Guidebook to

# The Gunung Leuser National Park

UNESCO
United Nations Educational, Scientific, and Cultural Organization

Published by YAYASAN ORANGUTAN SUMATERA LESTARI-
ORANGUTAN INFORMATION CENTRE (YOSL-OIC)
Medan, Indonesia



Suggested citation :
Orangutan Information Centre (2009) Guidebook to The Gunung Leuser National Park. Medan. Indonesia

ISBN 978-602-95312-0-6

Front cover photos : Sumatran Orangutan (Djuna Ivereigh), Rhinoceros Hornbill (Johan de Jong), Gunung Leuser National Park Forest (Adriano Almeira)

Back cover photos : GLNP forest (Madeleine Hardus)

The Orangutan Information Centre (OIC) is dedicated to the conservation of Sumatran orangutans (Pongo abelii) and their forest homes. Our grassroots projects in Sumatra work with local communities living alongside orangutan habitat. The OIC plants trees, visits schools and villages, and provides training to help local people work towards a more sustainable future. We are a local NGO staffed by Indonesian university graduates, believing that Sumatran people are best suited to have an impact in and help Sumatra.

Phone / Fax: +62 61 4147142
Email: info@orangutancentre.org
Website: www.orangutancentre.org

# Acknowledgements

Thanks are owed to many people who have been involved in the compilation and publication of this guidebook.

First, our particular thanks go to James Thorn who spearheaded the writing and editing of this guidebook. David Dellatore and Helen Buckland from the Sumatran Orangutan Society also contributed; their patience and time during the reviewing and editing process reflects the professional expertise of this publication.

We would like to thank to Suer Suryadi from the UNESCO Jakarta office, who has provided us with invaluable feedback, insights and suggestions for the improvement of this text. Many thanks also for all of his encouragement for our organization to play a more prominent role in the conservation of the Gunung Leuser National Park. We would like to thank Arantzazu Acha de la Presa and Sri Suci Utami Atmoko for providing further comments and feedback.

Thank you to the head of the Gunung Leuser National Park (name???) and his staff (especially Mr Ari, Mr Ujang, Mr Hendra, Mr Subhan, and Mr Rivan), who have provided us with feedback and information on the current conservation situation of the GLNP.

We would like to give thanks to all those who graciously contributed their excellent photos for use in the book, as well as ARKive, for the use of their excellent resources. Also, special thanks to Eva Collado and Jamil who have designed the layout and artwork for the book.

Lastly we would like to thank the UNESCO Jakarta Office, the Australian Orangutan Project, and Chester Zoo UK for funding assistance to produce this guidebook.

Sumatran elephant in Tangkahan (photo : Adriano Lameira)

# About this publication

This guidebook is intended to be used by anyone entering the Gunung Leuser National Park (GLNP). Whether a licensed guide or a first-time visitor, you will find a wealth of useful information aimed at making your experience in the park more informative, safe and rewarding. If you are a licensed guide, this book will provide you further information on GLNP conservation issues, the fauna and flora you show and explain to visitors, and the guidelines you and your guests need to adhere to when in the park and viewing orangutans. If you are a visitor, by reading this manual, you will get the most out of this amazing rainforest ecosystem.

This publication begins with a broad introduction to the Gunung Leuser National Park, the fauna and flora, and the current threats to this fragile ecosystem (Chapter 1). In Chapter 2 it takes a look at the ecology and conservation status of the Critically Endangered Sumatran orangutan (Pongo abelii), and discusses the important ecological role this species plays. The concept of ecotourism is examined in Chapter 3; its potential benefits for the environment and local peoples, and the problems that can arise from its mismanagement. One of the most prominent risks of humans in close proximity to endangered primates in the GLNP is disease transmission and in Chapter 4 these issues are detailed and described.

The park's fauna and flora can be very sensitive to human presence and disturbance. It is therefore essential to know how best to reduce your impact on the ecosystem around you, so it can be enjoyed by future generations of not just people, but also the wildlife you have come to visit. You have the opportunity to observe not only the orangutan in its natural habitat, but a myriad of other wonderful animals. The species guide in Chapter 5 will help you to identify and know more about some of the animals you will have the chance to see. Finally, by following the simple set of guidelines laid out in Chapter 6 you can have a more natural, enjoyable and safer visit, without detracting from your groups' or your own wildlife watching experience.

Overall, this guidebook will act as a valuable tool and souvenir, either if you are working in or visiting the GLNP, or if you are simply interested in finding out more information about conservation issues and the Gunung Leuser National Park.

Sumatran Orangutan (photo : Nick Tignonsini)

# Contents

Damar tree in Gunung Leuser National Park (photo : David Dellatore)

# 1

# The Gunung Leuser National Park

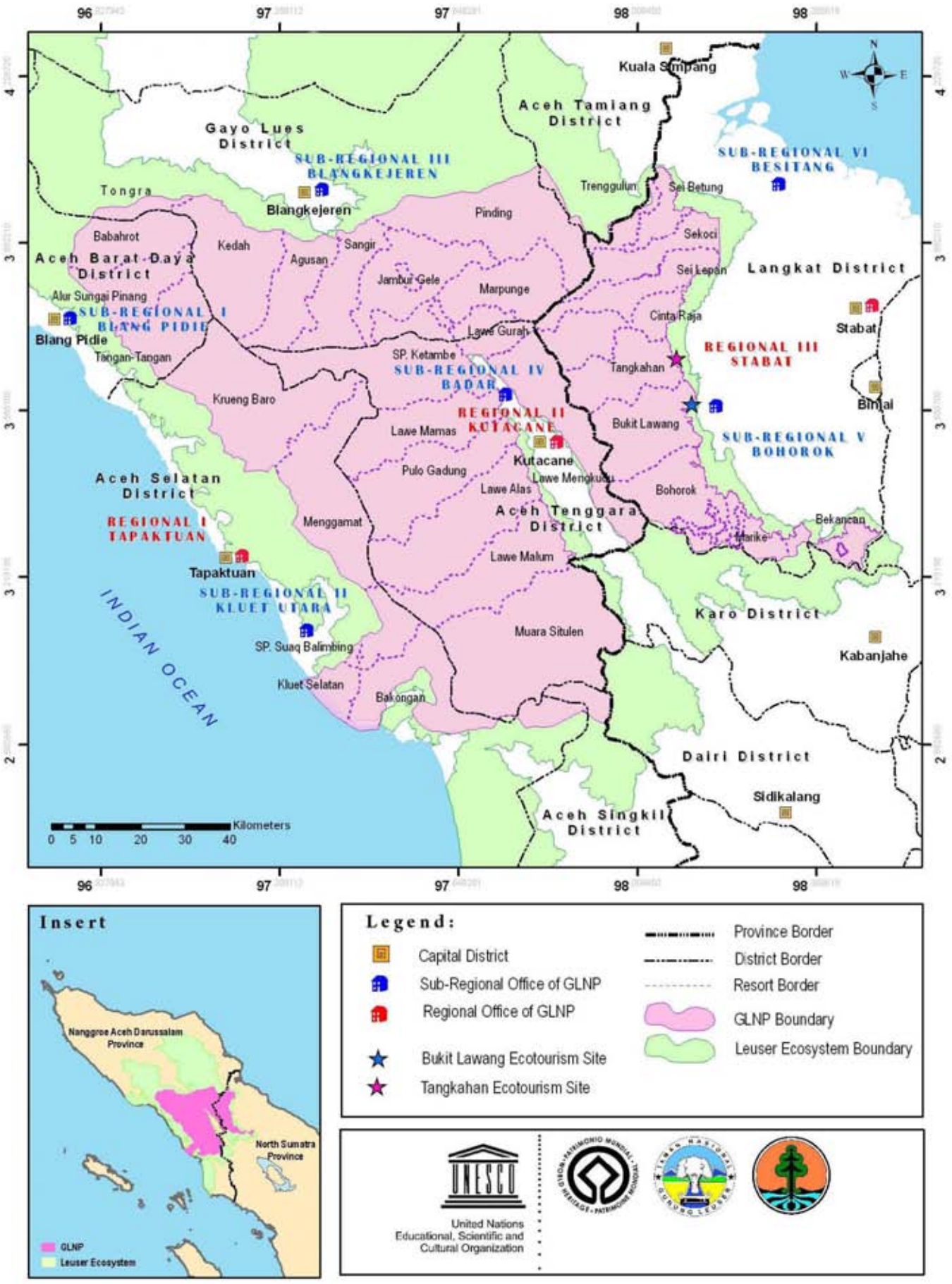
Background

The Gunung Leuser National Park is located in northern Sumatra, Indonesia covers approximately 1,094,692 hectares (ha) (1 ha is about the size of a football pitch), and straddles the borders of the two provinces of Nanggroe Aceh Darussalam and North Sumatra. The GLNP takes its name from the towering Mount Leuser, whose peak stretches to 3,404m. The park was originally established as a 142,800 ha Indonesian Nature Reserve in 1934 (ZB No. 317/35), and after a series of additions and classification changes in the years inbetween was formally established as a National Park in 1980 (811/Kpts/Um/II/1980).

Together with Bukit Barisan Selatan and Kerinci Seblat National Parks, the GLNP forms the Tropical Rainforest Heritage of Sumatra UNESCO World Heritage Site (TRHS). The World Heritage status was inscribed in 2004, along with previously attributed status of being recognized as a Biosphere Reserve in 1981 and an ASEAN Heritage Park in 1984. Here exists a complex, amazingly species rich and fragile environment, with a delicately balanced network of animal and plant life. The GLNP is the core of many endangered species' remaining habitat. The area is considered to be of huge environmental importance, and the unique flora and fauna are in critical need of conservation and protection. The GLNP is also part of one of the WWF's 200 Global Ecoregions of conservation importance for world biodiversity [2].

The Gunung Leuser National Park also lies within the 2,364,874 hectare Leuser Ecosystem (LE). This region was established because after careful analysis of research conducted in the 1980s and 90s, it was realised that the borders of the was legalised through a Minister of Forestry Decree in 1995 (No. 227/KPTS-II/1995), afforded greater status through a Presidential Decree in 1998 (No. 33/1998), and in 2008 a new government regulation was passed that established the LE as a national strategic area (No. 26/2008) [3].

# MAP OF GUNUNG LEUSER NATIONAL PARK (GLNP)



# Biodiversity of the GLNP and Leuser Ecosystem

## Flora

Approximately 8,500 different plant species grow in the beach, swamp, lowland, mountain and alpine ecosystems of the Gunung Leuser National Park and the Leuser Ecosystem, with no less than 4,000 of these growing in the GLNP itself [4,5]. The region represents one of the best remaining expanses of lowland dipterocarp forest across Indonesia. The trees reach 40-70m in height and are home to a great number of plant and animal species. The dipterocarp trees tend to produce exceptionally very large amounts of fruit at the same time every two to five years. This is known as mast fruiting [6]. During these years there is a vast surplus of edible fruits available for forest animals, much of which remains untouched. In normal fruiting seasons, there is far less fruit, meaning that fruit dependent animals such as orangutans have to cover large distances to find enough food.

The forests are home to an enormous variety of plant species, due to the soil diversity and differences in altitude. The parasitic rafflesia flower (Rafflesia arnoldi) is the world's largest individual flower, and is found only on Sumatra and the neighbouring island of Borneo. The flower can weigh as much as 11kg when fully grown, with its dark pink and red petals growing up to 1m long and 2.5cm thick [5]. It is a parasitic plant and lacks any leaves, stems or roots, instead obtaining nutrients from host plants to which it attaches itself. Its rather morbid common name is the 'corpse flower' as it is said to emit a very pungent smell, used to attract pollinating insects within the dense forest. Casuarinas trees, wild nutmeg, camphor, nibung palms, rotan, mangrove trees, and pandan can all be found in the beach and swamp forests, and along the rivers grow pometia pinnata. In the lowland forests, trees such as meranti, keruing, camphor, and damar, along with several wild fruit trees such as durian, mango, wild banana, citrus fruit and wild jack fruit grow in abundance. The mountain and alpine woods are home to several species of moss and wild flowers: gentians, primulas, strawberries, herbs, and wild orchids. The rafflesia flower can also be found here.

The damar tree is particularly useful to people, as it grows to great heights and can be harvested for its resin. The resin can be burned and used for starting fires and as a pleasant smelling incense. The wood of the damar tree is also very valuable, and timber sales can generate important revenue for local people. It also plays an important role in the local ecosystem, supporting the growth of a certain type of strangling fig. During fruiting season there can be 4 to 5 orangutans, along with several gibbons, Thomas leaf monkeys, macaques, squirrels, and rhino hornbills feeding in a single tree at the same time!

Rafflesia (photo : Nick Lyon)

# Fauna

Approximately 350 bird species are known to live in the GLNP, with 36 of the known 50 species endemic to Sundaland Biodiversity Hotspot being found here as well [4] (387 species are known in the LE [5]). 194 species of reptiles and amphibians and 129 of the 205 species of mammals of Sumatra live in the GLNP [4,5] (with 127 known in the Leuser Ecosystem). The forests are thought of as the last stronghold for a number of highly endangered mammals, supporting quite possibly the last remaining viable populations of Sumatran orangutan (Pongo abelii), Sumatran tiger (Panthera tigris sumatrae), Sumatran elephant (Elephas maximus sumatranus) and Sumatran rhinoceros (Dicerorhinus sumatrensis sumatrensis).

It is the only place on earth where these Critically Endangered species coexist [7] and loss of this habitat will almost undoubtedly result in their extinction in the wild.

Besides the orangutan, there are a number of other primate species frequently sighted throughout the Gunung Leuser National Park: the lar gibbon (Hylobates lar), the siamang (Symphalangus syndactylus), the Thomas leaf monkey (Presbytis thomasi), the long-tailed macaque (Macaca fascicularis) and the pig-tailed macaque (M. nemestrina) (see the Chapter 5 Species Guide for detailed descriptions).

Lar Gibbon (photo : Martin Harvey)

Flying Snake (photo : Wikipedia)

One may also be lucky enough to catch a night-time glimpse of the elusive greater slow loris (Nycticebus coucang), an endangered and little known primate relying on the protection of the GLNP for its survival. Other fascinating mammals include the Malayan sunbear (Helarctos malayanus) which roams the forest in search of figs and honey, and perhaps the most easily identifiable bird, the hornbill (Family Bucerotidae). Hornbills fly amongst the canopy and can sometimes be seen sharing a tree with orangutans. See Chapter 5 for a description of more species which can be seen throughout the GLNP.

# A Valuable Resource for People

Both humans and wildlife depend on the conservation of the environment for their survival. The forests of the Gunung Leuser National Park and the Leuser Ecosystem provide livelihoods and resources for roughly four million people living within and around it [5]. These resources include:

- Regular food stock - wild animals are traditionally hunted for their meat and forest plants are harvested for their fruits and seeds.
- Natural medicines - A number of plants are used for their healing and medicinal properties
- Fresh water supply - rainfall and river channels provide water for people, plants and animals.
- Soil erosion control - tree roots help to bind the soil together, making it less vulnerable to being washed away in to the rivers. When the soil becomes eroded the nutrients are lost and the land rapidly becomes unproductive. It is then very difficult to reverse the damage.
- Flood prevention - trees help to slow down the runoff of water from the land in to river channels, therefore reducing the likelihood of flooding.
- Local climate regulation and carbon fixing - trees play a vital role in the hydrological and carbon cycles. They help to maintain a balance of moisture in the atmosphere and also generate oxygen from carbon dioxide.
- Fisheries - coastal fisheries and aquaculture in and around Leuser are extremely important to local people. They provide a major share of the animal protein in local people's diets as well as generating substantial benefits from overseas trade [1].
- Natural beauty and ecotourism - (discussed in detail in Chapter 3)

All these resources enable communities living near the forest to have a better quality of life. By maintaining the forest in or close to its most natural state, the people can benefit from the many ecological services provided through continued sustainable management of natural resources, which then also has a positive impact towards the conservation of the high level of biodiversity present in the rainforest. The negative effects of deforestation on the aforementioned resources becomes evident quickly e.g. groundwater reservoirs are being rapidly exhausted with several rivers running dry during part of the year, thus making it difficult for

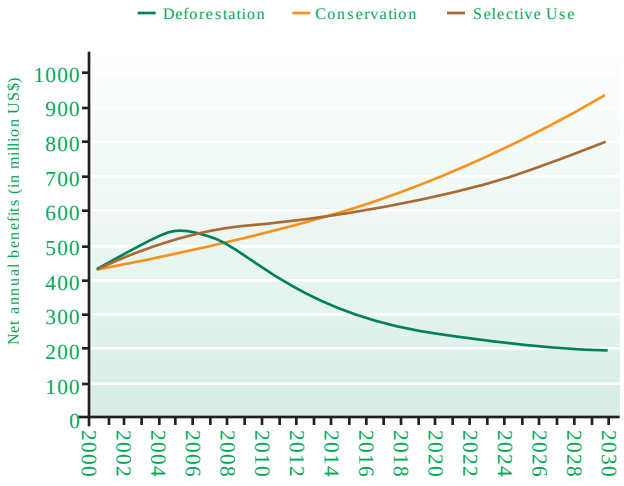



Figure 1 : Net annual benefits over time of the GLNP [1]

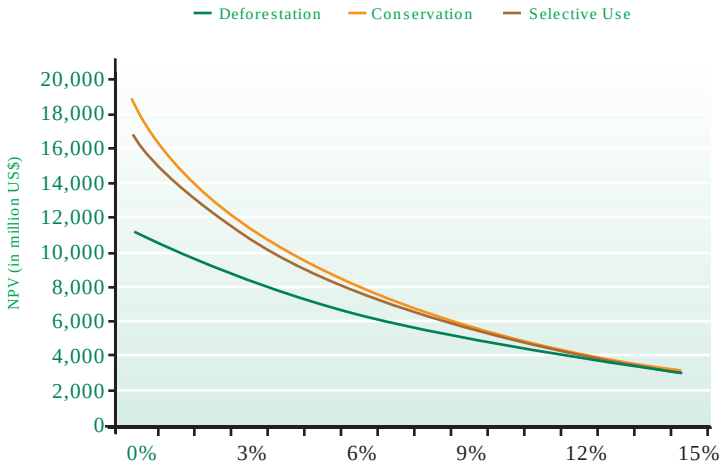



Figure 2 : Total Economic Value of the GLNP per hectare under different use scenarios (NPV = Net Present Value) [1]

Figure 1 and 2 from van Beukering, P.J.H., Cesar, H.S.J., Janssen, M.A., Economic valuation of the Leuser National Park on Sumatra, Indonesia. Ecological Economics, 2003. 44: p. 43-62. Used with permission.

people to obtain water easily; degradation of the freshwater ecosystem has a knock-on effect on the fishery sector; flooding events tend to happen more often and are more destructive as a result of converting forests to other forms of land use.

