two mountains called Bukit Lanjak (1,285 m above sea level) in the southwest and Bukit Entimau (800 m a.s.l.) in the northwest. Lanjak Entimau Wildlife Sanctuary (LEWS) was constituted in 1983 as Sarawak's largest Totally Protected Area (TPA) "for the purpose of protecting all animals and in particular *maias* (orangutan) and hornbills living in the area" (Sarawak Government Gazette, Part II Swk. L.N. 19, dated 3 March 1983). The orangutan belongs to the Bornean sub-species of *Pongo pygmaeus pygmaeus*. Of the estimated total population of 1,500 individuals, some 350 occur in the adjacent Batang Ai National Park.

From the original size of 168,758 hectares, LEWS was extended to 192,000 hectares in 2003. It is located in south-western interior Sarawak, between 111° 53' E to 112° 28.5' E and 1° 19' N to 1° 51' N, straddling the administrative Divisions of Kapit, Sarikei, Sibuan and Sri Aman. It shares its southern boundary with the Batang Ai National Park, while in the south-east it is connected to the Betung Kerihun National Park in West Kalimantan, Indonesia. These three protected forests form a contiguous ecosystem of tropical forest totaling some one million hectares.





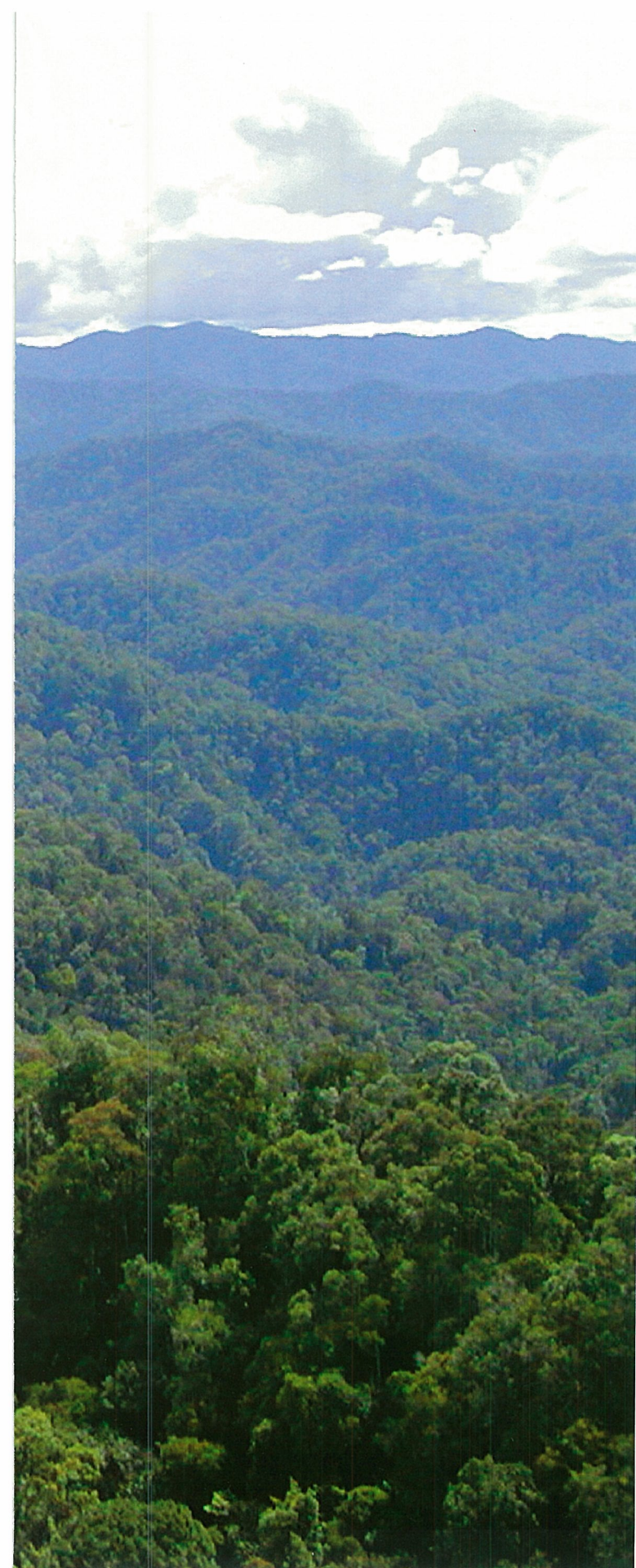
# Topography of Lanjak Entimau Wildlife Sanctuary and Batang Ai National Park











## Topography, Soils and Climate

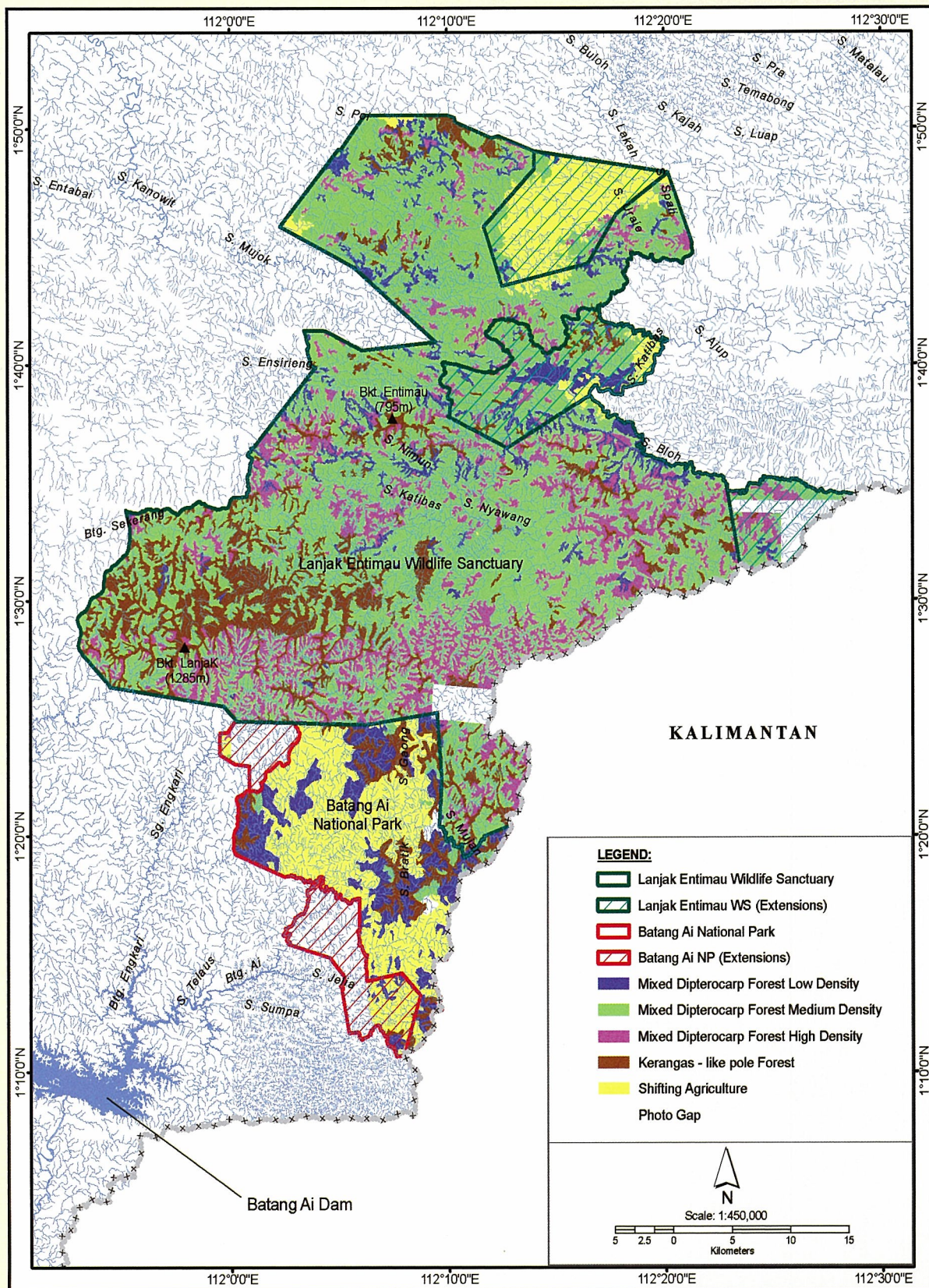
The Sanctuary's rugged and highly dissected terrain is typical of many parts of interior Sarawak. At around 250 m a.s.l., the lowland forest is generally confined to the foothills, river banks and alluvial plains. The northern terrain is relatively gentle and usually less than 700 m. Above this elevation the mountain ranges are marked by a complex of sharp ridges. Bukit Lanjak in the south-west is the highest peak at 1,285 m.