Economically, it is more beneficial to people to conserve the rainforest than to cut it down. The monetary value that the conservation of forest resources can provide over 30 years has been predicted to be greater than the economic value of intensive deforestation, by as much as US$2.5 billion [1].

If local communities make a serious and immediate commitment towards the conservation of the region, they would receive 56% of its inherent value, whereby deforestation would provide them with only 45% of the wealth, the majority of which would go to elite industry. Ecological services will persist only if the ecosystem remains intact and continues functioning as a whole interacting unit. The long term availability of natural resources is, however, threatened by unsustainable forest practices such as logging, forest clearance, fires and plantation development, which can all lead to soil erosion, disastrous flooding and droughts [6]. This is on top of catastrophic loss of biodiversity and exacerbation of climate change processes.

# Threats to the Biodiversity of the Gunung Leuser National Park

## Vanishing Species

The environment in which an animal lives is crucial to its survival. Viable populations of Sumatran orangutan, tiger, rhino, elephant, and many others are all dependent on the GLNP continuing to flourish in its natural state. In addition to the Critically Endangered Sumatran orangutan, (see Chapter 2 for a detailed look at orangutan sociality, ecology and conservation status) the highly threatened Sumatran tiger has a wild population of perhaps only 400 to 500 individuals [8]. Five other tiger sub-species currently survive worldwide; the Siberian, or Amur tiger (Panthera tigris altaica; Russian far east and north eastern China); Northern Indochinese Tiger (P. t. corbetti; Indochina north of the Malayan peninsula); Malayan tiger (P. t. jacksoni; Peninsular Malaysia); Bengal tiger (P. t. tigris; Indian sub-continent) and south China tiger (P. t. amoyensis; although this species has not been observed in the wild since the 1970s and is possibly extinct). The six existing sub-species are classified as Endangered by the IUCN Red List. The Javan, Balinese and Caspian sub-species of tiger have already gone extinct.

The Asian elephant is widespread as a species but classified as Endangered by the IUCN Red List [9]. The small forest-dwelling Sumatran sub-species now survives only in an unknown number of highly fragmented populations [10]. They are severely affected by habitat loss and poaching. Conflict with humans is also becoming a more pressing issue. When their forest home is destroyed they are forced to seek food from nearby cropland [11], or cause crop damage while moving to other habitat fragments. As a result, many elephants are killed on new oil palm plantations and other crops [6]. Conflict between humans and the wildlife of the GLNP is now a widespread issue, with other animals such as orangutans, macaques and leaf monkeys also raiding crops. For species such as elephants and orangutans, which have very slow reproductive cycles and growth rates (several years between births), it is difficult for populations to recover from unnatural losses.

Perhaps most endangered of all mammal species in the GLNP is the Critically Endangered Sumatran rhinoceros, with perhaps only 170 to 230 individuals remaining in the wild [12].

This sub-species of rhino once lived from the foothills of the Himalayas in Bhutan and northeastern India, through southern China, Myanmar, Thailand, Cambodia, Laos, Vietnam, and the Malay Peninsula, as well as the islands of Sumatra and Borneo. Now they are restricted to the Sumatran mountain rainforests, this the western sub-species' final stronghold from more rampant lowland deforestation (there exists an eastern sub-species as well, confined to the state of Sabah on Malaysian Borneo, where there are only an estimated 50 individuals

remaining). There are thought to be between 60 and 80 individuals in the GLNP. The two main threats to their survival are poaching and reduced population viability. Hunting is mainly driven by the supposed medicinal properties of rhino horns and other body parts [12].

It is therefore especially worrying to hear of the many perils faced by each of these three amazing species, as even today very little is known of their distribution in the Gunung Leuser National Park [13]. It is thus possible that they may become extinct without our ever having learned their full story (for a brief summary of what is known, please see the species guide in Chapter 5).

## Habitat loss

As recently as 1950, Indonesia was still densely forested. In the 50 years that followed, forty percent of the existing forests were cleared, with forest cover falling from 162 million ha to 98 million ha. Between 1990 and 2005 total forest loss in Indonesia was 28.1 million ha [14].

Approximately 1 million ha per year were cleared during the 1980s, rising to around 1.7 million ha per year in the early 1990s, and since 1996 deforestation is thought to be occurring at around 2 million ha per year [15]. Forest cover in Sumatra alone was reduced by 61% in just 12 years, from 1985-1997, due to logging, infrastructure development, internal migration and plantation development [7]. The forests of the Leuser Ecosystem continue to disappear at a rate of 21,000ha per year [15].

In 2003, 73-88% of the total volume of timber harvested in Indonesia was logged illegally, and the GLNP is currently one of the areas most affected by illegal logging activities across the whole of Indonesia [6].

Habitat is being destroyed due to weak compliance with government regulations, weak law enforcement for catching perpetrators, and an inadequate legal environment for dealing with those who are apprehended [16]. Conversely, although the Leuser Ecosystem, which encloses GLNP, is an officially recognized conservation area, it consists of almost entirely government forest land, approximately

Oil palm plantation near Gunung Leuser National Park (photo : Helen Buckland)

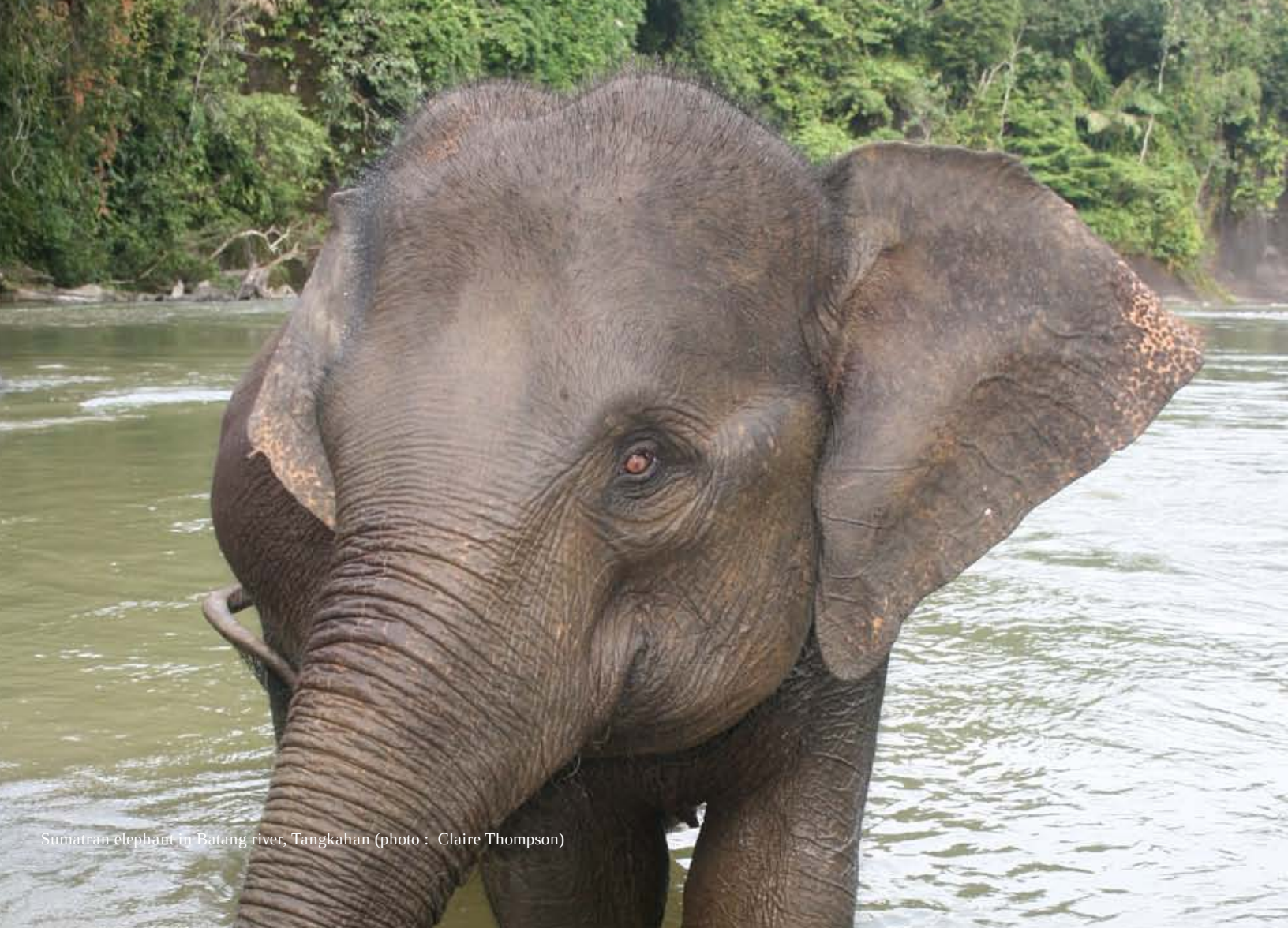
one third of which can be legally logged or transformed for agricultural use [16]. The continual timber extraction and exportation is caused by the high international demand. According to a 2007 report, China and Japan receive almost half of Indonesian timber exportations, while several other Asian countries, Europe and North America account for the rest amount [6]. The import of wood products to China alone increased from 40 million $m^3$ in 1997 to 140 million $m^3$ in 2005. It is this high demand from western countries and China which is triggering the biggest problems from illegal logging activities.

## Plantations and Biofuel

By far the greatest present threat to forests and biodiversity is the expanding plantation industry, with oil palm being one of the world's most rapidly increasing crops [14].

Commercial oil palm cultivation began in Sumatra in 1911 with expansion to other parts of Indonesia not occurring until the 1980s [14]. Millions of hectares of Indonesian rainforest have since been converted to oil palm plantations. Indonesia and Malaysia are the two largest palm oil producers, accounting for over 80% of global production [14]. Palm oil is currently found in many everyday products, including margarine, many baked goods, sweets, detergents and even shampoo and lipsticks [17]. The Nanggroe Aceh Darussalam province in Sumatra alone converted 265,995 hectares of forest habitat into oil palm plantations between 1985 and 2001 [18] and the rapid expansion of this industry is putting great pressure on the forests of the GLNP and the LE [19]. This surge in growth is caused by the high demand for commercial products, as well as a more recent growing demand for biofuels. With fossil fuels supplying the majority of energy requirements of industrialized nations, greenhouse gas emissions pose a real problem in terms of human induced climate change, which threatens both human livelihoods and biodiversity. Biofuels are being singled out as a solution to the reliance on fossil fuels and a way to reduce carbon emissions. In doing so, however, vast areas of natural forest are being destroyed to make way for monoculture plantations.

Oil palm plantation adjacent to Gunung Leuser National Park in Sei Betung, Langkat district (photo : Mustaqim)



Sumatran elephant in Batang river, Tangkahan (photo : Claire Thompson)

Tropical forests store approximately 46% of the world's living carbon and 25% of net global carbon emissions are thought to result from deforestation.

This shows the contradiction of clearing forests to produce supposedly carbon-neutral fuels. Furthermore, the forests of southeast Asia are among the most species-rich, so their loss seriously threatens global levels of biodiversity.

Recent findings suggest that replacing high-carbon forests and peatlands with oil palm monocultures in order to reduce the use of fossil fuels will accelerate both climate change and biodiversity loss [20].

Oil palm plantations support far fewer species than do natural forests [20], and contribute towards fragmentation and isolation of wildlife populations. As a result, animals are being marginalized and forced into ever decreasing habitat fragments. Further negative effects include water pollution (by pesticides and fertilizers) and air pollution (by burning forests to clear land, the fumes generated by the large numbers of trucks used for transportation, and emission of greenhouse gases from deforestation) [14]. There are other rapidly expanding crops being heralded as potential fossil fuel substitutes, such as soy bean and sugar cane, but large scale cultivation of these crops is also likely to have disastrous effects on both carbon emissions and biodiversity if plantations replace existing forests or peatlands [20]. The plantation industry is not just restricted to Indonesia, but is a global problem. The forests of South America and Africa are also suffering great losses. Indonesia contains valuable peatland areas which hold vast amounts of carbon, as well as being home to many rare and specialized organisms found

nowhere else. When peatland is burned or drained for biofuel plantations, the carbon is released into the atmosphere, and exacerbates the problem of global warming. In general, it is estimated that it would take between 75 and 93 years for the carbon emissions saved through use of biofuel to compensate the carbon lost through initial forest conversion [20]. If the original habitat was peatland however, it would take more than 600 years [20]. A large number of new plantations are being created in recently logged forest areas, whereas they could be established on already degraded land [21]. Planting oil palms on already cleared and deforested land would lead to carbon balance after only 10 years [20].

Future oil palm expansion needs to be managed in a way that is sustainable and avoids large scale deforestation.

## Illegal Wildlife Trade

An in-depth study of the live animal trade in Medan, North Sumatra, carried out between 1997 and 2001 revealed a total of 300 bird species, 34 mammal species, and 15 reptile species available for sale [22]. These included macaques, leaf monkeys, gibbons, siamangs and leopard cats. 20 per cent of the 349 species identified in this study, were totally protected by Indonesian Law, making their trade entirely illegal. The majority of these animals were captured within Sumatra, some locally from the GLNP. It is likely that this is having a catastrophic effect on numbers of wild animals. Further, in a more recent TRAFFIC report on the wildlife trade in gibbons and orangutans in Sumatra, from 2006-2008, 53 gibbons and siamangs were identified for sale in live markets, with an additional 15 found being held as pets [23]. Orangutan hunting for trade continues, despite being absolutely prohibited throughout their range, and is thought to be another major factor contributing to their decline [24]. Infant orangutans are normally obtained by intentionally killing mother, and the youngsters being taken to the marketplace to be sold as pets. Playful infant orangutans soon grow into potentially dangerous adults, however, weighing 80kg+ and several times stronger than an adult human. Consequently, many pet orangutans are abandoned or killed when they become unmanageable. Having become dependent on their owners, they are unable to survive in the wild and subsequently starve or end up along with countless other orphan orangutans, in centres run by conservation organizations, with the purpose of rehabilitating them and returning them to the wild once fully grown. Although no orangutans were found for sale in the TRAFFIC reports, there are reported a number of new arrivals in zoos throughout southeast Asia, from unknown origins [23]. In addition, there is a steady annual influx of confiscated orangutans to the Sumatran Orangutan Conservation Programme (SOCP) rescue/reintroduction programme, thus this indicates that there is still active trade occurring in these protected, highly endangered species.

Large numbers of orangutans and gibbons originating from Sumatra are being taken to sell at markets on Java and Bali [25]. These animals are categorized under Appendix I in the Convention on International Trade in Endangered Species (CITES) [26]. This means that all international commercial trade of these species is illegal. Weak law enforcement, inadequate training among customs officials and corruption at many levels however, enable the trafficking to persist [27]. The slow loris, for example, a highly threatened primate species found in the Gunung Leuser National Park, is the most commonly observed primate in live animal markets even though it is fully protected under Appendix I of CITES [28]. They are caught easily when an area of forest is being cleared. Although the effect this is having on their abundance in the wild is not yet known, many forest areas where one would expect to find a number of them, including parts of the GLNP, have been found with very low densities or simply none at all [29]. This suggests that harvesting for the pet trade is having a catastrophic impact on some wild populations.

## Infrastructure development

In 1982, a road project split the GLNP in two, leading to illegal settlements inside the park, as well as an ever-expanding wave of encroachment, illegal logging

and poaching of endangered species. Any new infrastructure development in the area would be equally environmentally disastrous [30]. Further road development would fragment the forest even further. It could divide the remaining orangutan populations [30], cut an important elephant migration route, and affect a number of other already threatened species. Many animals see roads as barriers and are unable to cross them to access other habitat areas; a process known as dispersal. This leads to more isolated populations, which then face serious problems, such as inbreeding and loss of genetic diversity. The adaptive capacity of the population towards diseases, predators and food shortages then is drastically reduced, making them more vulnerable to disappearance. In addition, if animals cross the roads, there is an increased risk of injury or death from oncoming traffic. Some arboreal (tree dwelling) species such as orangutans and slow lorises try to use power lines in an attempt to move to neighbouring forest fragments in search of food, mates and territory. This results in serious injury and often death by electrocution.

Increasing vehicle access to the interior of the forest will also facilitate large-scale illegal logging and illegal settlements, along with poaching of threatened species [31]. The problem of soil erosion and flash flood risk in downstream areas during the wet season, and lack of water during the dry season will also be exacerbated by removal of the forest and the soil being exposed [5]. The GLNP is particularly vulnerable to these problems due to the prevalence of steep slopes throughout the region. According to one estimate, constructing the road through the Leuser forest would lead to the logging and clearance of between 400 and 2400 ha for each km of road built. [32].

Thomas Leaf Monkey (photo : Miran Campbell-Smith)

Sumatran Orangutan (photo : Nick Tignonsini)

# 2

# The Sumatran Orangutan

## Origins and Distribution

Orangutans are the Asian representatives of the great apes or Hominidae, a Family of primates which includes their African cousins: chimpanzees, bonobos and gorillas. Scientists also place humans in the great ape family. All primates share a common ancestor and the lineage leading to modern great apes diverged approximately 25 million years ago (mya) [33]. Orangutans were the first to diverge roughly 11 mya somewhere in the Asian mainland [34], leading to the genus Pongo. This was then followed by the gorillas (genus Gorilla) 7 mya. The human lineage (genus Homo) was the next to diverge from our common ancestry approximately 6 mya, and then nearly 3 million years later, the chimpanzees and bonobos diverged, both in the genus Pan. So all great apes are closely related as members of one Family..

Historically, orangutans were distributed widely across the Asian continent, from northern India, to southern China, and southwards until the Indonesian island of Java [33]. Modern orangutans are now found only on the islands of Borneo (Indonesian Kalimantan and the Malaysian state of Sabah), and Sumatra, with over ninety per cent of the orangutan population living in the territory of Indonesia, the world's fourth most populous nation [35]. Orangutans are now categorized as two separate species; the Bornean orangutan (Pongo pygmaeus) and the Sumatran orangutan (Pongo abelii). The Bornean orangutan lineage diverged from the Sumatran orangutan lineage approximately 1.1 - 2.3 mya. Orangutans share 96.9% of our genetic makeup [36] and are one of our closest living relatives. We can therefore learn a great deal about our own origins from our primate cousins. The distribution of orangutans we see today has been shaped by climate, geographical barriers such as waterways, and human pressures (see Chapter 1 for more details). The Sumatran orangutan is now restricted to 18 habitat blocks on Sumatra, ranging in size from 1000 ha to 93,400 ha, and approximating a total of 694,600 ha of suitable habitat, mostly to the north of the island [30] (See Fig 1). The most viable populations are in the GLNP and the Leuser Ecosystem, as well as the coastal swamps and lowland parts of the Alas Valley [9, 16,30,31].

Sumatran Orangutan (photo : Nick Tignonsini)

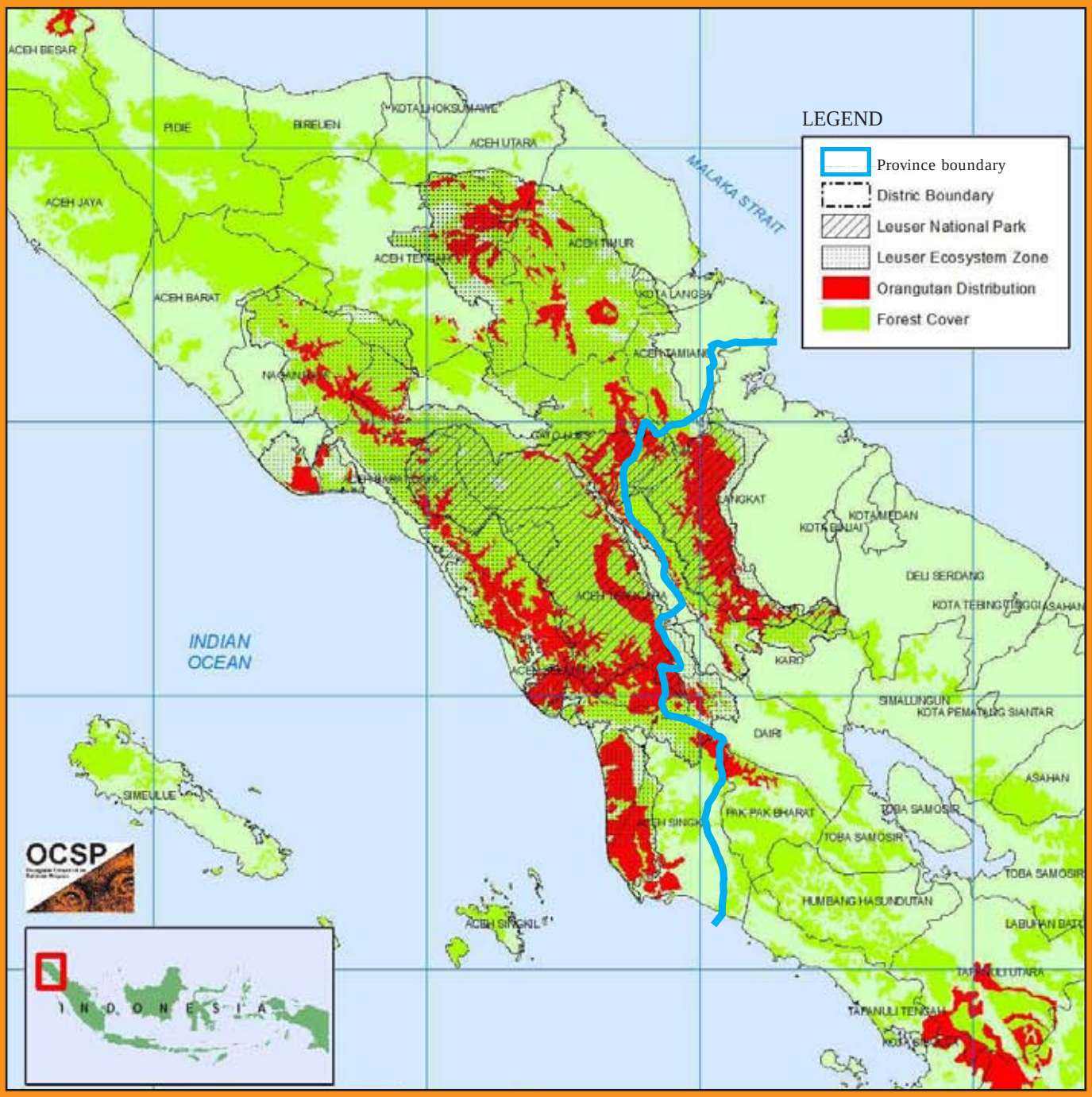



Figure 3. Latest known distribution of the Sumatran orangutan. Map from Directorate General of Forest Protection and Nature Conservation (2009) Orangutan Indonesia : Conservation Strategies and Action Plan 2007-2017

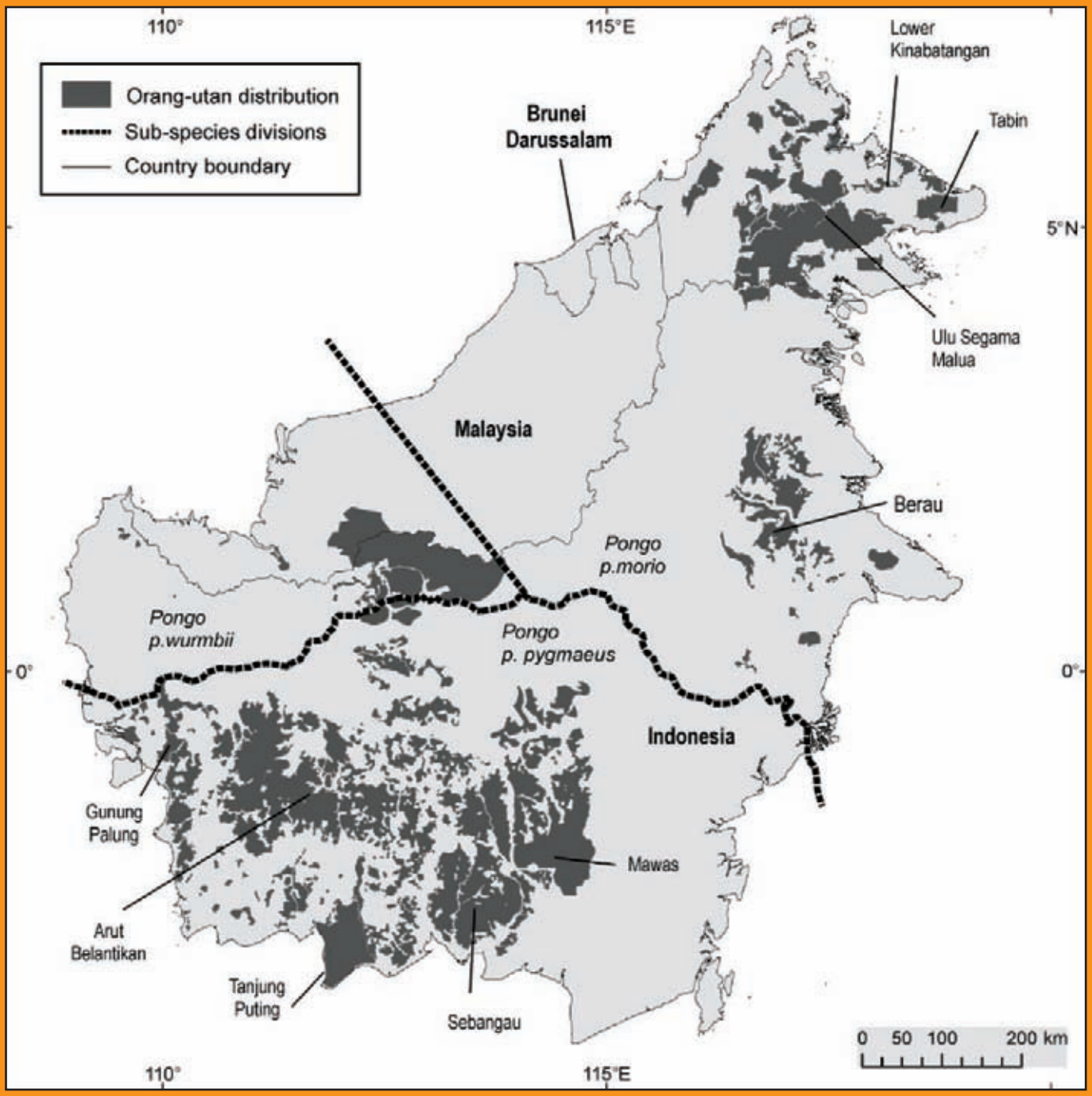



Figure 4. Latest known distribution of the Bornean orangutan. Map from Wich et al. 2008, Distribution and conservation status of the orang-utan (Pongo spp.) on Borneo and Sumatra: how many remain?, Primates. Used with permission from Cambridge University Press.

For reference purposes, the distribution of Bornean orangutans (P. pygmaeus) is given in Figure 2. Of which there are now three distinct sub-species: 1.Pongo pygmaeus pygmaeus-found in the northwest of Borneo 2. Pongo pygmaeus morio-found in the east of Borneo 3. Pongo pygmaeus wurmbii-found in the southwest of Borneo. There are no recognised sub-species in Sumatran orangutans.

## Anatomy

Sumatran orangutans have long, thick russet red hair covering the upper body, arms, legs and head. There is a marked difference in size between males and females, with males weighing approximately 80kg, and females approximately 39kg. There is a pattern of bimaturism observed in orangutan males. This bimaturism leads to the coexistence of two adult, sexually mature morphs: flanged and unflanged males: (1) flanged male, the fully developed male with secondary sexual characteristics (SSCs) – large cheek flanges, enlargedthroat sac, beard and growing to approximately twice the size of an adult female; and (2) unflanged male, the arrested adult male whom is fully fertile yet retains the characteristics of an adolescent male-slightly larger than a female but otherwise undeveloped.

Evidence from studies in captivity leaves no doubt that the switch between male tactics maybe triggered by a change in social situation (the disappearance of a flanged male from the vicinity of an unflanged male [37, 38]. The transition from the unflanged to flanged state at the long term wild orangutan research site in Ketambe (Sumatra) coincided with the disappearance of the longest dominant resident flanged male and a subsequent situation of social instability, with many unfamiliar flanged males passing through [39, 40]. However, there seems to be a density-dependent effect on male sexual development too, if we pointed that in Ketambe (Sumatra), where orangutan density is comparatively high, the ratio of flanged males to adult females is 1:3, and the ratio of flanged males to unflanged males is 1:2, where as in Tanjung Puting (Borneo), where orangutan density is low, the ratio of flanged males to females is 1:1, and unflanged males are rare [40].

In Sumatra, SSC development may be delayed for many years or even decades after reaching sexual maturity. The changing from the unflanged to flanged state is a once-in-a-lifetime decision [40]. Although unflanged mature males lack SSCs, they are fertile, sexually active and able to sire offspring [37, 41]. This conclusion is also supported by a study of museum skeletons that found there were males who must have died at an old age, but who had maintained a 'female appearance' [42].

Adult male Sumatran Orangutan (photo : Helen Buckland)

Adult female Sumatran Orangutan (photo : Nick

# Behaviour and Sociality

Orangutans divide their time between feeding, resting and moving, with various other activities making up the rest of the time. There are variations in every population, with wild orangutans in the Suaq Balimbing research site in Sumatra on average spending 55% of their days feeding, 25% resting, 17% moving, and 3% on other activities[43]. Table 1 shows the results of various studies looking at orangutan activity budgets.

Table 1: Results from a number of studies looking at wild orangutan activity budgets

| Site/Study | Feeding % | Resting % | Moving % | Other % |
|---|---|---|---|---|
| Ketambe - Sumatra/Rijksen 1978 | 40 | 43 | 15 | 2 |
| Tanjung Puting National Park - Kalimantan/Galdikas 1988 | 65 | 18 | 15 | 2 |
| Average across Borneo sites/Delgado and van Schaik 2000 | 43 | 41.5 | 13.5 | 2 |
| Suaq Balimbing - Sumatra/Fox et al 2004 | 55 | 25 | 17 | 3 |

Orangutans differ from the other great apes in that they are almost entirely arboreal (tree dwelling), They are the largest arboreal mammal on earth. The Sumatran species lives at a density of between three to six individuals per $km^2$, and live at higher densities than the Bornean orangutan. Home ranges vary from 800 to 1,500 ha or larger for females, of which for males it is not yet fully known but is thought to be in excess of 3,000 ha [44]. Females tend to stay near the range in which they were born, whereas males disperse and form a home range two to three times the size of of the females' [7]. Socially, orangutans can be described as "neighborhoods, where residents know many others, but know them less well as the home range overlap decreases"[45]. There is a clear level of aggression between fully adult male orangutans.They will, however, tolerate the smaller males, unflanged males [46]. Based on long term behavioral data and genetic paternity studies at Ketambe, there are two coexisting male morphs, each of which is reproductively successful [41]. Moreover, the relative tolerance of the flanged males toward the unflanged males is not facilitated by an inclusive fitness advantage by the flanged males. The co-occurrence of flanged and unflanged males, must, therefore, be explained as a result of the practical impossibility for flanged males to keep unflanged males out of their home-ranges[47].

The flanged-male condition is associated with the tactic of advertising one's presence with long-calls and waiting for females, which are attracted when sexually motivated. The unflanged condition is associated with a tactic of keeping a low profile (no long-calls), thus avoiding the provocation of flanged males, and at the same time searching for females and trying to seduce them, or occasionally even to force them into matings [47]. The former has a high cost along with a potentially high reproductive benefit and the latter relatively low cost with a low benefit conferred [48].

The adult flanged male periodically emits a powerful, bellowing vocalization termed the "long call" which is audible to humans up to 2 km away [49].

Unflanged, or not yet fully developed males and adult females are capable of making calls (i.e. the lork call), but these are rarely emitted [50]. Long calls are individually distinct and other orangutans seem to recognize the identity of the caller based on the particular characteristics of the long call, and respond accordingly [51-53]. Due to these aspects of long calls and because of the system of semi-sociality seen in orangutans, there is a strong reason to believe that long calls play a crucial role in the organization of both male and female reproductive strategies [52].

Recent findings show that the orangutans' call repertoire is much more rich and diverse than originally assumed and that other calls, despite being less conspicuous than the long call, may play important functions as well [50]. For example, with the exception of humans, orangutans are the only other species known to use tools to actively modify their own calls during emission- by positioning a hand or leaves in front of their lips while emitting kiss-squeaks (i.e. orangutans' alarm call), the orangutans lower significantly the frequency of that sound (Hz). This is thought to make it sound as though their body size larger than it actually is, potentially deceiving a predator [54]. Moreover, there is evidence that this behavior is learned between animals, composing partly the local culture of particular populations [54]. At the same time, other studies, still ongoing in 2009, indicate that orangutan call repertoires may differ between populations in a similar ways as they do in human languages, with distinct and population-specific calls serving the same function in different populations [55, 56].

The main ecological factor determining orangutan sociality is food abundance; animals that are better fed have more time and energy to socialise [45]. Wild populations consist most commonly of solitary adult males, adult females usually accompanied by one or two dependent offspring, and independent sub-adults and adolescents [57]. During years of high fruit availability (mast fruiting, explained in Chapter 1), however, they become more social, with consorts sometimes being formed between males [58]. At Suaq Balimbing, an orangutan research site in the Gunung Leuser National Park, there is a much higher population density of orangutans, and as a result, higher frequency of social interactions.

## Life History

Orangutans have the slowest birth rate of any primate species, and the longest interbirth interval of any other primate or land-based mammal, with a mean duration of 9.3 years in Ketambe and 8.2 years in Suaq Balimbing [59, 60].

This is highly significant as it makes population recovery very difficult to achieve. The mother-infant bond is very strong, with offspring remaining dependent for up to seven-eight years. Sumatran species of orangutans are reported to survive at least up to fifty years of age, with females in both species not giving birth until approximately fifteen years of age. This equates to just four to five surviving offspring in an average mother's lifetime [45].

## Conservation Status

Since 1900, the number of wild Sumatran orangutans is thought to have fallen by as much as 91%, with an exponential population decrease towards the end of the twentieth century up to the present day [7]. In 8000BC, there were an estimated 380,000 Sumatran orangutans, which then fell to 85,000 in 1900 [7]. From then numbers dropped dramatically to an estimated 12,500 in 1997, and again to 7,501 in 2004 [31]. The current total population estimate as of 2008 is 6,624 [30], and numbers are continuing to fall every year [62] (For reference purposes, the current total population estimate for Bornean orangutans is approximately 54,000 individuals remaining in the wild) [30]. Of the 13 known population units of Sumatran orangutan, only seven are thought to have more than 250 individuals, and just three hold more than 1,000 individuals, with a further three having between 250 and 1,000 individuals [30, 63]. 91% of all Sumatran orangutans occur within the boundaries of the Leuser Ecosystem (see Sumatran orangutan distribution map) [30]. The

most significant orangutan population outside of this vitally important area is found in the Batang Toru area south of Lake Toba (which holds 400 individuals in 60,000 ha of forest).

Orangutans are facing high levels of human induced threat. Approximately 75% of the total remaining population of Sumatran orangutans occur outside of GLNP boundaries [64], some areas of which are prone to high levels of illegal logging, mining, forest conversion to plantations and fires [6]. The Leuser Ecosystem provides varying levels of protection, with no protection whatsoever in some parts [16]. Agricultural plantations do not provide viable orangutan habitat, but selectively logged land can still support a population, albeit at lower densities than primary forest [30]. Although orangutans exhibit high behavioural and dietary flexibility that allows them to persist in secondary logged forest [65], densities do decline following logging, particularly in the long term. The threats of hunting and logging apply to orangutan populations on both Sumatra and Borneo, although hunting is a larger threat in some parts of Borneo than Sumatra, and much less orangutan habitat remains on Sumatra than on Borneo [63].

The status of Sumatran orangutans, and the threats they are facing, are causing conservationists to speculate that they could become the first great ape species to go extinct. Using various population modelling techniques, orangutan conservation biologists have predicted that high annual rates of habitat loss (15% or higher) will result in certain extinction in all Sumatran orangutan populations within 50 years [63]. According to this study, only the West Batang Toru population (located south of Lake Toba) is large enough and has a sufficiently low rate of habitat loss (2% annually) to persist for more than 150 years – however, if these rates were to continue this population too would be pushed to extinction within 275 years. The same study shows that if logging and hunting are halted altogether, the number of Sumatran orangutans expected to remain in 50 years would be about 6,570. It must be remembered that although these data are based on informed models, they are still only potential outcomes and thus need to be treated with a certain level of caution.

It is clear that Sumatran orangutans are in urgent need of our help if they are to avoid disappearing forever. The Indonesian government has developed the 2007-2017 National Strategy and Action Plan for Orangutan Conservation, which is geared towards ensuring the long-term survival of the Sumatran and the Bornean orangutans [67]. This plan puts emphasis on habitat management as one of the focal points for the conservation effort, which should be conducted through both existing protected conservation areas as well as other regions hosting orangutan populations outside of those boundaries, with


GNLP forest (photo : David Dellatore)


GNLP forest (photo : Madeleine Hordus)

the involvement of all relevant stakeholders. In order to achieve this, the following points have been laid out:

1. Strategies for the improvement of in situ conservation as the principal activity in ensuring the orangutans' survival in its natural habitat
2. Strategies for the development of ex situ conservation activities as an adjunct to in situ conservation
3. Strategies for research and development in orangutan conservation

Further, recent discussions amongst orangutan conservationists came up with a wide range of options for improving their chances of survival in the long-term. These include:

- preventing road construction in protected areas;
- more funding for conservation projects;
- more effective law enforcement;
- continued monitoring of orangutan populations;
- building vegetation corridors between forest fragments;
- implementing education and outreach programmes;
- maintaining a moratorium indefinitely for legal logging;
- helicopter patrols;
- participation and collaboration with local conservation organizations;
- forest regeneration;
- developing alternative livelihoods for local people e.g. sustainable tourism;
- international and national media campaigns [63].