The sedimentary rocks of the Sanctuary were laid down from the Upper Cretaceous to the Lower Eocene from around 100 million to 40 million years ago. The soils are classified as skeletal soils or red-yellow podzolic soils that are common in central Sarawak. The main components are sandstone, shale and slates. More than 86% of the soils are shallow and poor and unsuitable for agriculture. Alluvial soils are found in the flood plains.

The year-round climate of the tropical rain forest is hot and humid. Annual rainfall ranges from 2,200 mm to a high of 4,000 mm. The temperature records from Sri Aman Town show a daily range of 23°C to 32°C and a mean of 27°C. With ascending altitude towards the summit of Bukit Lanjak the micro-climate changes with low temperatures, high humidity and strong winds.



## Vegetation Formation of Lanjak Entimau Wildlife Sanctuary and Batang Ai National Park







Living in harmony





Boating through shallow rocky streams in the Sanctuary is a great challenging experience





*Shorea parvifolia* (meranti sarang punai)





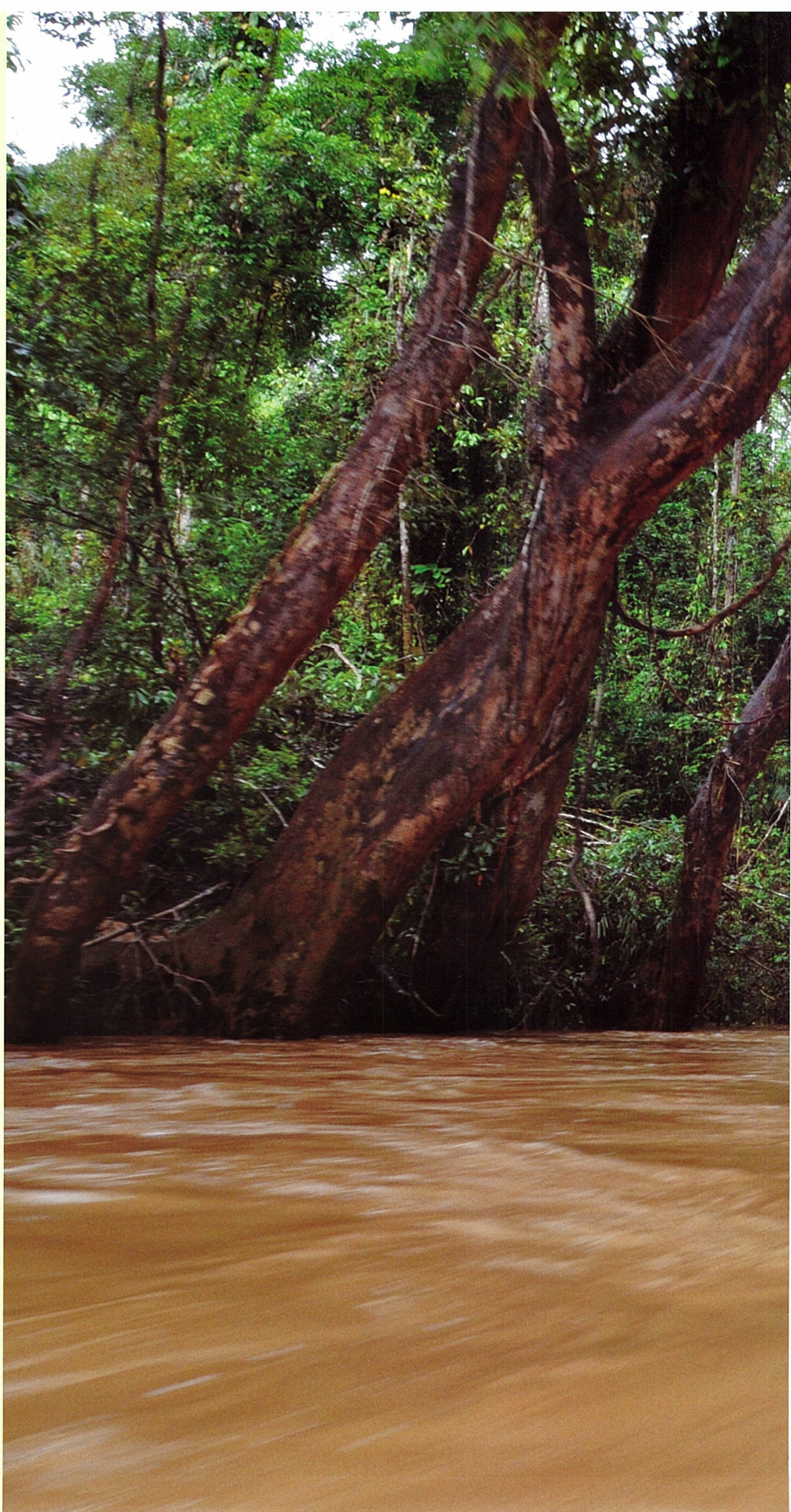


## A Treasure Trove of Plant Life

Lanjak Entimau W.S. protects a significant proportion of Sarawak's remaining virgin forest that is remarkably unique and rich in plant resources. Data collected from ecological surveys and botanical expeditions have revealed that there are 1,996 species of flowering plants of which 1,446 are trees and 550 are non-trees and their varieties. Plants among the non-tree category are palms, climbers, herbs and epiphytes. Another 720 species of 353 trees and 367 non-trees are recognized only by their families or genera and thus require further studies. Many species in this group may be new to science. Newly described species are *Heliciopsis madmudii* and *Symlocos leochaiana*.

Mount Murud (2,424 m) and Mount Mulu (2,376 m) in the northern region are Sarawak's highest mountains and possess similar sets of forest habitats as Lanjak Entimau. Available data show that Murud and Mulu contain about 1,500 species of flowering plants each. This makes Lanjak Entimau the richest floristic region in Sarawak.

Galaxy of *Dipterocarpus oblongifolius* (keruing ensurai)







Montane mossy forest, Bukit Lanjak





Mixed dipterocarp forest at its pristine state





Intact canopy of mixed dipterocarp forest



# Chapter 3

## Biodiversity Hotspot

### Ecosystem Diversity

As a mega-biodiversity country the wealth of species found in Sarawak's forest is attributable to a diversity of habitat types that are associated with a combination of factors like topography, geology, soils and climate. In the lowland rain forest the temperature and rainfall are high and uniform all year round. With ascending altitudes, a steady drop in the temperature occurs while the amount of annual precipitation and relative humidity increases.

The Sanctuary's diverse habitat types and species richness are similarly contributed by these sets of environmental factors. The mature climax vegetation of the mixed dipterocarp forest dominates 65% of the lowland landscape, along with other smaller forest types like riparian forest, alluvial forest and secondary forest. Habitat diversity is also attributable to local endemism of the flora.

At about 800 m a.s.l, the mixed dipterocarp forest merges into a transitional forest with the trees becoming shorter in height and smaller in diameter. On Bukit Lanjak, as the temperature decreases further and humidity increases at 1,000 m in the cloud forming zone, a stunted forest of pole-sized trees appears. Mosses or bryophytes thrive on the abundant humidity, growing profusely on the trees and forming thick carpets on the ground. This is the montane mossy forest, locally called *hutan lumut*.

The top of Bukit Lanjak is windy and cold, and is constantly misty in the mornings and evenings. In this zone of the upper montane forest the trees rarely exceed 10 m in height. The windy condition and unstable hole-filled ground in some areas cause many of the trees to assume a leaning position. Bukit Lanjak is ecologically interesting because of the rare occurrence of the montane mossy vegetation at less than 1,300 m a.s.l. In Sarawak, this vegetation is normally found at much higher elevations of 1,800 m, like on Mount Mulu and Mount Murud in northern region.

In Lanjak Entimau is to be found a rare secondary forest that is estimated to be some 150 years old. This forest is located near the Sanctuary's headquarters in Ulu Katibas, and at Sg. Nyungan further up the Katibas River. The forest here was cleared for hill paddy farming and later abandoned when the farmers migrated downriver to settle along the Batang Rajang.

Interestingly, this old secondary forest resembles the climax primary mixed dipterocarp forest in structure and appearance, but differs in its species composition, particularly in the low number of species of the Dipterocarpaceae. Another secondary forest of similar age is located in Ulu Engkari in the south-west.





Forest ecology team during transboundary expedition, 1997



## The Project

The Lanjak Entimau Wildlife Sanctuary project is the longest ITTO-funded project that began in 1993 and is due to end this year. The project's overall objectives are in line with the ITTO Mission's recommendations to strengthen biodiversity conservation, improve public relations between Forest Department and local communities, and enhance benefits to the local communities.

The project has undergone four phases. Phase I from 1993 to 1995 started with basic research to collect scientific data on forest ecology, flora and fauna. A study on the socio-economic aspects of the local Iban people was also undertaken.

The year 1994 saw the establishment of the transboundary biodiversity conservation area (TBCA) between Lanjak Entimau W.S. and Betung Kerihun National Park in West Kalimantan. This is the first transboundary conservation area in the humid tropics.

Basic research was continued in phase II (1996 to 1999). In 1997, a six-week ITTO Borneo Biodiversity Expedition (IBBE 1997) to the Lanjak Entimau-Betung Kerihun Transboundary Biodiversity Conservation Area was organized. It was also during this time that community development activities among the Iban communities were initiated.

Community development for local livelihood improvement was the main focus of phase III. The people's preferred activities were fish farming and fruit tree planting. The concept of local participation in conservation management was also introduced. In 2003, the Sanctuary was extended by another 23,000 hectares; and the Batang Ai N.P. became a part of the TBCA domain. Environmental education for the local communities and schools was implemented.

The present phase IV (2007 to 2011) is an important concluding phase to ensure that strategies for the Sanctuary's management are in place, the work and activities implemented with ITTO support are continued, and the local people are able to enjoy maximum benefits from sustainable utilization of the Sanctuary's resources. The Management Plan for Lanjak Entimau W.S. and Batang Ai N.P., and Orangutan Strategic Plan for the TBCA were published. At the end of the phase, the local participants will be more ready to take over and manage the fish farming and fruit planting projects that were started for them.





Batu Gong in Ulu Katibas with an Iban legend





*Flacourtia rukam* (rukam) with typical spiny trunk. The fruits are edible





*Ficus* sp. (strangling fig)