Putting all of these ideas into motion will take considerable public and political will, but should be considered of the highest priority if we are to save the Sumatran orangutan from extinction.

## Orangutan Rehabilitation and Reintroduction

Due to such high levels of habitat loss (see Chapter 1), an increasing number of orangutans are being displaced from their natural environment [68-70]. With the opening up of the forest to human development, orangutans are often captured and sold into the pet trade. It is illegal across the whole of Indonesia to obtain and keep orangutans [71], so if discovered by the authorities they are confiscated and taken into rehabilitation and reintroduction programmes. Upon reaching adulthood and sometimes sooner as adolescents, they are returned to the forest to become free living animals again. This is not an ideal element of the conservation of orangutans, but rather a reactionary solution to a persistent problem. Rehabilitation and the releasing of orangutans began in the 1960s when it was thought that they were nearly extinct, with only 5,000 wild individuals estimated to remain [72]. It was expected that the programmes would counter the effects of the illegal pet trade as well as reinforce wild populations [35]. A large part of the success of a reintroduction program depends on the suitability of the release site and the ability of the animals to establish a viable breeding population [73-75]. Individuals must reduce any learned dependence on humans to be able to return to natural life in the

Sumatran Orangutan (photo : Mike Perez)

forest [76, 77]' Such dependence is fostered through maintaining contact with humans [78], a factor that has resulted in most orangutan reintroduction programs banning visitors access to recently released animals [35].

The first Sumatran rehabilitation centre for orangutans was set up by the Indonesian Nature Conservation Service (PPA) in 1971 at Ketambe, which is located in the Nanggroe Aceh Darussalam province. It was established alongside a research project on wild orangutan ecology and conservation. Since 1978 Ketambe has focused only on research projects and moved ex-captive orangutans to Bukit Lawang [Schurmann pers. comm.] A similar project for Bornean orangutans was set up shortly afterwards by Dr Birute Galdikas in the Tanjung Puting National Park (also designated a UNESCO Biosphere Reserve in 1977) in Central Kalimantan. Subsequently, a second rehabilitation centre was established for Sumatran orangutans at Bukit Lawang (also referred to as the Bohorok Rehabilitation Centre), on the eastern border of the GLNP, in 1972 [35]. Sometime later it was realised that visitors' behavior at these centers was not being controlled and that orangutans were often coming into direct contact with humans, exposing them to disease and making them more dependent on people for food provisioning [35]. These attitudes were in direct contradiction with the official orangutan rehabilitation process. As a result an instruction was issued by the Indonesian authorities on April 23rd 1991 for these stations to be officially closed. At Bukit Lawang, a number of orangutans and their surviving offspring still remain in the area to this day. Scheduled supplementary feedings are held twice a day for this population, consisting only of bananas and milk. The idea is to keep the provisioned diet as bland as possible to encourage the released, or semi-wild, individuals to find food independently. In 1992, a second Bornean rehabilitation centre was set up at Wanariset Samboja in East Kalimantan, under a new approach formally approved by the Indonesian Ministry of Forestry. In 2002, the Sumatran Orangutan Conservation Programme initiated a reintroduction programme for Sumatran orangutans, with a rescue/quarantine centre located in Sibolangit, North Sumatra. SOCP conducts all orangutan releases in Bukit Tigapuluh National Park, in the Jambi province in the south of Sumatra – this is now the only active reintroduction programme on the island.

## Flagship Species

The Sumatran orangutan is what conservationists class as a flagship species. These are particularly charismatic or fascinating animals which act as ambassadors to an entire conservation campaign, and can be used as a public symbol for wider conservation aims. Protecting such species usually has benefits for associated less well-known animals and plants. Through the Sumatran orangutan's ability to capture the attention of the general public, there is extraordinary potential for conservation. They easily win people's hearts and minds through their intelligence, unique character and evolutionary relationship and similitude with humans, and many people readily acknowledge that protecting the orangutan and its environment is an important task. Its highly appealing nature can draw a great deal of attention to the rainforests where they live.

## Under the Orangutan Umbrella

The case for protecting the orangutan is strengthened by the relationship it has with the ecosystem in which it lives; acting as an umbrella species. This is an animal whose home range and habitat requirements are large enough that when it becomes the focus of protective management, the entire ecosystem and biodiversity within its range is automatically protected [58]. The orangutan, with its predominantly arboreal behavior and fruit-eating diet, is a unique species in terms of its ecological role in maintaining the rainforest function [35]. A regular density of orangutan population, allows an area to host at least five other primate species, at least five hornbill species, at least 50 different fruit tree species and 15 different liana species [35]. Promoting the important role orangutans play in an ecosystem together with people's desire to see them in the wild will lead to a much more successful conservation strategy.

Bohorok river (photo : David Dellatore)

# 3

# Ecotourism in Sumatra

## Indonesia's Tourism Industry

During the 1980s international tourism grew at an annual average rate of 4.7% worldwide, while Asia and the Pacific experienced double this rate. In 1990–2000 average growth was slower internationally and regionally because of heightened fear of international insecurity and, in the last part of the decade, slower economic growth in Asia, but the relative figures were still 4.4% for global growth and 7.1% for the Asia–Pacific region. Since 2000 growth has been further stimulated by deregulation of aviation within Asia, with - despite initial protectionism - a vast expansion of regional low-cost airlines. The figures reflect the region's increasing prosperity, shown in higher levels of travel for both business and leisure purposes.

Indonesia's tourism industry has benefited from the world-wide growth in tourism, with arrivals exceeding 1 million visitors for the first time in 1987 and increasing to over 5 million by 1996. This has since gone up significantly, as from 2002-2008 there were 36,435,294 foreign visitors, with 2008 hosting the highest annual amount of 6,234,497 foreigners to the country. Of these, on average each visitor was said to spend $915, thus it could be said that in 2008 alone foreign tourism brought in $5,704,564,755 to Indonesia. The principal markets are other countries in the Asia - Pacific region, notably the ASEAN countries, followed by Europe, Australia, and the USA. These last three are important markets for cultural and ecotourism, partly because visitors from these markets stay much longer than Asian visitors, and partly because their recreational preferences are more varied.

From the closing months of 2008 until the present (June 2009), the world has been submerged in a global economic crisis, with effects being felt throughout nearly every industry and market. Thus far in 2009 the tourism market in southeast Asia has experienced a 4.7% overall decrease, as compared to the same period in 2008. With much of the economy coming to rest on income brought in through tourism, there is major cause for concern. However, one potential safeguard that will help ensure that tourism persists and grows is to offer to visitors a unique and unparalleled experience of all the natural beauty and wonders of Indonesia. With so much to see along with a multitude of endemic species found nowhere else in the world, Indonesia retains a formidable position of strength in the market and can continue to draw new and returning visitors each year.

Waterfall in Tangkahan (photo : FFI)

## What is Ecotourism?

Growing concern for conservation has resulted in a closer relationship between the environment and tourism. As a result, ecotourism has become increasingly popular and commercially viable. Ecotourism can be described simply as "responsible travel to natural areas which conserves the environment and improves the welfare of local people". Ecotourism can also be placed under the umbrella of sustainable tourism, a form of economic development designed to improve the standard of living of local people and maintain the quality of the environment that local people and visitors are dependent upon.

There is great potential for ecotourism to contribute both to conservation as well as development of local communities through the revenue it provides. Local governments can generate income from the tourism sector and the private sector can gain much from tourism income (e.g. hotels, restaurants, transportation, etc). The annual worldwide value of ecotourism is now a major source of income in many countries , as well as being of great conservation importance if properly managed. The volume of tourism to Indonesia, at 6.2 million visitors in 2008, makes the minor ecotourism sector significant, and its effects can have a considerable impact in relation to the sometimes fragile environments, cultures and economies where it often takes place .

Ecotourism should not be confused with wildlife tourism, which is based solely on interactions with wildlife such as viewing/photographing, direct contact and feeding.

These activities do not necessarily carry any sense of responsibility to the environment or local communities in the areas where the wildlife lives and can often be detrimental to the animals themselves. Negative impacts can include destruction of habitats, alteration of behaviour, altered patterns of habitat use, disease transmission and increased chances of poaching through over-habituation. This can also have negative impacts on the human sphere, through problems associated with the "Tourist Area Life-Cycle Model", wherein over time as the industry and associated infrastructure is developed, local communities are marginalized and the region's original authenticity and/or natural beauty diminished, thus resulting in sociocultural stress and the overall decline of the area. On the other hand, if ecotourism is developed and thereafter managed ethically, there is no reason for these problems to occur, and sustainability will be implicit, with conditions that are highly beneficial for both people and wildlife.

## Moving Towards Sustainable Tourism

Well-managed ecotourism is a viable industry that does not depend on the destruction or extraction of natural resources and therefore can constitute a valuable tool to safeguard wildlife. An enhanced appreciation of wildlife and natural environments may be fostered, encouraging education and providing working opportunities for the local population. Increasing conservation awareness can also generate momentum to persuade government officials to take action . Perhaps most importantly, ecotourism can encourage local communities to value their environment, and to manage and protect their own land and natural resources .

If managed effectively ecotourism should be a most welcome venture in areas such as the Gunung Leuser National Park, which has a large number of natural assets to be visited.

Successful ecotourism needs to be highly inclusive of the local population, as its success depends on local people's knowledge as well as the natural and cultural environment, which nearly everyone can capitalize on. In villages such as Bukit Lawang and Tangkahan, there is a great opportunity to diversify the tourist industry, making the area less dependent on viewing just a single species such as orangutans or elephants, and focus more on the GLNP itself and its many other natural wonders. The provisions of different activities will not

A canoe to Orangutan viewing centre Bukit Lawang (photo : Emmy Pardede)

only cater to the interests of a wider spectrum of visitors, but could also entice primarily orangutan or elephant interested tourists to participate in other activities and therefore further contribute to the local econot. Ecotourism is a means of sustainable development that people can embrace, but it must be done responsibly. This is when ecotourism begins to shift towards sustainable tourism.

## The Side Effects of Ecotourism

It is essential for ecotourism ventures not only to be beneficial to the wildlife, but also to bring in revenue and sustainable development to local communities. With the many benefits that ecotourism can provide to local people and wildlife however, come some additional negative side effects, which are possible to avoid. When animals come into close contact with large groups of tourists, they can become stressed, which in turn causes them to change their natural behaviour, such as changing their feeding habits. A long term concern is that tourism can exacerbate the risk of disease transmission between humans and primates, and vice versa. This issue is discussed in detail in Chapter 4. As you will see later on, there are simple steps that can be taken to prevent this from happening.

Illegal food provisioning to Orangutan in Bukit Lawang (photo : David Dellatore)

# Case Study :
# Tourism in Bukit Lawang

Although it is no longer a center for orangutan rehabilitation and reintroduction, Bukit Lawang hosts a tourism industry based on the remaining population of semi-wild individuals. This involves both passive viewing, as well as occasionally direct interaction with tourists. Although it is illegal and forbidden to touch, feed, or disturb the orangutans, such practices still do occur in the forest for the enjoyment of the tourists. Many tourism operators bring rucksacks full of fruit into the forest that either they or the tourists then give to the orangutans. Orangutan sightings are nearly guaranteed to tourist groups, with most including 'scouts' that travel ahead of each group, calling and luring orangutans to the trail system until the group arrives. Although a small portion of tourists informally surveyed reported they were unhappy with such practices, there are many more accounts of tourists' (close) encounters with the orangutans, with most expressing their satisfaction in holding and/or feeding orangutans in Bukit Lawang (Dellatore, pers. obs).

Official figures from the GLNP department reported 220,142 foreign tourists from 1985 to 2008, averaging 9,173 per year; and 82,058 domestic visitors from 1990 to August 2008, with the maximum annual number of visitors being 21,577 foreign and 9,561 domestic visitors in 1995. The total amount of visitors to the area in 23 years totals 302,200. This does not include any unregistered visitors, of which there may have been more than double the official figures.

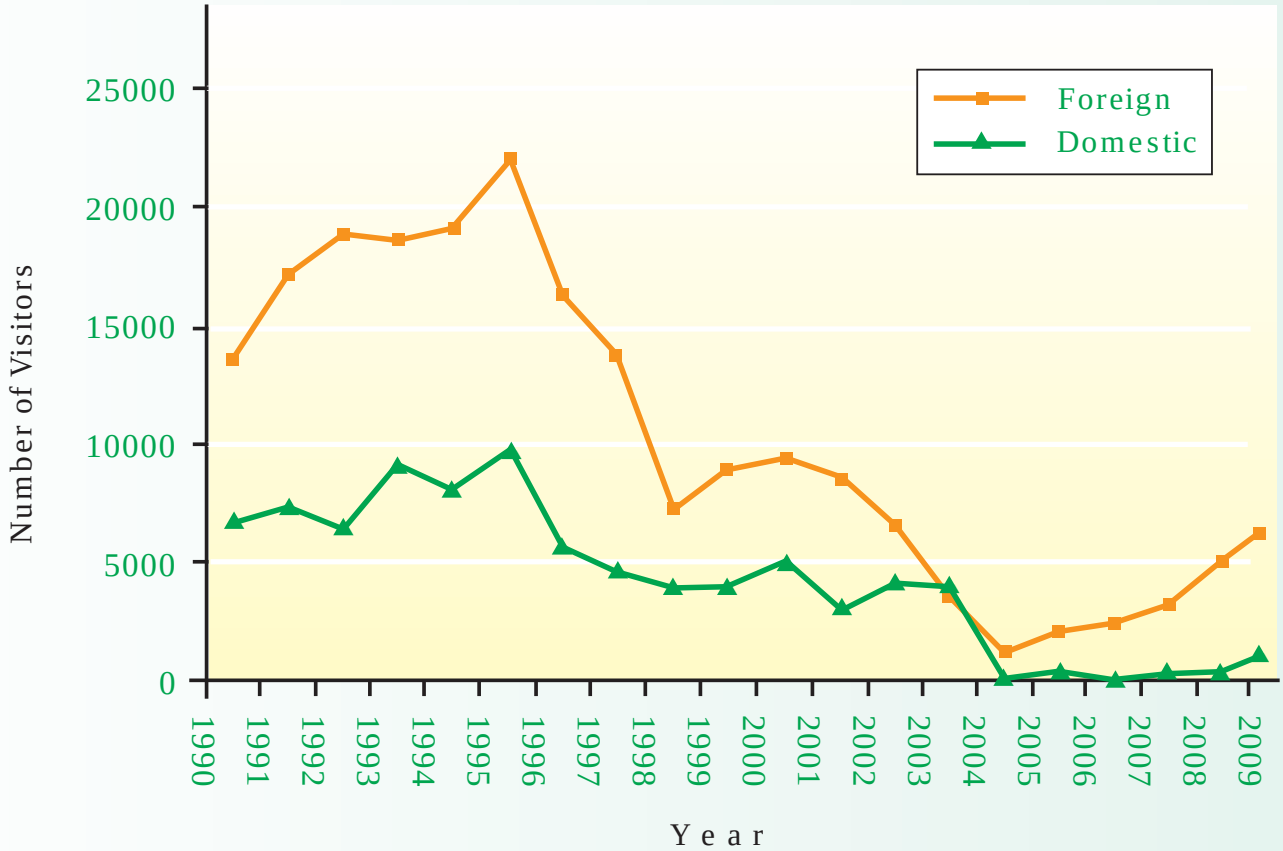



Figure 5. Registered visitors to Bukit Lawang 1990 - 2009 ☆

Source : GNLP Bukit Lawang Office
☆ January - August 2009

The tourism industry in Bukit Lawang reached an all time low in 2004. On 2nd November 2003, a 12 metre high flash flood swept through Bukit Lawang, tragically killing 239 people including 5 foreign visitors. Hundreds of houses and guesthouses were destroyed, buried under tonnes of logs, mud and debris. Many local people were left homeless with their livelihoods completely gone. Only since 2006 have visitor numbers begun to recover more significantly. Furthermore, the 2004 tsunami (though it did not directly affect the area) and the political climate during that time (e.g. Bali bombing of 2002, previous armed conflict in Nanggroe Aceh Darussalam for almost 30 years) could probably be implicated in the considerable drop in the numbers of tourists visiting the area.

## Not Just Orangutan Tourism

As mentioned before, often a charismatic or flagship species draws visitors to an area and encourages people to become involved in conservation efforts . In some parts of Gunung Leuser National Park, such as Bukit Lawang and Tangkahan, these flagship species are the orangutan and the elephant, respectively. Being dependent on species like these highlights the importance of proper management of tourism ventures, to ensure the species remain for future generations (so as to continue drawing more visitors to the area). It also stresses the need to make people aware of the many other wonderful attractions of GLNP and the experiences they can have aside from observing orangutans. With all of the focus on orangutans, who have become habituated to continued human traffic, little consideration is given to other wildlife species. Animals such as the tiger, rhinoceros, and sun bear are all known to be affected simply by the presence of small numbers of researchers in the forest, causing them to change their ranges and behaviour. It is highly possible then that large numbers of tourists in the forest are having an even greater impact on these and other species.

A shift in the focus of ecotourism in GLNP from the orangutans towards other species would be hugely beneficial in many ways. Bukit Lawang would become a gateway to the GLNP and not just an orangutan viewing centre, reducing the pressure on the orangutan population and raising the conservation status of the area in general. The park has much intrinsic beauty to be appreciated; exciting treks into the forest with the potential of encountering wild animals as a bonus. Tourist will value their visit more if they have a holistic experience as opposed to just an 'orangutan viewing tour'. This will better serve both the tourists and the local community, fostering a greater appreciation for the natural environment and the way ecosystems work. It is important to change people's perception of animals; to make them see that they are going to witness their daily lives in their natural habitat, and not just exhibits on show.

A group of tourists observing a Thomas Leaf Monkey in Bukit Lawang trekking trail (photo : Panut Hadisiswoyo)

A large group of tourists on trail 1 in Bukit Lawang (photo : David Dellatore)

# 4

# Disease Transmission

## The Vulnerability of Orangutans

When it comes to ecotourism and human contact, the risk of disease transmission is by far the greatest threat to orangutans. As well as the other nonhuman great apes (chimpanzees, gorillas and bonobos) they are genetically very close to humans. The more similar two species are, the greater the number of diseases that can be exchanged between them [109]. As a result, orangutans are highly vulnerable to human infections (anthropozoonotic disease transfer), viruses and parasites, as much as humans too are vulnerable to any diseases carried by orangutans (zoonotic disease transfer). Furthermore, Studies have shown that primate populations in close proximity to humans have higher levels of parasitic infection than those which rarely come in to contact [109-112]. The consequences of disease can be important both at individual and group level [113]. Any infections which are transmitted to orangutans can then be passed to other orangutans, which risks infecting an entire population if someone enters the forest carrying any contagious disease. Even the common cold is a threat, which can easily spread through a population of orangutans because they lack the immune system qualities needed to combat this human ailment. A whole range of diseases can be passed between orangutans and humans, making close contact a difficult issue, especially when observing them in their natural habitat and trying to sustain tourism. The following contagious diseases affect both orangutans and humans: pneumonia, influenza, hepatitis, smallpox, chicken pox, bacterial meningitis, tuberculosis, measles, rubella, mumps, yellow fever, polio, encephalomyocarditis, and Ebola fever [92].

Several factors determine the susceptibility of an orangutan population to disease transmission, most importantly the health condition of humans who enter into their habitat [114]. The size of the orangutan population itself and the extent of fragmentation of their forest habitat are also significant because both these factors will determine the level of sociality and the frequency with which orangutans come into contact with each other [92]. Here the potential for intraspecies disease transmission becomes significant, when there are more individuals in close proximity, increasing the frequency of contact between orangutans. Although current studies call for there to be only a few remnant or no wild orang-utan population in a reintroduction site, to prevent rehabilitated individuals from introducing diseases into wild populations, it has been observed that such a wild population exists within the Bukit Lawang area. Therefore there is a potential for habituated semi-wild orangutans to come into close contact with people, and later pass human infections on to the wild population.

Predation can become a greater threat, with infected animals potentially having a weakened ability to avoid conflict or defend itself, and lastly disease may also result in lowered reproductive rates in the population [115].

If there is a high density of orangutans in a small forest fragment then contact between them, and the risk of disease transmission, will be higher. It is important to remember that Sumatran orangutans live in higher densities than Bornean orangutans, making them more vulnerable to disease transmission. With continually shrinking forests this issue becomes more and more exacerbated. Furthermore, a highly fragmented forest will make it more difficult for individuals to disperse to less crowded areas.

## The Link Between Disease Risk and Tourism

Foreign visitors to an area inhabited by orangutans can unintentionally bring a number of unfamiliar diseases that the local population has no level of immunity against [114]. Potential routes of transmission include the following [92, 101, 109, 114] :

- Direct contact and animal bites - a number of conditions can be caused by such contact. Pathogenic fungi, scabies, and any other number of bacteria and germs can be spread through direct skin contact with wildlife. Further, if a bite occurs diseases such as rabies can be spread from the animal's saliva onto the victim. Direct contact also implies that the below conditions for disease transmission are also potential issues, as if a person is in direct contact with wildlife than there is ostensibly 0m distance from said animal so that the chances of disease transfer are at their highest.
- Airborne (coughs and sneezes) and sputum (spitting) - The risk of airborne infection increases as humans and orangutans get closer to each other [109], thus if guides and tourists directly touch the orangutans there is a high potential for infection. Diseases transmitted this way can include the common cold and influenza, polio, mumps, measles, chicken pox and tuberculosis. If tissue handkerchiefs are left in the forest these become of great interest to young orangutans who often snatch them up and eat them.
- Faecal-oral - pathogens transmitted this way include several bacterial organisms that cause diarrhoea and viruses such as hepatitis and polio. Infection occurs when an animal comes into contact with faeces which is then ingested, thus humans defecating or vomiting in the forest this can pose a great risk to the orangutans in close proximity. The same is also true for any human coming into contact with animal waste and without later washing one's hands.
- Arthropod vectors - a number of infections are transmitted by biting insects. Malaria is one example which of a virus which requires arthropods for transmission. Young orangutans which live in close proximity to humans are often infected with human malaria, caused by mosquito bites. Conversely, wild orangutans are affected by only two other strains of malaria, neither of which can harm humans.

Long-tailed Macaque (photo : Claire Thompson)

In addition, contact with contaminated objects [72, 92] (e.g. discarded fruit skins, tissues, bags taken from people in the forest, raiding the rubbish bins at the quarantine area) may also play a role in disease transmission.

Parasites can also be considered a major threat. With an animal's behaviour shown to relate to levels of parasites and infection [101, 116-118] it is possible that the semi-wild orangutans which have more regular contact with humans and spend more time on the ground, are contracting illnesses that can then prove fatal. Time spent on the ground also carries with it an increased exposure to parasites [119]. Semi-wild orangutans spend more time on the ground than wild orangutans, who generally spend no time on the ground. Juveniles in particular actively seek human contact, mainly in search of social interactions and playing opportunities, and are forced to visit the ground to achieve this proximity. Previous studies on other reintroduced animals suggest that supplementary feeding encourages the occurrence of orangutans on the ground [120, 121]'.

Observing great apes close up in their natural habitat is seen as one of the best ways to raise awareness about great ape conservation, both in Africa and southeast Asia. For ecotourism to work, the shy, forest-dwelling apes are made to feel comfortable being observed by groups of people through a habituation process. The habituation of orangutans for tourism, however, increases the risk of infection both by bringing in human ailments/diseases that would otherwise not be present in the forest, and also by boosting the orangutans' willingness to approach humans and agricultural land. An increased presence of human visitors closer to the animals means an increased chance of disease transmission between orangutans and humans, as well as potential negative effects of changes in their behaviour.

As discussed in Chapter 2, the forests around Bukit Lawang in the GLNP are home to a number of semi-wild orangutans which were part of the rehabilitation and reintroduction programme conducted between 1972 and 1991. These populations of released semi-wild individuals may be prone to additional risk of contracting disease, due to behavioural traits learned in captivity. For example, under natural conditions, orangutans are semi-solitary and rarely congregate in groups [57]. Semi-wild orangutans, due to their altered upbringing, may be more social once returned to the wild [122]. If strict regulations are enforced by park rangers and forest guides however, then visitors to the forest can have a memorable experience without endangering themselves or the animals they have come to see (see Chapter 6). This involves not allowing people to get too close to the animals or feed them by hand.

Adult male Sumatran Orangutan (photo : Djuna Ivereigh)

## Orangutan Mortality in Bukit Lawang

The official mortality rate for all orangutans confiscated from the pet trade and later reintroduced into Bukit Lawang (229 individuals), from 1972-2007, is 22%. Of the forty offspring born to released orangutans (recorded between 1988 and 2008), only eight are confirmed to be surviving (with two of these survivors being infants with now deceased mothers). Twenty-four orangutans born to the released orangutans are confirmed to have died, with an additional two presumed dead due to an average inter-birth interval of only two years between consecutive infants. The remaining six are marked as 'unknown', since they have not been seen in recent years so their status is unclear. Thus the overall mean mortality rate for offspring born to released orangutans in Bukit Lawang is 65%. Of this same population, the overall infant mortality rate (death occurring before reaching 3 years of age) is 55% (22 individuals), with mean age of death at 1.94 years. This rate is extremely high, as compared to the wild populations' rate, estimated to be only 5-10% across research sites, with a mean range of 0.5 - 6% occurring over 30 years in the Ketambe research station in Sumatra [31, 123]'. Previous studies in nonhuman primates have shown that infant mortality can be an indicator of the impact of tourism [124]. Thus the infant mortality rate observed in Bukit Lawang presents a worrying situation. However, in the Sepilok Orangutan Rehabilitation Centre in Malaysian Borneo, there is also a high rate of infant mortality reported: 57% [125].

## Ways of Reducing Disease Risk

A potential cause of this observed high mortality rate may be disease, though whether naturally occurring or due to human/tourist presence is unknown. Tourism operators often cite the lack of solid evidence of negative impact on wildlife, which has been shown as difficult to produce, as in free living populations, often the problem is not noted until the effect becomes apparent, so that the cause could be one of any number of factors [86, 92, 109,124, 126]. Though it is difficult to determine the absolute cause, in many documented cases there is a strong probable disease transmission link between humans and primates [72, 127]. Another potential cause could be poor mothering skills on behalf of the released orangutans, that would have resulted in poor nutrition and inadequate care for offspring. Malnutrition however can be ruled unlikely as all three mothers have exhibited a level of proficiency in foraging and again the entire population has access to supplementary provisioning (often with extra food given to mothers with infants).

In areas where controlled, limited habituation of wildlife and ethical ecotourism is carried out, there are strict guidelines to combat the disease transmission risk, such as not allowing sick visitors or guides into the forest and maintaining strict minimum distances from the animals. Even when these safeguards are used, they can never guarantee the 100% safety of animal populations. With disease spreading quickly through a care centre or a small free ranging population in a fragmented forest [74, 128, 129], a health and safety protocol for all visitors who are planning to contact the semi-wild orangutans is the first step towards reducing the threat [92]. However, having traveled a long distance at great expense, the visitor may not readily accept being banned from entering the forest, if for example, he/she has a cold upon arrival. Visitors to orangutan conservation programmes must, however, have a certain level of interest and sympathy for the well-being of wildlife, and having been given proper information should be more cooperative in helping safeguard the animals they have come to see [87, 109]. This is one of the main aims of this guidebook. Following the simple guidelines laid out in Chapter 6 should be sufficient to dramatically reduce the risk of spreading disease, and ensure a more natural, holistic experience for visitors to the Gunung Leuser National Park, who come to observe exotic wildlife in its natural habitat.

Thomas Leaf Monkey (photo : Madeleine Hardus)

# Species Guide

The following species guide is an introduction to some of the fascinating wildlife you can observe during your visit to Gunung Leuser National Park. This guide is intended to help you identify what you see and also to understand a little more about these animals' behaviour, ecology, conservation status and the threats they are facing in this unique enclave. As GLNP hosts hundreds of species, it is not possible to include every mammal and bird species living in it, we have selected the most remarkable ones.

Each species in this guide is described following these sections:

Appearance: : A description of the physical characteristics of the animal.

Size : Given as the average weight (kg) of a fully grown adult. Sometimes this will differ for males and females. In these cases, separate figures are given.

Life Span : Average life expectancy of an individual in the wild.

Diet : The animal's most usual food resources.

Home Range : An animal's home range can also be called its territory. It is the area that it needs to cover to access food, sleeping sites and mating. The size of an animal's home range often varies between males and females, with male ranges overlapping a number of females'. Food availability will also determine home range size. Figures are given either in hectares or $km^2$.

Habitat : The habitat types preferred by the species including the maximum altitude (m) at which they occur.

Distribution : The geographic range of the species. The species distribution is shown in dark red stripes. The outline of the Leuser Ecosystem is also shown.

Behaviour and Ecology : These section describes the main behavioural characteristics of the animal, such as if it is nocturnal, diurnal or cathemeral (active both day and night), or arboreal (tree-dwelling) or terrestrial (ground-dwelling). Other interesting facts about the animals' daily activities are also provided.

Status : This is the species' current conservation status, given in three parts: 1.The IUCN Red List classification, 2. The CITES classification and 3. The population trend in the wild.

1. The IUCN (International Union for Conservation of Nature)Red List () is a service of the International Union for Conservation of Nature (IUCN), and provides information regarding the conservation status of species that have been considered to be in certain risk of extinction, in order to highlight the threatened ones, and therefore promote their conservation.

The Red List consists of 9 categories, but for this guidebook we are only covering those species in the following four categories:

Critically Endangered - Implies an extremely high risk of extinction in the wild, with among other scenarios: an observed or inferred population size reduction of = 90% over the last 10 years

Endangered - Implies a very high risk of extinction in the wild, with among other scenarios: an observed or inferred population size reduction of = 70% over the last 10 years

Vulnerable - Implies a high risk of extinction in the wild, with among other scenarios: an observed or inferred population size reduction of = 50% over the last 10 years

Least Concern - Lowest potential risk of extinction, with species still maintaining wide distribution and no evidence of perilous threats to the populations.

2. CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) () represents an international agreement that individual countries adhere to in order to regulate the trade of endangered species. Its purpose is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. There are three different levels of protection afforded, cited as:

Appendix I - Offers the highest protection level, stating that all species at this level are at severe risk of extinction and trade if is only allowed in extenuating circumstances.

In 2008 there were approximately 900 plant and animal species listed on Appendix I.

Appendix II - Implies that the species enlisted under this appendix are not under direct threat of extinction, but that trade should be limited and controlled to prevent any further decline in population numbers.

In 2008 there were approximately 33,000 plant and animal species listed on Appendix II.

Appendix III - Species are not as threatened as those enlisted in Appendix I-II, but assistance in the restricting their trade has been requested by a nation's government.

In 2008 there were approximately 161 plant and animal species listed on Appendix III.

3. Population trend in the wild is given as either increasing or decreasing.

Threats : The main factors threatening the extinction of the species

Species information has been sourced with permission from (www.ARKive.org), which is an excellent source of information and multimedia on many interesting and threatened species; as well as from the following places, which we also recommend for further reading and research:

Campbell, C.J., Fuentes, A., MacKinnon, K.C., Panger, M. and Bearder, S.K. (eds) (2007) Primates in Perspective. New York, Oxford University Press. Pgs 720.

IUCN (2008) 2008 IUCN Red List of Threatened Species. . Downloaded on 11th November 2008.

CITES (2009) Convention on International Trade in Endangered Species of Wild Fauna and Flora. http://www.cites.org. Downloaded on 29th June 2009.

Nekaris, K.A.I. & Jaffe, S. (2007) Unexpected diversity within the Javan slow loris trade: implications for slow loris taxonomy. Contributions to Zoology, 76, 187–196.

Rowe, N. (1996) The Pictorial Guide to the Living Primates. East Hampton, NY, Pogonia Press. Pgs 263.

Wong, S. T., Servheen, C. W., Ambu, L. (2004) Home range, movement and activity patterns, and bedding sites of Malayan sun bears Helarctos malayanus in the Rainforest of Borneo. Biological Conservation, 119, 169-181.

Species distributions for construction of the maps in ESRI ArcGIS 9.2 were sourced from:

Boitani, L., Catullo, I., Marzetti, M., Masi, M., Rulli, M. & Savini, S. (2006) The Southeast Asian Mammal Databank: A Tool for Conservation and Monitoring of Mammal Diversity in Southeast Asia. . Downloaded on 1st November 2008. Instituto di Ecologia Applicata, Roma.

Photo : Mike O Griffiths


Photo : Rosa Garriga

# Greater slow loris (Nycticebus coucang)

Appearance : The ongoing taxonomic research may reveal the existence of two species of slow loris in Sumatra. The one found in Gunung Leuser National Park has a bright reddish brown colour, including the dorsal stripe and facial markings. It also presents rounded forks above the eyes with pronounced dorsal stripes extending down to a more reddish belly.

Size : 600 to 800 g.

Life Span : 20 years.

Diet : Slow lorises are fruit-eaters but also feed on insects, leaves and birds eggs. Another key resource for them is nectar from the flowers of the burtram plant.

Home Range : Studies have shown great variation, ranging from 2 to 18 ha (but no study has yet been carried out on the Sumatran groups).

Habitat : Primary and secondary lowland forest, gardens and plantations.

Distribution : Sumatra.

Behaviour and Ecology : Nocturnal and arboreal

IUCN Red List Status : Endangered

CITES : Appendix I

Population trend : decreasing

Threats : Unsustainable hunting and poaching for the illegal wildlife trade and traditional medicines and on-going habitat loss. Animals are also occasionally shot in the surroundings of farmlands as they can be considered as crop pests that can damage or eat crops.

Photo : Madeleine Hardus


Photo : Caoimhe Giblin

# Long-tailed macaque (Macaca fascicularis)

Appearance : Body fur varies from grey to reddish brown, with a lighter coloured underside. The macaques often have a noticeable pointed crest on the head where the hair grows backwards. Their face is pinkish. Males have cheek whiskers and mustache; females have a beard.

Size : Males: 4.7 to 8.3 kg.
Females: 2.5 to 5.7 kg.

Life Span : 37 years.

Diet : Omnivorous - fruit makes up 64% of their diet, with seeds, buds, leaves and animal prey (frogs, insects and crabs). They may also raid crops.

Home Range : 25 to 200 ha.

Habitat : Very adaptable to a wide range of habitats including mangrove and swamp forests, they can also be found in agricultural areas near secondary growth, secondary forest and primary forest.

Distribution : Southern Indochina, Burma, Indonesia, Philippines, Nicobar Islands (India)

Behaviour and Ecology : Diurnal and semi-terrestrial. They are good swimmers and will jump into water from nearby trees. They live in multi-male multi-female groups of 10 to 100 individuals.

IUCN Red List Status: Least Concern

CITES: Appendix II

Population trend : decreasing

Threats : Across much of the species' range, the major threat is hunting. Habitat loss is a localised threat but this species is able to adapt to many different environments.

Photo : Nick Lyon


Photo : Nick Lyon

# Pig-tailed macaque (Macaca nemestrina)

Appearance : The pig-tailed macaque is a rare primate of Southeast Asia. It is characterized by its short tail that is carried half-erect and somewhat resembles a pig's, hence its common name. Macaques are medium to large sized monkeys with stout bodies. This species has a brown coat with a lighter underside and its legs are long and strong. The muzzle is long and lacks hair though males have mane-like hairs surrounding the face, giving them a majestic appearance. When females are receptive to mating they develop large swellings on the rump. Adult females are around half the size of males.

Size : Male: 6.2 to 14.5 kg.
Female: 4.7 to 10.9 kg.

Life Span : 26 years.

Diet : Predominantly fruits and seeds, but also includes insects, birds, termite eggs and larvae, river crabs, leaves, buds and flowers. They may also raid ripe corn crops and oil palms.

Home Range : 62-828 ha.

Habitat : Lowland primary and secondary forest, as well as coastal, swamp and montane forest. They prefer dense rainforest but is very adaptable to agricultural land.

Distribution : This species is found in Brunei, Indonesia (Bangka, Kalimantan Borneo, and Sumatra), Malaysia (Sarawak and Sabah Borneo and the Malay peninsula), and southern Thailand, with introduced populations on Singapore and in the Natuna Islands (Indonesia).

Behaviour and Ecology : Diurnal and predominantly terrestrial though they spend sometime in the trees. The pig-tailed macaque spends more time on the forest floor and in the open than other macaques. It has cheek pouches to carry food while it forages, and often returns to the safety of the trees to feed. They are social primates and live in group sizes of 5 – 40 (average 15 – 22) individuals, though the group splits into smaller units to forage. Females remain in their natal group, and males will disperse shortly before they reach sexual maturity.
IUCN Red List Status : Vulnerable

CITES : Appendix II

Population trend : decreasing

Threats : Destruction of forests by felling, encroachment, slash and burn cultivation and monoculture are all major threats to the pig-tailed macaque's habitat. The rate of forest destruction is alarming, and is not only reducing the extent of this primate's habitat, but also fragmenting it. The macaque's taste for agricultural crops has also caused it to be viewed as a pest, and it is therefore frequently shot on sight. Furthermore, pig-tailed macaques are very popular for use in laboratories, for both psychological studies and medical research.