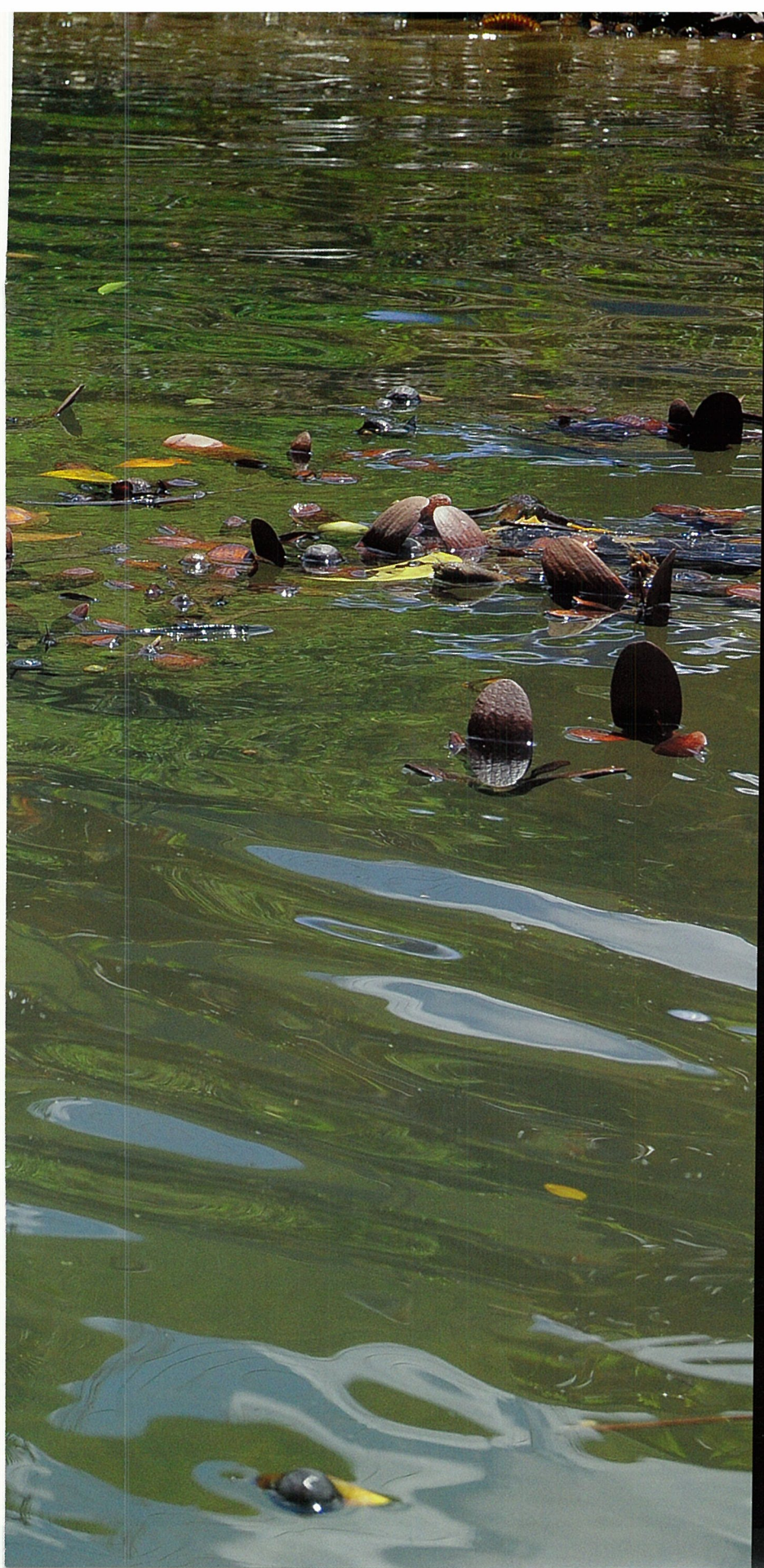


*Cyathea* (tree ferns) are common inhabitants on river banks





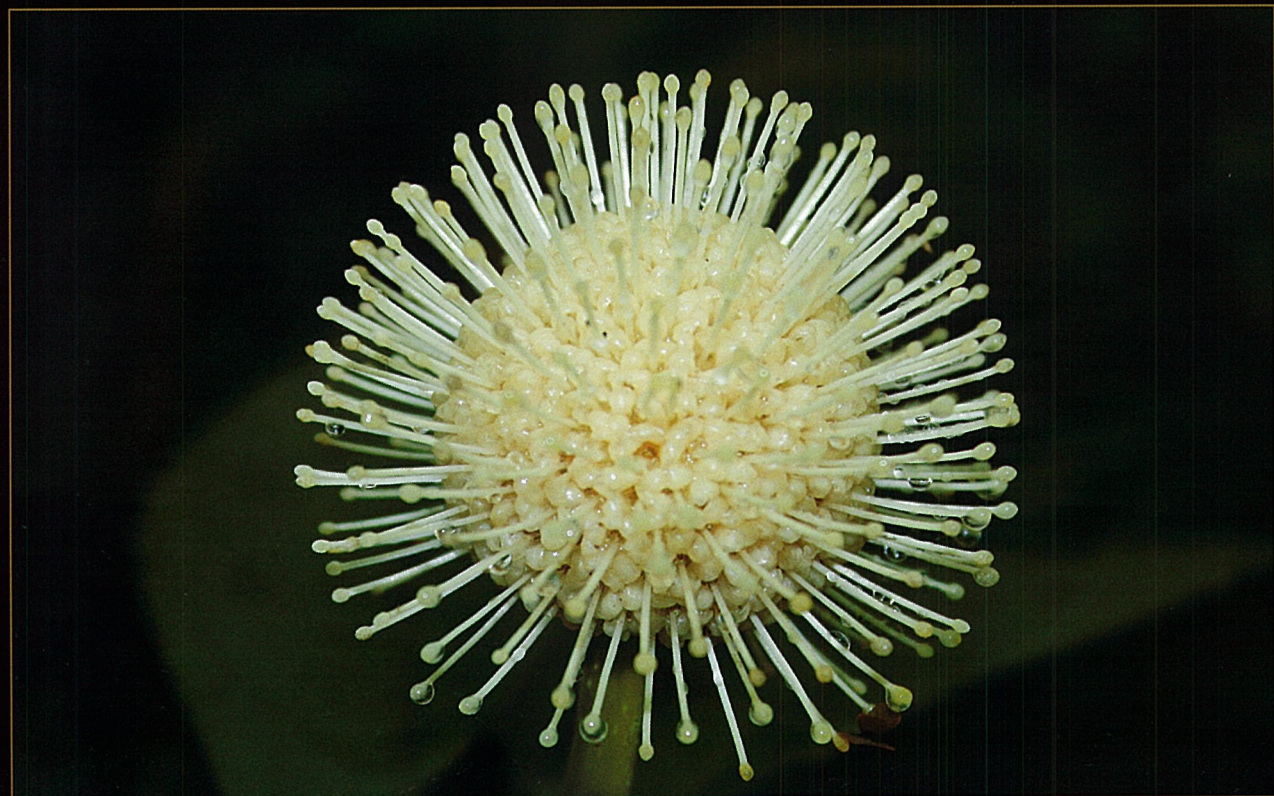




Drifting fruits of *Shorea macrophylla*  
(engkabang jantung)







*Myrmeconauclia strigosa* (mumban) grows on rocks in fast flowing rivers. A flower head is shown below.





Colony of *Cynandrium* near river





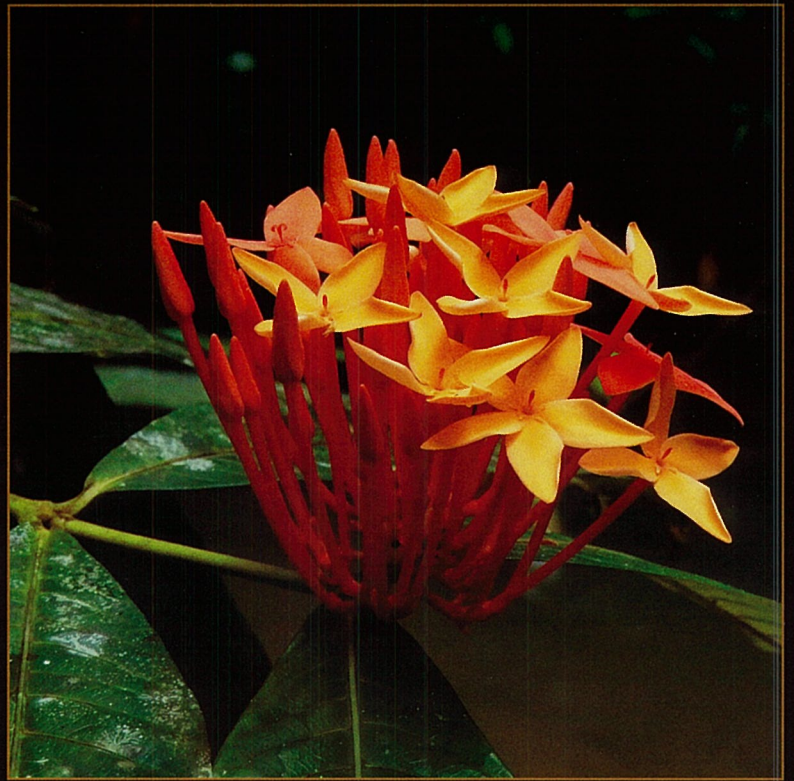
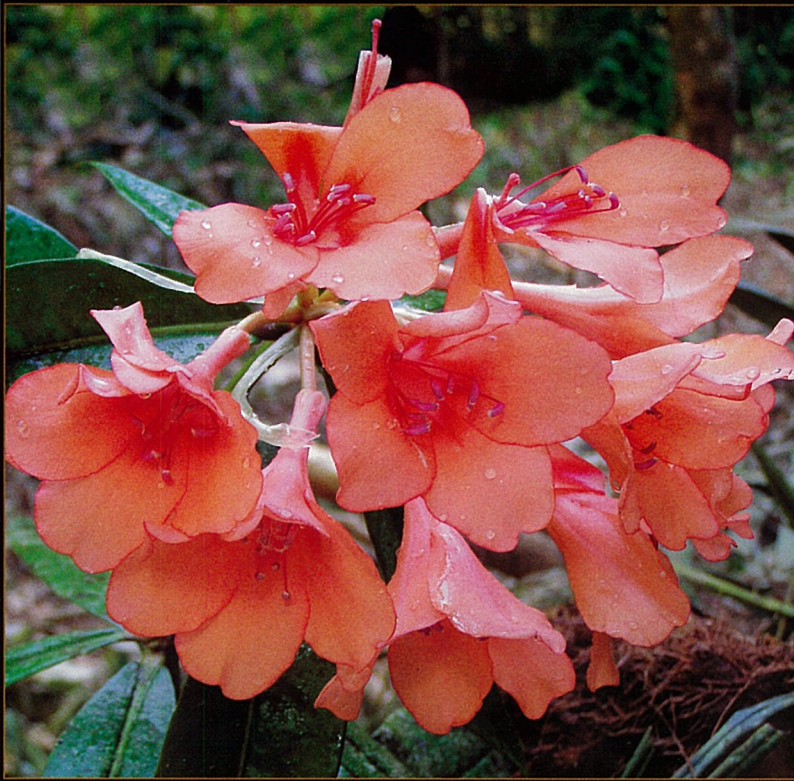
*Dischidia rafflesiana* is an ant plant; ants live in enlarged leaves that form chambers. Enlarged leaf (above)





Members of the *Loranthaceae* are semi-parasites





Clockwise from above left: *Rhododendron durionifolium* (bunga klangin); *Ixora* sp. (gergansai); *Aeschynanthus* sp. (lipstick flower); *Polyalthia* sp. (semukau)





Flowering giant climber *Whitfordtiodendron nieuwenhuisii* (akar belum)





*Rafflesia tuan-mudae* (bunga pakma) at Sungai Bloh





*Nepenthes rafflesiana* (periuk kera)





Wild ginger *Globba atrosanguinea* (above) and small wild ginger *Boesenbergia* sp. (below)





Climbing pandan *Freycinetia* sp. with male and female flowers (above)  
*Garcinia myristicaefolia* (kandis) or wild mangosteen with edible fruits (below)



Fungi are another group of plants that are still little understood. They are both a vital decomposing agent in the forest ecosystem and an important source of food and medicine. Numerous mushrooms are edible. Two best known examples of medicinal fungi are the penicillin anti-biotic from the mould *Penicillium*, and *lingzhi* from the *Ganoderma* bracket fungi used in Chinese medicine. The presence of more than 520 species of macro-fungi in the mixed dipterocarp and alluvial forests in Lanjak Entimau offers a great opportunity for studies into their immense potentials in the development of food and medicine for future bio-industries.



*Hydnum* sp. (left) and *Gymnopilus* sp. (right)






*Ganoderma* sp. (above) and *Cookeina tricholoma* (below)









## Wealth of Non-timber Forest Products

The Iban people have an amazing knowledge of the forest plants in Lanjak Entimau. More than 250 species are consumed as vegetables and fruits, while some 200 species are used in medicine. Selling of wild vegetables and fruits helps farmers to bring in additional cash income, but use of herbal medicine is on the decline as modern medicines for common illnesses are easily available and cheap.

Other less well-known traditional uses are natural dyes, spices and condiments to enhance the flavour of food, and fragrances and perfumes, of which 40 species are known. Natural dyes are necessary for the handicraft industry. The basic colours for making the famous Iban cloth *pua kumbu*, mats and baskets are black, red and dark blue, prepared from the bark, leaves and fruits of a variety of plants.

Plants that are still commonly used to flavour food include the sour fruits of limpaong tree (*Baccaurea lanceolata*) and fragrant leaves of the bunggang tree (*Syzygium polyanthum*); and the aromatic gingers kecala and tepus (species of *Etilingera*) and panyun (*Hornstedtia*). In the past, young girls used the rhizome of the ginger *Boesenbergia oligosperma* to give their nails a yellow colour, and the resin from the small tree *Agrostistachys longifolia* to stain their teeth black.

The agar wood from the *Aquilaria* tree is the most valuable among the fragrance producing plants. The scent in the wood is the result of fungal infection that causes the affected part to rot and turn black. Agar wood commands a huge market in Asia and the Middle East where a top quality grade can fetch up to US\$10,000 per kg; yet demand is far exceeding supply. The wood is used to make high quality medicine and incense. This wood and the other fragrant plants have a potential in the huge perfume and cosmetics industries that are constantly and eagerly looking for natural scents to develop new products.

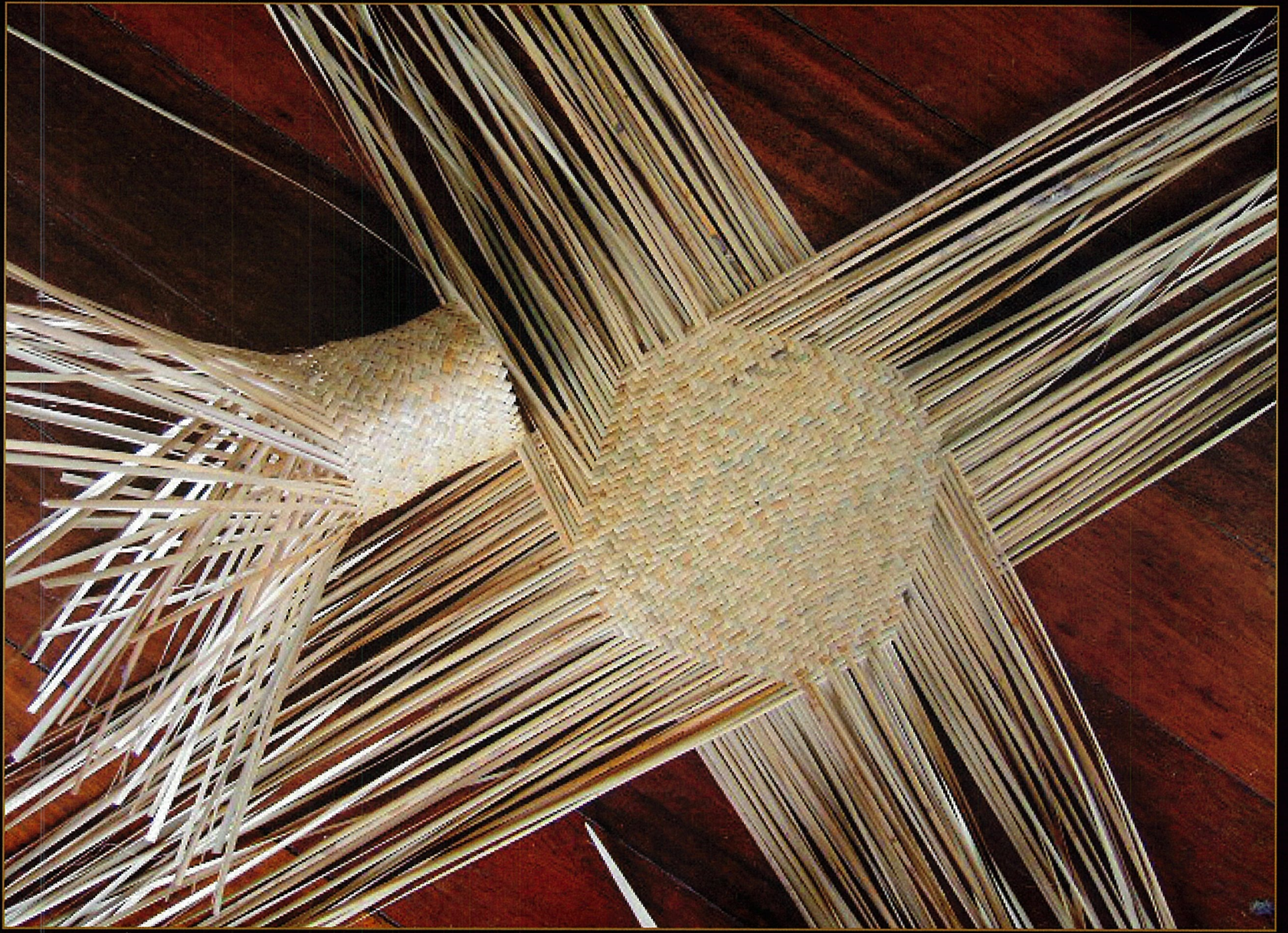
The fruit trees, agar wood and ornamental plants are among the useful species that the ITTO project has been promoting to benefit the local economy. However, the people will need more encouragement and support in research and development, financial assistance and marketing in order to succeed.