Adapted from : http://www.ARKive.org/sunda-pig-tailed-macaque/macaca-nemestrina/info.html

ARKive


Photo : Miran Campbell-Smith



Photo : Miran Campbell-Smith

# Thomas leaf monkey (Presbytis thomasi)

Appearance : Body covered in black fur with white fur on torso and under arms and legs. Face has a white V shape meeting at the eyes, with a very distinct black mohawk hair style.

Size : 5 to 8 kg.

Life Span : 20 years.

Diet : Primarily leaf eating, but also feeds on fruits and flowers, and occasionally toadstools and the stalks of coconuts as well as ground snails.

Home Range : 12.3 to 15.7 ha.

Habitat : Primary and secondary rainforest. Rubber and fruit plantations. Ranges in elevation up to approximately 1,500 m.

Distribution : Sumatra.

Behaviour and Ecology : Diurnal and arboreal. Animals live in single male – multi female groups. The male defends his females and not the territory, as is seen in many other territorial species. Average group size is 6.

IUCN Red List Status : Vulnerable

CITES : Appendix II

Population trend : decreasing

Threats : Loss of primary habitat due to logging and conversion to oil palm plantations. Hunting does not seem to be a significant threat for the Thomas leaf monkey.


Photo : Martin Harvey



Photo : Martin Harvey

# Lar gibbon (Hylobates lar)

Appearance : A beautiful and captivating primate, the lar or white-handed gibbon is a master of agility. As true brachiators, gibbons are much admired for their remarkably fast, yet seemingly effortless, suspensory motion through the trees. The white-handed gibbon possesses the typical gibbon's long arms and hands, which make them perfectly equipped for swinging from branch to branch. Despite lacking a tail, the gibbon's sense of balance is surprisingly acute, and it can even be found walking on its hind legs along branches high above the ground, characteristically raising its arms above its head for balance. Individuals vary in color from dark brown or black to red-buff and pale fawn, but always with a white fringe framing the black face and white upper sides of the hands and feet. Males and females are very similar in size and can have all color variants. Their unmistakable call, a loud whooping sound, is enhanced by a sound-amplifying throat sac and can be heard from a great distance.

Size : Male: 4.9 to 7.6 kg.
Female: 4.4 to 6.8 kg.

Life Span : Up to 44 years.

Diet : Primarily frugivorous, the white-handed gibbon eats figs, young leaves, flowers, stems, shoots, buds, insects, eggs and occasionally birds. They swallow nearly all the seeds from the fruits they eat, making them important forest seed dispersers in the forest.

Home Range : Varies geographically from 16 ha up to 54 ha.

Habitat : This arboreal species inhabits primary or secondary semi-deciduous monsoon forests and evergreen, semi-evergreen and mixed evergreen-deciduous forests. They are also known to live in regenerating secondary forest and selectively in logged forest. It is a predominantly lowland species (below 1,000 - 1,500m). Occupying only the upper canopy, these gibbons rarely, if ever, descend to the forest ground.

Distribution : Found in the tropical rainforests of south and southeast Asia, in China, Laos, Myanmar, Thailand, Malaysia and Indonesia (North Sumatra).

Behaviour and Ecology : Diurnal. The white-handed gibbon was considered to be monogamous (life-lasting pair bonds), but recent studies show some serial monogamy with occasional partner changes, and even non-monogamous groupings. Generally, however, groups consist of a mated pair and their offspring. An elaborate duet sung between males and females is thought to maintain pair bonds as well as to mark and defend the pair's territory. These gibbons breed all year round, usually producing one young every two to three years. The gestation period lasts seven to eight months and young are weaned at 18 months.

Juveniles reach adult size at six years but remain with their natal group until they reach sexual maturity at around nine years old. Parental care is predominantly given by the mother but the father and elder siblings also help raise young.

IUCN Red List Status : Endangered

CITES : Appendix I

Population trend : decreasing

The white-handed gibbon is protected from international trade by its listing on Appendix I of the Convention on International Trade in Endangered Species (CITES). Other efforts are being made to save these primates, such as national parks and reserves, but they are not terribly effective as they are often poorly supervised and laws against capture are not enforced.

The highest priority in protecting this primate must be given to preserving adequate areas of suitable habitat. Action is required now if we are to prevent this agile and intelligent lesser ape from becoming more critically endangered.

Threats : Rapid loss of habitat poses the principle threat to gibbons, placing their future in great peril. With breathtaking speed the forests of Southeast Asia being cut down by logging and agriculture, the forest inhabitants have gradually smaller areas where to live. The lar gibbons are sometimes hunted for its meat and the capture of young gibbons for the pet trade is rampant in some countries. Frequently, as it happens with orangutans, in order to capture the young the mother is shot, having a double impact on the wildlife population.

Adapted from : http://www.ARKive.org/white-handed-gibbon/hylobates-lar/info.html

Lar Gibbon (photo : Martin Harvey)

Photo Terry Whitaker


Photo Simone Sauren

# Siamang (Symphalangus syndactylus)

Appearance : The siamang has black color all over the body and a larger and stockier build as compared to the less robust lar gibbon. Adults have a dark grey throat sac that they inflate when they make their great call.

Size : Male: 12.2 to 14.8 kg.
Female: 10.0 to 11.0 kg.

Life Span : 35 years.

Diet : Although primarily a leaf eater on the mainland area of its range, on Sumatra it primarily feeds on fruits, mainly figs.

Home Range :15 to 50 ha.

Habitat : Primary and secondary semi-deciduous and semi-evergreen forest. They occur at lower densities in secondary forest but are able to live in such degraded areas. They range from the lowlands up to 1,500m in altitude.

Distribution : Sumatra, Malay Peninsula.

Behaviour and Ecology : Diurnal and strictly arboreal. They are highly territorial and primarily monogamous keeping the offspring in the family group.

IUCN Red List Status : Endangered

CITES : Appendix I

Population trend : decreasing

Threats : Habitat loss and opportunistic poaching for the pet trade on Sumatra.


Photo Claire Thompson



Photo Simone Sauren

# Sumatran orangutan (Pongo abelii)

Appearance : In the Indonesian language, the word orangutan means 'person of the forest'. The orangutan is the most arboreal of the apes, and rarely descends to the ground. Recent genetic evidence has led to the re-classification of Bornean and Sumatran orangutans as separate species: Pongo pygmaeus and Pongo abelii respectively. Orangutans have distinctive body shapes with very long arms that may stretch as far as two metres. They have a coarse, shaggy reddish coat and grasping hands and feet. Orangutans are highly sexually dimorphic, two coexisting mature male morphs (bimaturism): the fully developed adult male(Flanged males) as being distinguished by their size are on average 2.0 to 2.3 times as heavy as adult females, and having secondary sexual characteristics (SSCs) such as throat pouch ,flanges either side of the face, known as cheek pads, a long coat of hairs, and produce ‘a long-call’; and undeveloped adult males (Unflanged males) whose lacking SSCs. Male Sumatran orangutans' cheek pads are covered with a fine white hair (a feature not shared with their Bornean cousins)

Size : Male: 80kg.
Female: 39kg.

Life Span : Up to 50 years and possibly more in zoos.

Diet : They eat primarily fruit, but will also leaves, termites, and ants. Meat consumption has also been reported, though infrequently, and is considered to be opportunistic feeding rather than active hunting, upon relatively easy targets like the slow loris.

Home Range : Female home range can be between 800 and 1,500 ha. The true extent of male home range size is not fully known, but is thought to be higher than 3,000 ha.

Habitat : Primary lowland swamp to montane forest up to 1500 m but has a preference for altitudes below 500 m. Does not cope well with habitat disturbances, and in selectively logged areas population densities have been reported to plummet by as much as 60%

Distribution: Sumatra
Evidence from the fossil record suggests that orangutans were previously widespread throughout southeast Asia. Today, however, the Sumatran orangutan is found only in the north of this island in the Indonesian archipelago.
Behaviour and Ecology : Diurnal and arboreal. Males are semi-solitary, though when there is good food availability or they are searching for mates they behave more socially. Sumatran orangutans are more sociable than their Bornean relatives, due in part to the mast fruiting of the fig trees, where large groups come together to feed. Orangutans can live into their 50s, with females usually have their first baby after being 15 years of age. The infant spends its first two to three years being carried constantly by the mother and will still remain close to her for at least another three years.

The interval between births is the longest for any mammal, at eight to nine years. Orangutans move slowly through the trees, and will sway trees in order to cross larger gaps. Every night they build nests with branches and leaves, these nests which are in the top of trees, help them to sleep away from possible predators, such as tigers.
The adult male emits a powerful, bellowing vocalization known as the “long call” which we humans can hear from 2 km away. Although the purpose of long calls is still being discussed among experts, it has been suggested that male orangutans use it to announce their presence to females and intimidate other males

Orangutans are highly intelligent and some populations in Sumatra and Borneo have been reported to have learnt to use tools, passing this knowledge on through generations.

IUCN Red List Status : Critically Endangered

CITES : Appendix I

Population trend : decreasing

The Sumatran orangutan is fully protected by law in Indonesia (the Wildlife Protection Regulation No. 233/1931, Law No. 5/1990, the Minister of Forestry’s decree 10 June 1991 No. 301/Kpts-II/1991 and Government Regulation No. 7/ 1999) and is enlisted on the Appendix I of the Convention on International Trade in Endangered Species (CITES), which totally bans international trade of this species. Due to the large home ranges that orangutans require for living, only the protection of their habitat will ensure that these beautiful and enigmatic 'people of the forest' survive into the next century. The Leuser ecosystem is considered the Sumatran orangutans' last stronghold and is also an important refuge of the critically endangered Sumatran rhino (Dicerorhinus sumatrensis), elephant (Elephas maximus sumatranus) and tiger (Panthera tigris sumatrae), as well as numerous less-known species.

Threats : Severe habitat loss from logging, forest fires and encroachment by oil palm, rubber and other agricultural plantations. Orangutans are particularly vulnerable to these threats due to their extremely long interbirth interval, typically eight years, making them the slowest breeding primates on earth – thus losses, especially of females, have a big impact on the population and poses large difficulties to recover.

Orangutans are hunted for the illegal wildlife trade, and animals which wander into oil palm plantations and other human-inhabited areas may also be captured for profit in the illegal pet trade. As it happens with other species, the pet traders usually kill the mother in order to capture the young.

Adapted from : http://www.ARKive.org/sumatran-orang-utan/pongo-abelii/info.html


Sumatran Orangutan (photo : Helen Buckland)

Sumatran Elephant (photo : Claire Thompson)


Photo FFI



Photo FFI

# Sumatran Elephant (Elephas maximus sumatrensis)

Appearance : Asian elephants are smaller than their African savannah relatives (Loxodonta africana) and have many other physical features that distinguish them. Their ears are smaller and the back is more rounded so that the crown of the head is the highest point of the body. Although one of the characteristic features of an elephant are the modified incisor teeth, known as tusks, however, only some male Asian elephants have tusks, whilst females (cows) have 'tushes' instead, which are seldom visible. Elephants support their stocky body on stout, pillar-like legs, and the nose and upper lip are joined and elongated into a trunk. The trunk provides a wide variety of functions from feeding, vocalization, bathing and fighting; the Asian elephant trunk has only a single finger-like process on the base, whilst the African elephant has two. The thick, wrinkly skin covering the body is greyish-brown and very dry.

Size : 3000 to 5000kg.

Life Span : 60 to 70 years.

Diet : Due to their size and energy requirements elephants need to consume large quantities of food everyday (150-300kg). They are generalists and browse and graze on a variety of plants. The habitat type and the season will determine the types of plant they eat.

Home Range : Elephants range over large areas, and home ranges of more than 600km$^2$ have been recorded for females in south India. Smaller home range sizes, 30–160 km² for females and 53–345 km² for males, have been recorded in Sri Lanka. Nevertheless, no specific data exists for the Sumatran sub-species.

Habitat : Grassland, tropical evergreen forest, semi-evergreen forest, moist deciduous forest, dry deciduous forest and dry thorn forest, in addition to cultivated and secondary forests and scrublands.

Distribution : Sumatra
This species once roamed through much of the Asian Continent south of the Himalayas, extending into China and south to the Indonesian islands of Sumatra and Borneo. Three subspecies are currently recognised; in Sri Lanka (Elephas maximus maximus), Sumatra (E. m. sumatranus) and on the mainland of Asia (E. m. indicus). Some scientists also place the Bornean elephant as a separate subspecies (E. m. borneensis).

Behaviour and Ecology : Elephants are highly intelligent and long-lived animals. They are extremely sociable and live in groups of females, led by the oldest female known as the 'matriarch'. Groups of Asian elephants average six to seven individuals, and will occasionally join with other groups to form herds; although these are more transient than the African savannah elephants. Males leave their natal group when then reach sexual maturity at the age of six to seven years old, becoming predominantly solitary.

When males reach 20 years old they start coming into 'musth', a period where the testosterone levels in blood raises up to 20 times the normal levels, which is accompanied by a highly aggressive behavior. This state lasts about three weeks and during this time the males wander widely in search of females and fight other males for access to females. Cows only reach sexual maturity at the age of ten, and the interval between births may be as long as four years owing to the long gestation time and infant dependency. The single calf may suckle from other females in the group as well as their own mother. Elephants use their dextrous trunk to pluck grasses and bring them to their mouths; on average they eat 150 kilograms of vegetation each day. They may spend up to 14 to 19 hours a day feeding, and thus can defecate up to 18 times per day. Grasses make up the mainstay of the Asian elephant's diet but scrub and bark are also eaten, and calves may eat their mother's dung to obtain nutrients. Where elephants occur near plantations they will readily feed on banana or rice crops. Asian elephants have had a close relationship with man over the centuries and they are still used nowadays to clear timber, particularly in some of the more inaccessible forest areas of the continent, and play an important role in the religious and cultural history of the region.

IUCN Red List Status : Endangered

CITES : Appendix I

Population trend : decreasing

Although the trade of the Asian elephant is banned by being enlisted on Appendix I of the Convention on International Trade in Endangered Species, illegal elephant poaching remains a problem. Though most of the elephants inhabit protected forests, these are often too small to accommodate them, and the elephants usually encroach human settlements, which leads to human-elephant conflict. The creation of wildlife corridors to extend reserve lands, together with the halting the poaching are just some of the conservation steps needed to secure the future of the Asian elephant.

Threats : Asian elephant populations have been decimated by habitat loss and hunting throughout their historical range. Vast tracts of land have been logged or cleared to accommodate the growing human population in the region, which has led to elephant populations becoming increasingly isolated in the fragmented habitat that remains. In addition, the decreased available forest area, is leading to elephants raiding human crops. Crops are damaged and lives lost; up to 300 people a year are killed by elephants in India, leading to retaliation against local elephants. Poaching for ivory is also a threat and because only males have tusks, populations can become extremely skewed towards females, thus affecting breeding rates.

Adapted from : http://www.ARKive.org/asian-elephant/elephas-maximus/info.html

ARKive

Photo : Terry Whitaker


Photo : Mike O Griffiths

# Sumatran Rhinoceros (Dicerorhinus sumatrensis sumatrensis)

Appearance : The Sumatran rhinoceros is the smallest and most endangered of the five living rhinoceros species. It is possibly the world's most endangered large mammal and only one viable population remains in northern Sumatra. The reddish-brown, squat, thick-statured body and may be covered with long hair, which leads to this species to be known also as the 'hairy rhinoceros'. Like the African species it has two horns, unlike the other Asian rhinoceros species. The posterior horn, often absent in females, is much reduced and just a stub compared to the larger nasal horn. There are two deep skin folds that encircle the body, behind the front legs and in front of the hind legs.

Size : 500 to 800 kilograms.

Life Span : 35 to 40 years.

Diet : A browser of young saplings, leaves, fruits, twigs and shoots. Usually consumes up to 50kg of food a day.

Home Range : Males up to 5,000 ha and females between 1,000 and 1,500 ha.

Habitat : Found in a wide range of habitats, from tropical rainforest, montane moss forest and occasionally at forest margins and in secondary forest. They mainly live in upland hilly areas close to a water source. Due to human pressures however, populations are today concentrated at higher altitudes.

Distribution : Sumatra
The former range of the Sumatran rhinoceros extended from the foothills of the Himalayas, east to Vietnam and China, south along the Malay peninsular and into the islands of Sumatra and Borneo. Nowadays, two subspecies persist. The Eastern Sumatran rhinoceros (Dicerorhinus sumatrensis harrissoni) which historically could be found throughout Borneo, though the current population is estimated to be fewer than 50 individuals, all of them located within Sabah (Malaysian Borneo). The Western Sumatran rhinoceros (D. s. sumatrensis) is found in habitat fragments on the Indonesian island of Sumatra, with critically low population figures and the only viable population being located within Gunung Leuser National Park.

Behaviour and Ecology : Sumatran rhinoceros are a solitary and secretive species. They conspicuously mark their home territory with faeces, urine and soil scrapes. Individuals reach sexual maturity at the age of 6 to 8 years old and births usually take place during the wet season. A single calf is born, and is weaned after around 16 months. The inter-birth interval is around 3 -4 years. Individuals spend the day in wallows, allowing the mud to cool their skin and protect it from drying out. Foraging occurs either at night or during of the early morning and evening, when the temperature is still cold; they cut down and trample the young saplings which they mainly feed on. Essential minerals are obtained from salt licks, which constitutes an essential requirement for each home range.

# Sumatran Rhinoceros (Dicerorhinus sumatrensis sumatrensis)

IUCN Red List Status : Critically Endangered

CITES : Appendix I

Population trend : decreasing

The Sumatran rhinoceros is fully protected within its native countries and is listed on Appendix I of the Convention on International Trade in Endangered Species (CITES), which totally prohibits its international trade. The remaining illegal trade is investigated by TRAFFIC (the wildlife trade monitoring network of WWF and the IUCN), and substitutes for rhinoceros horn in traditional medicine are being investigated.

Threats : Numbers of the Sumatran rhinoceros are today worryingly low with fewer than 300 individuals. The Indonesian government estimated in 2007 that in the GLNP there is a population of only 60 to 80 rhinos, confined to 80,000 hectares. Hunting for medicinal properties associated with many parts of the body and particularly the horn, has occurred for centuries; although it is illegal today, poaching remains one of the principal causes of the declining population. Much of the lowland forest habitat of the rhinoceros has been lost due to intensive development of human settlements and the small, fragmented populations that remain may not be viable, with reduced genetic diversity and increased vulnerability to chance events. Given the habitat fragmentation and the reduced number of each sub-population, breeding becomes infrequent and successful births are rare. Thus populations, similar to orangutans, are difficult to recover from loss.

Existing protected rhino habitat needs to be expanded and habitat corridors and buffer zones created so that these rhinoceros can survive and coexist with humans. Captive breeding programmes have proved unsuccessful in the past, but recent attempts to breed rhinoceros within sanctuaries in their natural habitat appear to be more encouraging.

Adapted from : http://www.ARKive.org/sumatran-rhinoceros/dicerorhinus-sumatrensis/info.html

ARKive

Sumatran Rhino (photo : Donny Gunaryadi)


Photo : Mike O Griffiths



Photo : David Dellatore

# Malayan Sun Bear (Helarctos malayanus)

Appearance : The smallest of the world's eight living bear species, the Malayan sun bear has short, sleek fur which is usually black but can range from reddish-brown to grey. Every sun bear has an individually distinct chest patch that is typically yellow, orange, or white, and may sometimes be speckled or spotted. The sun bear has a broad muzzle that is relatively short and a large head, giving the bear a dog-like appearance. It has small, rounded ears, a fleshy forehead that occasionally looks wrinkled, and an extremely long tongue (longest of all bear species). With feet turned slightly inward, large naked paws and long curved claws, the sun bear is well adapted for climbing trees. Its feet are extraordinarily large compared with its body size, assisting in digging and breaking into dead wood in search of insects. The Malayan sun bears on Borneo are the smallest of this species and are considered by many to warrant subspecies status (Helarctos malayanus eurispylus).

Size : Males: 40 to 60 kg.
Females: 20 to 40 kg.

Life Span : Approximately 25 years.

Diet : It is an opportunistic omnivore, using its long tongue to eat termites, ants, beetle larvae, bee larvae, honey and a large variety of fruit species, especially figs (Ficus species). Occasionally, it will also eat small rodents, birds and lizards. During periodic mass-fruiting events, fruit makes up most of the diet, providing the opportunity for sun bears to build up, or recover, fat and energy reserves for the prolonged period of low fruit availability following these events.

Home Range : Between approximately 9 and 15 $km^2$.

Habitat : The Malayan sun bear inhabits both primary and selectively logged but still dense southeast Asian tropical forests, including tropical evergreen rainforest, montane forest and swamp habitat. Tropical evergreen rainforest is their main habitat in Sumatra. Habitat preferences vary across its range depending on altitude and climate. Tropical evergreen rainforest includes lowland dipterocarp forest, peat swamp, freshwater swamp, limestone, hill dipterocarp and lower montane forest. They occur at altitudes of up to 2,100m.

Distribution : The range of the Malayan sun bear has not been well documented, either historically or presently. However, the sun bear has been encountered throughout southeast Asia from the eastern edge of India and northern Burma, to Laos, Cambodia, Vietnam and Thailand and south to Peninsular Malaysia and the islands of Sumatra and Borneo. The range of the sun bear has been seriously reduced through large scale habitat destruction and poaching and is now thought to be extinct in Tibet, Bangladesh and possibly Yunnan, in southern China.

Behaviour and Ecology : As the least studied bear species, comparatively little is known about the Malayan sun bear.

The sun bear is mainly diurnal, spending most day hours foraging, although in human-disturbed areas it becomes more nocturnal. Unlike other bears, it does not hibernate, as food is available all year round. The sun bear spends time both on the ground and climbing trees for food. Except for females with offspring, sun bears are normally solitary.

Little is known about sun bear reproduction and cub rearing in the wild. Usually females are only seen with one cub, and very rarely with two of them after giving birth. The gestation period lasts approximately 95 days. There is some evidence that show that sun bears, like other bears, may have delayed implantation of the embryo to ensure that cubs are born when the mother has sufficient fat reserves, the weather is favorable and food is available. Sun bears give birth in dens or hollow trees where the cub is born naked and helpless. There it remains protected for some time until it is able to venture out to accompany the mother while she forages and travels. It is thought that the cubs remain with their mother until they are fully grown at around two years old.

The Malayan sun bear has very loose skin around the neck so that if bitten on the back of the neck by another bear, a tiger or clouded leopard, the bear can turn in its skin to bite back at its attacker.

IUCN Red List Status : Vulnerable

CITES : Appendix I

The Malayan sun bear is understudied, and little conservation action have targeted this species. It has been listed on Appendix I of CITES since 1979, which prohibits any international trade. Killing sun bear is prohibited under Indonesian wildlife protection laws, however there is lack of enforcement of this law. The Malayan sun bear is part of an international captive breeding programme and has a Species Survival Program under the American Zoo and Aquarium Association. Nevertheless, more research is required as only recently have field studies have started to investigate the basic biology, ecology and behavior of wild sun bears.

Conservation of sun bears needs to focus on protection of their forest habitat, appropriate management of these areas, strict enforcement of their legal status, minimizing human-bear conflict near forest areas and halting bear trade.

Population trend : decreasing

Threats : Malayan sun bears are classified as Vulnerable on the IUCN Red List, primarily due to the continued destruction of its habitat. Habitat loss, due to fragmentation and degradation is a huge threat to the Malayan sun bear population. This is caused mostly by human encroachment and illegal logging both within and outside protected areas in order to grow coffee, rubber plants and oil palms. Another threat facing these bears is poaching, even within protected areas, to supply the bear parts trade. Bear gall bladders and bile products are used in traditional medicines despite the fact that many herbal alternatives are equally beneficial, more readily available, legal and cheaper. Further threats include the capture of sun bears as pets and the killing of bears due to increasing human-bear conflicts. Catastrophic events such as forest fires and droughts also have an big impact on sun bear populations, causing a decrease their habitat and food availability, resulting in many bears suffering from starvation. As a result of this ongoing habitat loss and excessive human-caused mortality, many sun bear populations have already become extinct.

Adapted from : http://www.ARKive.org/malayan-sun-bear/helarctos-malayanus/info.html

ARKive

Photo : Abdul Kadir


Photo : Mike O Griffiths

# Sumatran Tiger
# (Panthera tigris sumatrae)

Appearance : One of the largest 'big cats', the tiger is an instantly recognizable and emotive animal. Nine different subspecies are recognized, three of which became extinct in the latter 20th Century; the Balinese tiger (P. t. balica), the Javanese tiger (P. t. sondaica) and the Caspian tigers (P. t. virgata). The remaining subspecies are the Siberian tiger (P. t. altaica), the South Chinese tiger (P. t. amoyensis), the Sumatran tiger (P. t. sumatrae), the Indochinese tiger (P. t. corbetti), the Malayan tiger (P. t. jacksoni) and the Bengal tiger (P. t. tigris). The different subspecies vary in their body size, coat color and markings, with the Sumatran tiger being the smallest and darkest, whilst the Siberian tiger is the largest and palest subspecies. Markings and coat color can overlap between subspecies and are not often used to differentiate them.
Generally however, tigers have a reddish-orange to yellow-ochre coat with a white belly and black markings, having a unique pattern. Like the other big cats, tigers are well adapted for hunting large preys and have short, heavily-muscled forelimbs and long, sharp, retractable claws.

Size : Males: 146 kg.
Females: 91 kg.

Life Span : 10 to 15 years.

Diet : Wild pigs and various deer species make up the bulk of the tigers' diet. They need to kill approximately 50 large prey animals per year to survive. They are opportunistic and will also eat birds, rodents, insects, amphibians and reptiles in addition to other mammals such as primates and porcupines. They can also hunt preys much larger than themselves and have been known to take both elephants and rhinos.

Home Range : Home ranges are small where preys are abundant (approx 20km$^2$).

Habitat : Varies widely across its range from tropical forests to tall grass jungles, encompassing coniferous woodlands, mangrove swamps and dry thorn forests. In general however, tigers require dense cover, access to water and sufficient large prey. Can occur up to 4,500m in altitude

Distribution : Sumatra
Tigers were once known throughout central and southern Asia and as far west as eastern Turkey but currently survive only in scattered populations from India to Southeast Asia, and in Sumatra, China and the Russian Far East.

Behaviour and Ecology : Tigers are predominately solitary animals. They occupy territories that are defended against intruders of the same sex and are marked with urine and soil scrapes at the boundaries. Adult female home ranges rarely overlap, whereas males have larger territories that overlap those of 1-3 females, with whom they mate. Mating occurs throughout the year and the female gives birth to a litter of two or three cubs after a four month gestation period. Cubs learn to hunt and kill when they are around six months old but remain dependent on the mother until at least 15 months old, when they disperse to find their own territory.

Tigers are 'stalk and ambush' predators and their stripy coat provides effective camouflage in tall grass and forest. They mainly hunt at night and the principal prey consists of deer and wild pigs, although tigers prey on a variety of other animals and will also eat carrion. Unlike other species of cats, tigers are competent swimmers; they will readily enter the water, and can be found lying half-submerged in streams and lakes in the mid-day heat.

IUCN Red List Status : Critically Endangered

CITES : Appendix I

The tiger is classified as Endangered by the IUCN, and of the six current species, the future of the South China tiger and the Siberian tiger seem particularly bleak. Recent extensive surveys resulted in no tiger sightings at all. India has the greatest number of tigers but even the Bengal tiger population is estimated at no more than 3,000 to 3,500 individuals. TRAFFIC monitors the level of international trade of tiger products and brings it to the attention of the relevant authorities. The key to the survival of the tiger is the maintenance of large tracts of contiguous habitat, but protection of this species is complicated by its man-eater reputation and by the threat posed to livestock. The involvement and commitment of local people will be vital for the future sustainability of this most regal of cats.

Population trend: decreasing

Threats : Human activities are the principal cause of declining tiger population. Hunting was a major cause of mortality in the past; both for trophies and as part of organised pest control measures. Nowadays poaching and illegal killing, mainly by livestock owners, remain the major threats to the survival of the species, particularly with the growing demand for tiger bones for Oriental traditional-medicine. The demand for remedies made from tiger parts has increased due to the higher purchasing power in Asia and laws preventing international trade in tiger parts are largely ignored. Hong Kong is the main importer of tiger products, being the tiger bone the most used part. The bones are crushed to make anti-inflammatory drugs for rheumatism and arthritis, amongst many other uses. The trade in tiger skins is also increasing. In addition, habitat loss has occurred through much of the tiger's territory, which is threatening it’s survival; as land is rapidly converted to meet the increasing demands of the increasing Asian population, tiger populations become isolated in remaining fragments of wilderness and eventually die. The tiger's natural prey species have declined in numbers due to over-hunting, leading them to prey on domestic livestock, which inevitably causes conflict with local farmers.

Adapted from : http://www.ARKive.org/tiger/panthera-tigris/info.html

Sumatran Tiger (photo : Mahdi Ismail)


Photo : Madeleine Hardus


Photo : Madeleine Hardus


Photo : Mike O. Griffiths

# Other species in the Gunung Leuser National Park

## Flora

In the beach and swamp forest you find Casuarina trees (Casuarina sp.), Wild Nutmeg (Myristica sp.), Campfor or Kapur baros (Drybalancops aromatica), Nibung palms, Rotan (Calamus sp.), Mangrove trees or Api-api (Avicennia sp.) and Pandan (Pandanus sp.). Pometia pinnata frows are found along the rivers.

In the lowland forest, trees such as Meranti (Shorea sp.), Keruing (Dipterocarpus sp.), Damar (Hopea sp.) and several wild fruit trees like Durian (Durio zibethinus), Mango or Mangga (Mangifera indica), Wild Banana, citrus fruit and wild jack fruit grow in abundance.

In the mountain and alpine woods, several species of moss and wild flowers, such as Gentians, Primula's, Strawberry, herbs, and wild orchids are found. The Rafflesia Arnoldi or Bunga padma (Rafflesia sp.) also grows here.

## Other mammals

Amongst other mammals, Otters or Berang berang (Lutra sp.), Wild Boar, Red Giant Flying Squirrel (Petaurista petaurista), Wild Dog (Cuon alpinus), Hog Badger (Arctonyx collaris), Lesser Mousedeer (Tragulus javanicus), Large Mousedeer (Tragulus napu), Barking Deer (Muntiacus muntjak), Sambar Deer (Cervus unicolor) Clouded Leopard (Neofelis nebulosa), Flat- headed Cat (Prionailurus planiceps), Temminck's Golden Cat (Catopuma temminckii), Leopard Cat (Prionailurus bengalensis), Flying Lemur (Cynocephalus variegates ) can be found in GLNP.

## Reptiles

The most conspicuous reptiles in GLNP are: Swamp Crocodile (Crocodylus palustris), Estuarine Crocodile (Crocodylus porosus), Flying Frog (Rhacaphorus pardalis), Flying Snake (Crysopelea), Common Flying Lizard (Draco volans), Hawksbill Turtle or Penyu sisik (Eretmochelys imbricata), Leatherback Turtle or Penyu belimbing (Dermochelys coriacea), Water Monitor (Varanus salvator).

## Birds

The following bird species are the most common in GLNP: Argus Pheasant (Argusianus argus), Asian Pied Hornbill (Anthracoceros albirostris), Rhinoceros Hornbill (Buceros rhinoceros), White-bellied Sea-eagle (Haliaeetus leucogaster), Blue-crowned Hanging Parrot (Loriculus galgulus), Osprey (Pandion haliaetus).

Buterflies in GLNP (photo : Madeleine Hardus)

Sumatran Orangutan (photo : Nick Tignonsini)

# 6

# Sumatran Orangutan Viewing Guidelines

As you trek through the forest at Bukit Lawang, it is important to remember that you are entering the habitat of one of the rarest great ape species on Earth.

The population of Sumatran orangutans at Bukit Lawang consists of both wild, and semi-wild (rehabilitated and released) orangutans, which are not ‘tame’. Instead they have been ‘habituated’, which means that they no longer associate the presence of humans as an immediate threat and are therefore relatively relaxed in the proximity of people. However they are free-ranging animals that have been given a ‘second chance’ at life in the wild, having been rescued from the illegal wildlife trade and reintroduced into the forest. Inappropriate conduct by forest guides and visitors may have a negative effect on orangutan behavior. This in turn may place them at an increased risk of becoming stressed and/or of becoming ill and dying.

By following these simple guidelines (which are in line with other official guidelines for great ape tourism[130, 131]), forest guides and visitors will be able to observe the Sumatran orangutans at Bukit Lawang in a way which is both safe for themselves as well as the orangutans.

These guidelines will lead to a more natural, unique and rewarding time in the forest.

## Group Responsibilities

As an individual in a group it is important to act responsibly, not only for yourself but for the group as a whole.

1) A maximum group size of seven visitors is to be adhered to whilst in the forest.
   Research carried out in other eco-tourist sites where great ape trekking are available have shown that visitor group size can affect the behavior of the animals and (as a result), the visitors' experience. Where groups of visitors are too high in number, the animals become stressed and nervous and move away from visitor groups.

2) A minimum distance of SEVEN TO TEN METERS is to be maintained at all times between the visitor group and the orangutans.
   The potential for disease transfer, both from humans to orangutans and vice versa, is very high due to the close genetic relationship we share with apes (see Chapter 4). Pneumonia, influenza, tuberculosis, hepatitis A, B, C, and E, cholera and even the common cold can all be passed between great apes and humans.


   - This also serves to protect from the possible threat of attack from the orangutans:
     If an orangutan does move towards the visitor group, it is the responsibility of the visitors as well as the forestguid to move the whole visitor group back (maintaining the minimum distance at all times).

3) Once sighted and in the presence of orangutans, the group should commence timing a period of ONE HOUR MAXIMUM in the area.
   When this period is over, the group is to leave the area where the orangutan is.
   - Timing is at the guides' discretion and the viewing period can NOT be extended:
     Remember that we are guests in the Gunung Leuser National Park, which is the orangutans' home, and that what is best for the orangutans is to freely roam and forage naturally in the forest.

## Orangutan Viewing

The Sumatran orangutan shares over 96.5% of its genetic DNA with us and as a result, is like us in many ways. It is important to remember that orangutans are thinking, feeling beings and should be treated with due care and respect.

Therefore, visitors to the Bukit Lawang site are to observe these 'orangutan etiquette' guidelines :

1) Visitors or guides should not touch the orangutans under any circumstances.
   · This is very dangerous for various reasons: diseases, infections and even parasites can easily pass between orangutans and humans and physical contact increases the possibility. Also, orangutans are approximately four times stronger than a human and are therefore capable of inflicting serious or fatal injuries if they feel threatened.

2) Visitors and/or guides must not feed the orangutan under any circumstances.
   · This can negatively affect the orangutans' behaviour and cause them to become more dependent on humans. Diseases can also be passed very easily from orangutans to humans and also from humans to orangutans through food provisioning.


3) Visitors or guides should try to avoid direct eye contact with the animals.
   · Many great ape species use direct eye contact as a threat technique.

4) Visitors or guides should not place themselves between two orangutans, especially between a mother and her infant.
   · Orangutan mothers are extremely protective towards their offspring and can become aggressive if they feel that their infant is being threatened.

4) Visitors or guides should not call out to the orangutans.
   · Calling to the orangutans can cause stress and disrupt their natural behaviour.
   · Orangutans must not be called/lured to the group or trail system, as this deters the orangutans from behaving and foraging naturally.
   · Visitors should refrain from making any sudden movements and should not attempt to gain the attention of the orangutans by waving their arms, etc.

5) Visitors or guides should refrain from being too noisy within the forest and should try to talk quietly.
   · Loud noise can be interpreted as a threat by the orangutans and they can respond either by fleeing or threatening back.
   · If the orangutan begins to elicit kiss-squeak vocalisations and/or is breaking and throwing branches – this is a sign of disturbance, and it would be best to move on and leave the orangutan alone.


## Visitor Responsibilities

1) Visitors must not go into the forest if they are feeling unwell.
   If a visitor has recently had sickness and/or diarrhoea, then they should not enter the forest. It is the responsibility of the visitor to decide whether they pose a potential threat to the orangutans. By spending time with the orangutans whilst unwell, visitors seriously risk infecting the animals, which could easily result in their death (and the potential transmission of the disease to other orangutans.
   - If the guide suspects that a visitor is not well enough to enter the forest, it is within his/her authority to deny the visitor to entry.

2) Visitors should not eat whilst in the forest as this increases the risk of both disease transmission and attacks from orangutans.
   · Visitors should take any litter they produce out of the forest when they leave the area.
   · It is most preferable to bring as little as possible into the forest – only the essentials should be taken in. This will limit chances of loss/damage.
   · Orangutan attacks only occur as they know from past experience that visitors and their guides often carry food into the forest – thus if no food

is brought in, the orangutans will learn that there is nothing to attack for, which will make a safer experience for ALL of the orangutans and ALL future visitors and guides.