The ipoh tree *Antiaris toxicaria* with moss-covered trunk produces a white latex used in making blowpipe poison









Making full use of non-timber forest products





Iban lady making 'pua kumbu'





Baskets made from rattan and bamban (*Donax* sp.)







Materials and food from the forest





Rattan shoots for vegetable



## Unique and Rich Fauna

Sarawak as a biogeographic unit of Borneo is well known for its diverse animal life. A total of 93 species are protected by law. Besides the 47 listed as totally protected due to their greatly endangered status, the government also sees the need to list another 46 species as protected although they are still quite common but may be threatened in the future.

The Lanjak Entimau forest is most remarkable because it is home to nearly all the totally protected and protected animal species, with the exception of the marine animals. The iconic species is the orangutan of the Bornean subspecies *Pongo pygmaeus pygmaeus*. The Sanctuary is also the stronghold of three other totally protected primates, the Bornean gibbon, red langur and white-fronted langur, numbering 25,000, 28,000 and 14,000 individuals respectively.

Bearded pigs, sambar deer and sun bears are common among the big ground mammals. Small mammals make up another 40 species, consisting of 13 bats, 10 rats, 9 squirrels, 5 shrews and 3 porcupines. In 2003, a joint study by University Malaysia Sarawak (UNIMAS) and Forest Department Sarawak made a rare discovery of the bay cat (*Catopuma badia*) by camera trapping. This animal is also found to be present in the Pulong Tau National Park.

The richest herpetofauna of 77 species is recorded in Lanjak Entimau. Amphibians form the dominant group with 51 species, followed by 13 snakes, 12 lizards and one turtle. New species discoveries include two frogs, one tagamid lizard, one piped snake and one tree frog.

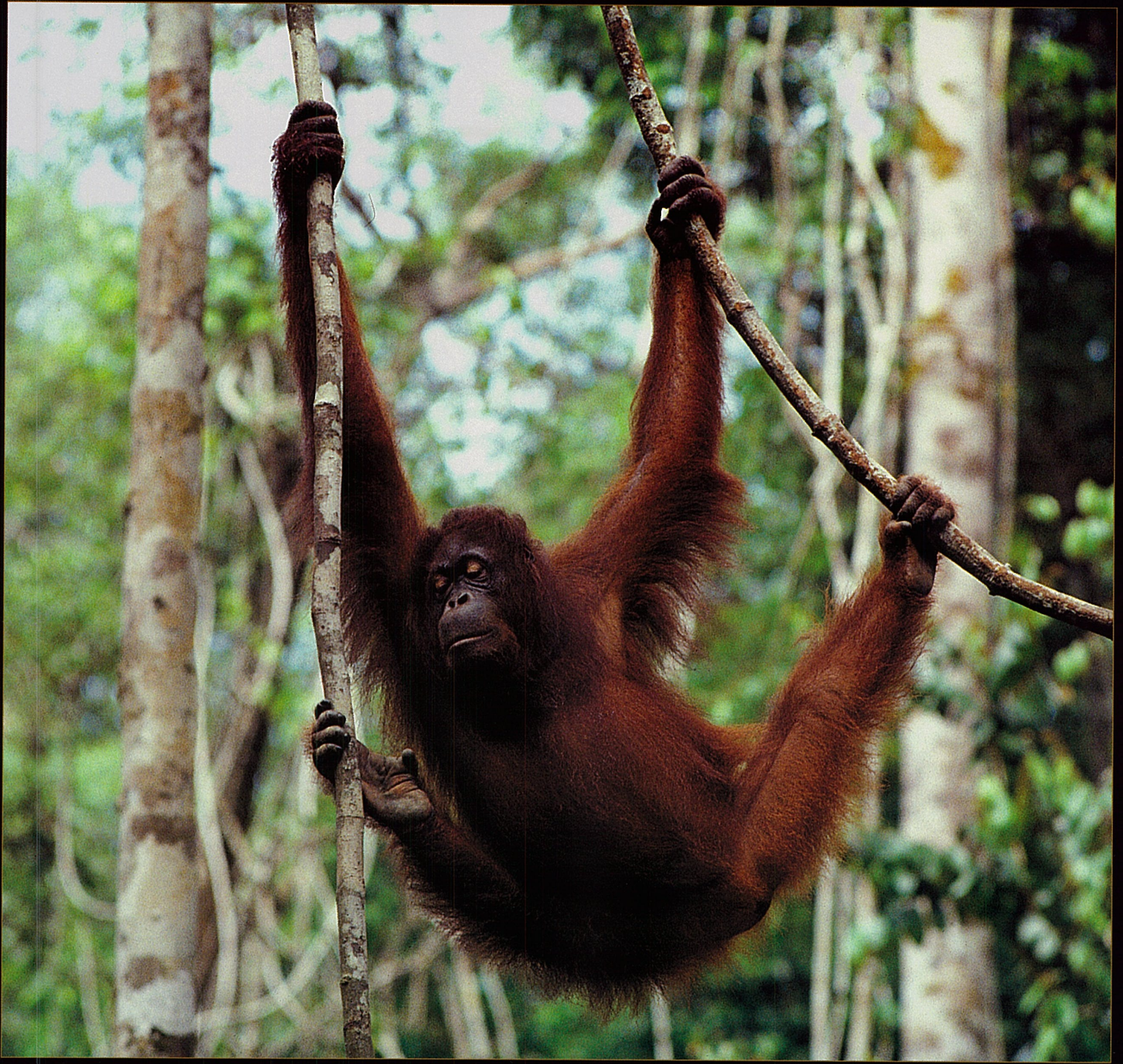
The bird fauna is equally impressive with 235 species that represent nearly half of the total of 514 species found in Sarawak. An amazingly high number of 203 species are resident birds, chief among them are seven species of hornbills, Argus pheasant and Bulwer's pheasant; all totally protected under the State's Wild Life Protection Ordinance (1998).

In the unpolluted rivers of Lanjak Entimau are to be found 82 species of fish of which 8 are endemic to Borneo and two, *Pontius kuchingensis* and *Gastromyzon katibasensis*, are endemic to Sarawak. The latter is a bottom feeder recorded only in the Katibas River east of the Sanctuary. At least another 12 species are possibly new to science. The Katibas and Engkari Rivers are two of the most important breeding sites for the valuable ikan semah (*Tor douronensis*) that requires unpolluted water to thrive.

Insects are the largest faunal group but preliminary studies have only described about 1,000 species, mainly in the orders of moths, butterflies, dragonflies/damselflies, bees and termites. The termites form a big group with 40 species including 10 Bornean endemics. The Rajah Brooke birdwing butterfly (*Troides brookiana brookiana*), the only insect in the IUCN Red Data List, is present in great abundance.

It is the Sanctuary's remarkably rich plant resources that have given rise to such a rich and diverse variety of animal life. The orangutan alone is known to feed on the fruits of 39 tree genera from 23 families. Although the number of species is not known, it is likely to be around 200. These resources are also shared by the other primates, the ground mammals, birds and flying foxes. Figs (*Ficus* species) occur in abundance and are the principal diet of the primates and hornbills. Another 75 fruits are consumed or visited by small mammals. Many birds, small mammals, frogs and lizards also feed on the insects.





Orangutan (*Pongo pygmaeus pygmaeus*), icon of Lanjak Entimau





*Hylobates muelleri* (Bornean gibbon)





Caught by camera trap: *Macaca nemestina* or pig-tailed macaque (above) and *Rusa unicolor* or sambar deer (below)





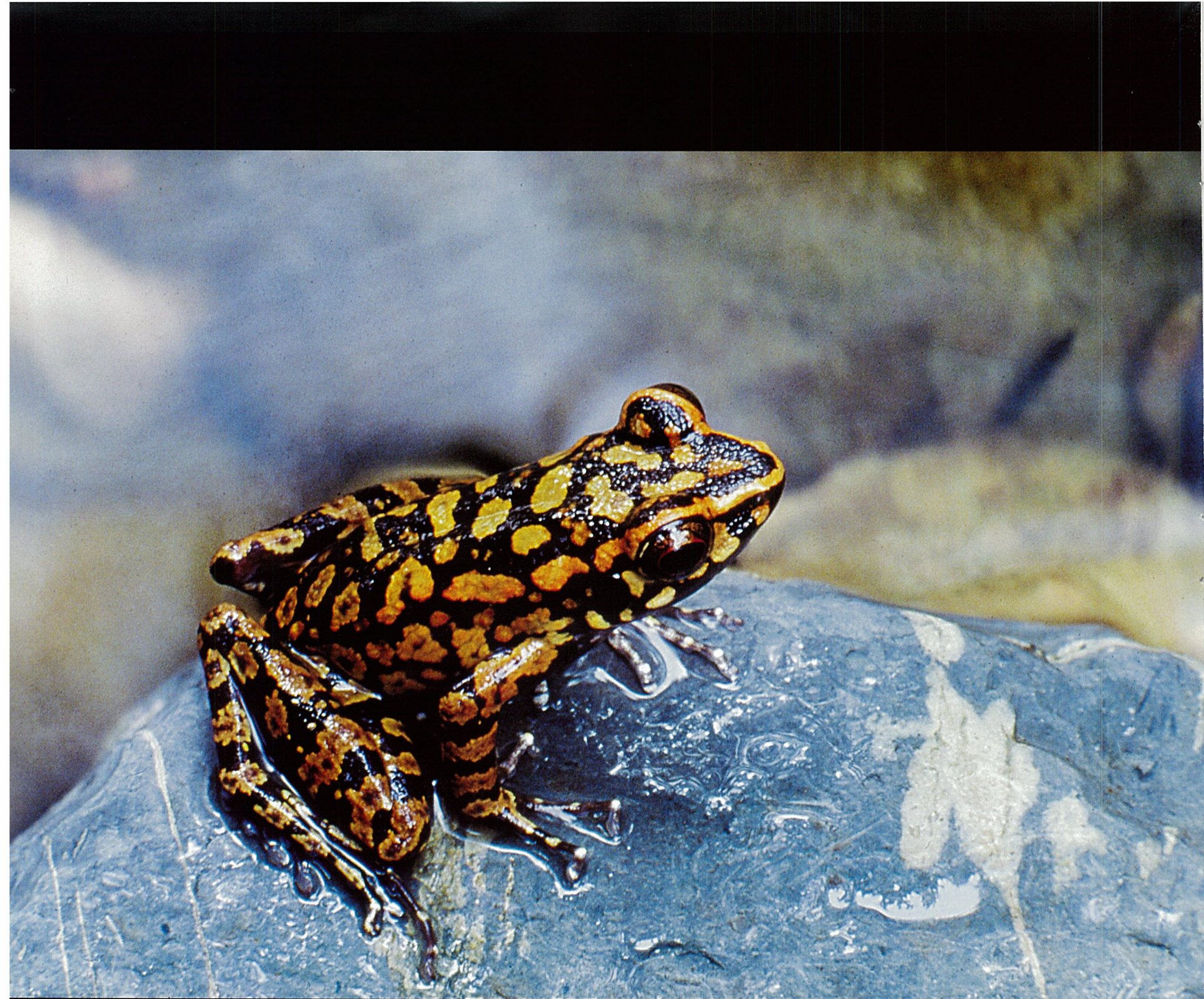
*Hystrix brachyura* (common porcupine)





*Tupaia gliss* (common tree shrew)





*Rana picturata* (spotted stream frog)





Clockwise from above left: *Rhacophorus* sp. (tree frog); *Rana hosii* (poisonous rock frog); *Bufo juxtasper* (giant river toad); *Leptobrachella mjobergi* (Mjoberg's dwarf linter frog)





*Tropidolaemus wagleri* (Wagler's pit viper)





*Cyrtodactylus* sp. (Bent-toed gecko)









*Anthracoceros malayanus* (black hornbill), one of 8 species in Sarawak (left)  
*Buceros rhinoceros* or rhinoceros hornbill (above)









Female *Alcedo euryzona* or blue banded kingfisher (left)  
Male *Blythipicus rubiginosus* or maroon woodpecker (above)





*Calyptomena hosii* (Hose's broadbill) a montane species recorded on Bukit Lanjak





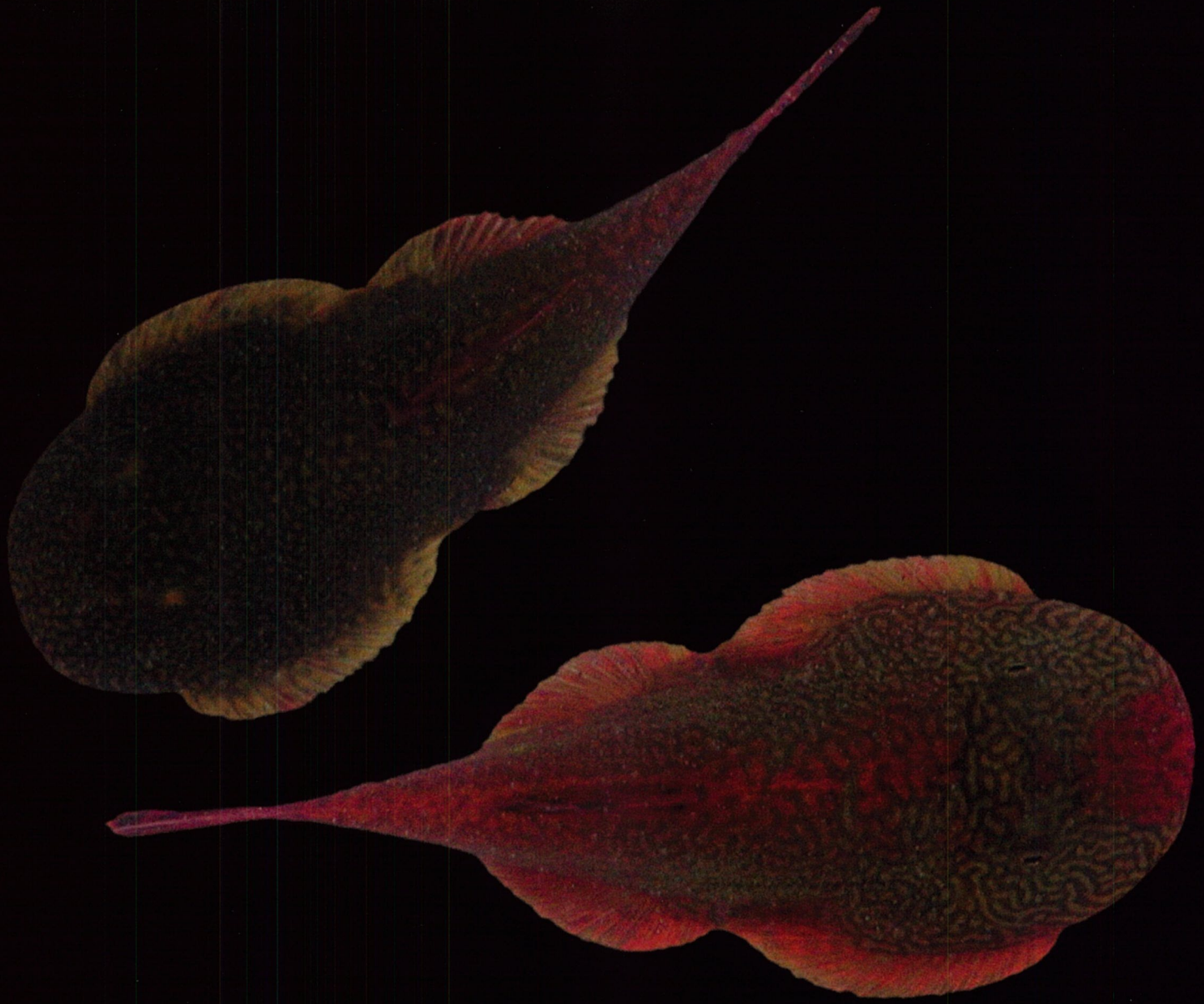
*Ketupa ketupu* or Buffy fish-owl (above) and male *Pitta baudii* or blue headed pitta (below) is endemic to Borneo





*Gastromyzon fasciatus* or lelekat (above) a bottom feeder and *Homoloptera* sp. (below)





*Gastromyzon katibasensis* (lelekat), a new species endemic to Katibas River





*Trogonoptera brookiana brookiana* (Rajah Brooke's birdwing) is a common inhabitant of Lanjak Entimau





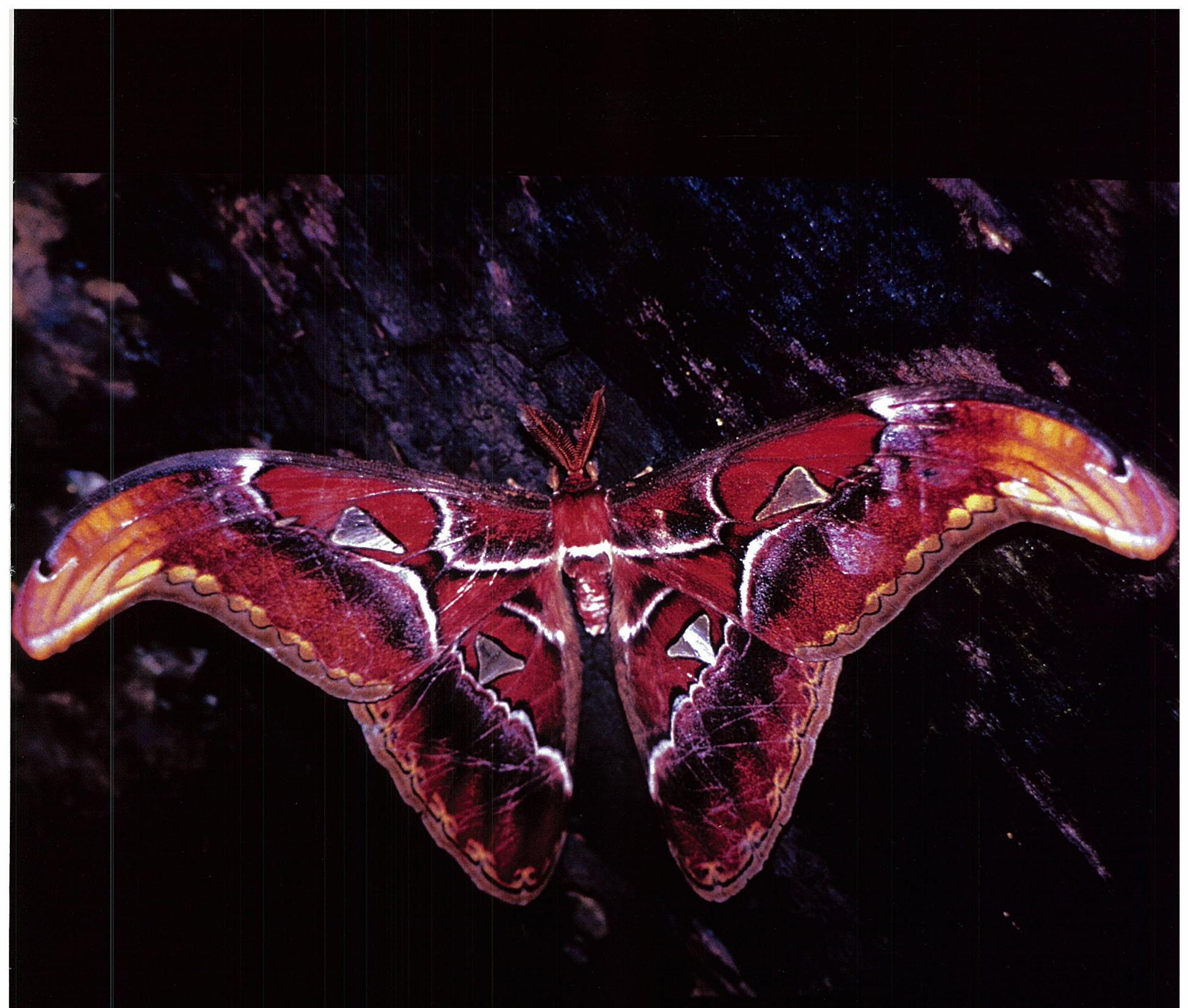
*Chersonesia rahria rahria* (wavy maplet butterfly)





A pair of *Antheraea helferi* (emperor moths)





*Attacus atlas* (atlas moth) is the largest in the world





*Batocera parryi* (longhorn beetle)





*Gasteracantha arcuata* (curved spiny spider)





Phasmid stick insect





Phasmid leaf insect





The queen termite of *Prohamitermes mirabilis* tended by workers in her royal chamber





Pill millipede, decomposers of the forest