3) If the visitor needs to urinate or defecate within the forest, he/she must ensure that it is far from the orangutans and that a hole is dug (at least 30cm deep) and subsequently filled in.
Where possible, visitors should try and wait until they are out of the forest.

## Forest Responsibilities

Like any tropical forest, Bukit Lawang and its surrounding areas represent a complicated and diverse, but above all, fragile habitat. The whole forest system is a delicately balanced network of animal and plant species and many species are heavily dependent on each another.

We therefore ask visitors to follow this simple guideline:

Visitors should not remove, damage, or alter any of the vegetation within the forest. Leaves, seeds and shells all play a role within the forest ecosystem and should not be taken out.

It is the responsibility of every person entering the forest to help ensure the survival of the critically endangered species and habitat. Visitors should discourage other members in their group, including their guides if necessary, from acting in a way which contradicts these guidelines, and should express their disapproval and report to the national park office any activity which puts either the visitors or the orangutans at risk.

With your help and cooperation, the orangutan can continue to flourish in Bukit Lawang, and visitors for years to come will also be able to enjoy and appreciate the orangutan in its natural forest home.


Sumatran Orangutan (photo : Nick Tignonsini)

# Glossary

Anthropozoonotic - Term used to describe a disease that can be transferred from humans to animals

Arboreal - Describes a species that spends most of its life in the trees.

Atmosphere - A layer of gases surrounding the earth that regulates temperature and other variables necessary for life to exist on the planet.

Biodiversity - Term used to describe the variation of life forms present in a given area; often used to describe the overall health of a region/ecosystem.

Bimaturism - Used to describe differences in size and physical characteristics between species members of the same sex. Male orangutans are an example of a species that can exhibit bimaturism, with some adult males with expressed secondary sexual characteristics, and other males that although still viable and able to successfully mate, do not yet have expressed SSCs and are smaller in size and stature.

Biofuels - Fuels formed through the processing of living biological material. One such example of biodiesel is the fuel that is produced with the palm oil derived from large oil palm plantations in Indonesia and Malaysia.

Brachiation - A system of movement whereby the individual travels by swinging from arm to arm through the trees (example species that uses this method - gibbons).

Canopy - Vertical level of a forest ecosystem describing the treetops.

Coniferous forest - Describes a forest with trees or shrubs bearing cones and evergreen leaves

Contagious - Disease that can be spread to other individuals.

Deciduous forest - Describes a forest with trees that seasonally lose their leaves throughout the year.

Deforestation - Term used to describe the cutting down and removal of all or most of the trees in a forested area. It can be done by burning or logging.

Density - Term used to describe the number of individuals living in a given area, often given in terms of 'amount/km$^2$'

Dipterocarp forest - Describes a forest of uniquely-flowering, often very tall canopy-emergent trees, whose trees mainly belong to the Dipterocarpaceae family.

Disease transmission - The passage of a disease from one individual to another, can be across species boundaries

Disperse - Pattern by which an individual leaves his/her family group upon becoming independent.

Diurnal - Activity pattern whereby an animal is primarily active during the day.

Ecology - The study of how individuals interact with each other and their environment.

Ecosystem - Term used to define the relationships among both plants and animals species as well as the chemical and physical components of a defined region.

Ecotourism - Responsible travel to natural areas that conserves the environment and improves the well-being of local people

Emergent layer - Highest vertical level of a forest ecosystem, consisting of individual trees that grow above the level of the canopy.

Endemic - A term used to describe a species found only within one area or country.

Evergreen forest - Describes a forest having foliage that persists and remains green throughout the year

Extinction - All members of a species are dead; complete removal from the planet. The end of a particular way of life or type of activity

Folivore - A diet consisting primarily of leaves

Flora - All the plant living in a given place or time.

Fauna - All the animal living in a given place or time.

Flagship species - Term used to describe a species that is particularly charismatic or fascinating, which can act as ambassadors to an entire conservation campaign.
Forest floor - Lowest vertical level of a forest ecosystem; the ground.
Fossil Fuel - Fuels formed over millions of years though decomposition of ancient organisms. Examples include petroleum, coal, natural gas, etc.
Frugivorous - A diet consisting primarily of fruit.
Genes - A segment of genetic material (DNA) that determines a physical trait in an organism. The gene is the most basic unit of heredity.
Genetic diversity - Similar to biodiversity, this is a term used to describe the degree of different genes present in a population; the higher the amount of genetic diversity, the more variation is possible – increasing the ability of that species to adapt and thus also a good determinant of the population's health.
Gestation - The period of time that the young of an animal develops inside its mother's body until it is born.
Global warming - Term used to describe the increase in the average temperatures of the Earth's near-surface air and oceans.
Greenhouse effect - Term used to describe the buildup of greenhouse gases in the environment, resulting in the heating up of the earth's atmosphere (global warming)
Greenhouse gas - Term used to describe the atmosphere gases that absorb energy/heat. Carbon dioxide and methane are examples of greenhouse gases.
Habitat fragments - Smaller portions of forest or an animal's habitat that have become disconnected from the larger body of the forest/habitat. Can be a major problem for species requiring large home ranges.
Hibernate - Term used to describe a state of inactivity invoked by some species such of bears, squirrels, and even snakes, during periods of low food availability. During hibernation the animals use less energy and have a decreased digestion or metabolic rate and body temperature.
Home range - The area used by an individual or group over an annual period.
Inbreeding - Breeding between closely related animals. When close relatives mate, there is a higher probability that genes passed on to offspring will be similar. This can be dangerous as it can lead to the expression of recessive traits which are normally blocked by the dominant traits in the population. With many recessive alleles considered negative this presents a major problem to small populations with inherent low genetic diversity.
Interbirth interval - Term used to describe the average amount of time a mother has between offspring.
Interspecies/Interspecific - An act occurring between two or more different species.
Intraspecies/Intraspecific - An act occurring within two or more members of the same species.
Lowland forest - Describes a forest that is fairly flat and not very high above sea level (less than 1 km in altitude)
Mast fruiting - Period of time where there are many trees fruiting at the same time in the forest, occurs approximately every 2-5 years.
Monoculture plantation - Term used to describe the agricultural practice of growing only one type of crop on a certain area of land. Some common Sumatran examples are oil palm and rubber. Such plantations support much lower levels of biodiversity than do natural forests.
Monogamy - Male-female grouping/mating pattern whereby one male mates exclusively with one female, without mating other individuals.
Monsoon forest - Describes a forest with a long dry season which is followed by a period of heavy rains.
Montane forest - Describes a forest found at higher altitudes, with shorter trees often covered in moss and lichen.
Nocturnal - Activity pattern whereby animal is primarily active during the night.
Omnivore - A diet consisting of a variety of all types of food.

Over-habituation - Term used to describe an animal species that has become highly accustomed to human presence and may come too depend on them for provisioning and/or approach them for physical contact.

Parasite - Term used to describe an organism that lives within a larger host species, to the detriment of the individual host.

Pathogen - Infectious agent or germ capable of causing disease.

Peatland - Term to describe an area whose ground consists of peat, which is a an accumulation of partially decayed plant material accumulated over time. This ground is very rich in minerals and thus can support rich, biodiverse forest ecosystems. Peatlands are also an important ecosystems as natural carbon sinks, so that if peatlands are cleared, a very high amount of carbon dioxide is released into the atmosphere.

Primary forest - A term used to describe a forest that has had no human interventions or has not had any in a very long period of time; many mature trees are present (as opposed to secondary forest). Primary forests host the largest rates of biodiversity.

Rehabilitation - The process by which animals displaced from the forest/confiscated from the pet trade, are treated for any medical and/or behavioural conditions and undergo a period of re-adaptation' so that they can later be returned to their natural habitat in the forest.

Reintroduction - Release of rehabilitated animals, such as orangutans, into areas which were once part of their historical range

Scrubland forest - Describes an uncultivated region covered with scrub vegetation; these areas are often subject to human deforestation.

Secondary forest - A term used to describe a forest that has been logged for larger/valuable trees, with only younger or less commercially valuable trees remaining (as opposed to primary forest).

Secondary Sexual Characteristics (SSCs) - Traits present within a gender of a species that have no direct effect on mating (primary sexual characteristics being the genitals). It is thought that SSCs are related to mating preferences, with as an example: female orangutans preferring to mate with fully developed adult male orangutans with pronounced SSCs such as cheek flanges, the large throat pouch and long hair on the arms and back.

Seed disperser - A term used to describe a species that either through discarding fruit seeds or ingestion and passing of seeds through faeces, serves to spread seeds (and therein trees and plants) across a region.

Semi-wild - Term used to describe an animal that had been removed from its natural environment, (I.e. held as a pet in a human environment), and then later rehabilitated and released back into its natural habitat.

Serial monogamy - A type of monogamy whereby one male will only mate with one female for a period of time, but may go on to mate with others over time.

Sexual dimorphism - Used to describe differences in appearance, mainly in size, between males and females of the same species.

Soil erosion - Removal of minerals and solids present in the ground, which are often important for plant/crop growth. It can be a natural process, but also be caused by human intervention, such as unsustainable land uses like mass deforestation.

Species - Primary classification level to describe individuals that can mate with one another and produce viable offspring.

Subspecies - A classification level below that of 'species', used to describe a group of the same species that live in a different geographical region and adapted in some way to local conditions (often with a slightly different appearance than other members of the species).

Supplementary feeding sessions - Term used to describe human provisioning performed for semi-wild, released individuals. The feeding sessions are meant only to supplement the natural diet and serves as a sort of safety-net' for individuals who without a complete natural upbringing may have reduced natural foraging skills.

Sustainable tourism - Term used to describe a form of tourism committed to improve the standard of living of local people and maintain the quality of the environment that local people and visitors are dependent upon

Sustainability - Term used to describe a system that can be self maintained, without external aid or the depletion of the resources. It implies consumption in a way that future generations will be able to have access to the resources.

Terrestrial - Describes a species that spends most of its life on the ground.

Umbrella species - Term used to describe a species whose home range and habitat requirements are large enough that when it becomes the focus of protective management, the entire ecosystem and biodiversity within its range is automatically protected.

Understory - An underlying layer of vegetation, especially the plants that grow beneath a forest's canopy.

Viable breeding population - Term used to describe the minimum size of a population necessary to maintain healthy genetic diversity and avoid problems of small population genetics. Can also be referred to as Minimum Viable Population, or MVP.

Wildlife tourism - Term used to describe a tourism operation that is based solely on interactions with wildlife such as viewing/photographing, direct contact, and feeding; no sense of responsibility to the environment or local community is necessarily implied.

Zoonotic - Term used to describe a disease that can be transferred from animals to humans

# ABOUT THE AUTHOR (OIC)

Jalan Sei Bahorok Baru No. 79
Medan 20154 North Sumatra
Indonesia

Phone / Fax: +62 61 4147142
Email : info@orangutancentre.org
Website : www.orangutancentre.org

Orangutan Information Centre

## Mission Statement

The Orangutan Information Centre (OIC) is dedicated to the conservation of Sumatran orangutans (Pongo abelii) and their forest homes. Our grassroots projects in Sumatra work with local communities living alongside orangutan habitat. The OIC plants trees, visits schools and villages, and provides training to help local people work towards a more sustainable future. We are a local NGO staffed by Indonesian university graduates, believing that Sumatran people are best suited to have an impact in and help Sumatra.

The Orangutan Information Centre works to :

1. Raise public awareness of threats to and conservation strategies for the Sumatran orangutan through community education and global communication
2. Educate and empower Sumatran youth through environmental education and awareness projects for local schools
3. Promote sustainable community development initiatives through training and capacity building in local communities
4. Collaborate with other local and international NGOs and businesses working towards parallel goals

Long-term goals:

- Conserve the endemic, critically endangered Sumatran orangutan and its rainforest ecosystem home
- Work with local people towards the preservation and restoration of rainforest habitat
- Assist local government in the protection and maintenance of protected areas
- Promote orangutans as global conservation ambassadors for the rainforest ecosystem
- Support the establishment of conservation education curriculum and community empowerment programmes in Sumatra

Supporting Organisations for this text:

1. Australian Orangutan Project (AOP) – An organization set up to assist field conservation programmes for the Bornean and Sumatran orangutan. The AOP also serves as an information body for all matters concerning the orangutan.

2. Chester Zoo – Formed in 1930, which later in 1934 became the North England Zoological Society (NEZS), a UK zoological garden with over 7,000 animals from 400 different species. Chester Zoo has a strong conservation base and supports field programmes all over the world.

3. OAPN - The Autonomous Organization for National Parks (Organismo Autónomo Parques Nacionales, OAPN), Ministry of Environment and Rural and Marine Affairs, Spain, is responsible for the development and coordination of the Network of Spanish National Parks. OAPN also coordinates the UNESCO Man and Biosphere (MAB) Programme in Spain, as well as supports international environmental projects aimed to improve the management of natural protected areas in several countries all over the world.

   www.mma.es/secciones/el_ministerio/organismos/oapn/

4. Sumatran Orangutan Society (SOS) – International environmental NGO partner of the Orangutan Information Centre (OIC), working to support conservation efforts in Sumatra for the orangutan and its rainforest habitat.

5. UNESCO – As a specialized agency of the United Nations, UNESCO (United Nations Educational, Scientific and Cultural Organization) contributes to the building of peace, the alleviation of poverty, sustainable development and intercultural dialogue through education, the sciences, culture, communication and information. UNESCO has two global means of promoting environmental sustainability and protecting the natural environment; the Man and the Biosphere (MAB) Programme, with at its core the World Network of Biosphere Reserves, and the World Heritage Convention.

# References


1. van Beukering, P.J.H., Cesar, H.S.J., Janssen, M.A., Economic valuation of the Leuser National Park on Sumatra, Indonesia. Ecological Economics, 2003. 44: p. 43-62.
2. Olson, D.M. and E. Dinerstein, The Global 200: Priority ecoregions for global conservation. Annals of the Missouri Botanical Garden, 2001. 89: p. 125-126.
3. LIF, The Leuser Ecosystem: Wildlife Paradise. 2008: Leuser International Foundation.
4. Wiratno, Leuser, Warisan Dunia. 2007, Gunung Leuser National Park Authority.
5. LIF. Leuser International Foundation. 2008 [cited; Available from: www.leuserfoundation.org.
6. UNEP, The Last Stand of the Orangutan – State of emergency: Illegal logging, fire and palm oil in Indonesia's national parks., C. Nellemann, Miles, L., Kaltenborn, B. P., and M. Virtue, and Ahlenius, H., Editors. 2007, United Nations Environment Programme: Norway.
7. McConkey, K., Sumatran orangutan (Pongo abelii), in World Atlas of Great Apes and their Conservation, J. Caldecott and L. Miles, Editors. 2005, University of California Press. p. 184-204.
8. Chundawat, R.S., Habib, B., Karanth, U., Kawanishi, K., Ahmad Khan, J., Lynam, T., Miquelle, D., Nyhus, P., Sunarto, Tilson, R.,Wang, S. Panthera tigris. 2008 IUCN Red List of Threatened Species 2008 [cited 2008 19 November]; Available from: www.iucnredlist.org.
9. IUCN. IUCN Red List of Threatened Species. 2008 [cited 2009; Available from: www.iucnredlist.org.
10. Choudhury, A., Lahiri Choudhury, D.K., Desai, A., Duckworth, J.W., Easa, P.S., Johnsingh, A.J.T., Fernando, P., Hedges, S., Gunawardena, M., Kurt, F., Karanth, U., Lister, A., Menon, V., Riddle, H., Rübel, A.,Wikramanayake,E. Elephas maximus. 2008 IUCN Red List of Threatened Species 2008 [cited 2008 11 November]; Available from: www.iucnredlist.org.
11. Hedges, S., Tyson, M.J., Sitompul, A.F., Kinnaird, M.F., Gunaryadi, D.,Aslan, Distribution, status, and conservation needs of Asian elephants (Elephas maximus) in Lampung Province, Sumatra, Indonesia. Biological Conservation, 2005. 124: p. 35-48.
12. van Strien, N.J., Manullang, B., Sectionov, Isnan, W., Khan, M.K.M, Sumardja, E., Ellis, S., Han, K.H., Boeadi, Payne, J.,Bradley Martin, E. Dicerorhinus sumatrensis. 2008 [cited 2008 18 November].
13. Hardiono, K., D.J., Rianta, E., Revision of Taman Nasional Gunung Leuser Management Zonation, in Draft Protocol Discussion Paper. 2009, USAID Orangutan Services Program.
14. Fitzherbert, E.B., Struebig, M.J., Morel, A., Danielsen, F., Bruhl, C.A., Donald, P.F.,Phalan, B. , How will oil palm expansion affect biodiversity? Trends in Ecology and Evolution, 2008. 23: p. 538-545.
15. FAOSTAT. 2006 [cited 1st November 2008]; Available from: Http://faostat.fao.org. .
16. van Schaik, C.P., K.A. Monk, and J.M.Y. Robertson, Dramatic decline in orang-utan numbers in the Leuser Ecosystem, Northern Sumatra. Oryx, 2001. 35(1): p. 14-25.
17. Buckland, H., The Oil for Ape Scandal: How Palm Oil is Threatening Orangutan Survival. 2005, Friends of the Earth: London.
18. EOA, The 'Golden' Crop? Palm Oil in Post-tsunami Aceh. 2007, Eye on Aceh.
19. Pin Koh, L. and D.S. Wilcove, Cashing in palm oil for conservation. Nature, 2007. 448: p. 993–994.
20. Danielsen, F., Beukema, H., Burgess, N. D., Parish, F., Bruhl, C. A., Donald, P. F., Murdiyarso, D., Phalan, B., Reijnders, L., Struebig, M.,Fitzherbert, E., Biofuel plantations on forested lands: Double jeopardy for biodiversity and climate. Conservation Biology, 2008. DOI: 10.1111/j.1523 1739.2008.01096.x.
21. Venter, O., Meijaard, E.,Wilson, K., Strategies and alliances needed to protect forest from palm–oil industry. Nature, 2007. 16: p. 451.
22. Shepherd, C.R., Sukumaran, J., Wich, S.A., Open Season: An Analysis of the Pet Trade in Medan, Sumatra 1997 2001, T.S. Asia., Editor. 2004.
23. Nijman, V., An assessment of trade in gibbons and orang-utans in Sumatra, Indonesia. 2009, TRAFFIC Southeast Asia.: Petaling Jaya, Selangor, Malaysia.
24. Marshall, A.J., Nardiyono, Engstro, M.L.M, Pamungkas, B., Palapa, J., Meijaard, E.,Stanley, S.A, The blowgun is mightier than the chainsaw in determining population density of Bornean orang-utans (Pongo pygmaeus morio) in the forests of East Kalimantan. Biological Conservation, 2006. 129: p. 566–578.
25. Nijman, V., In Full Swing: An Assessment of Trade in Orangutans and Gibbons on Java and Bali, Indonesia. 2005, TRAFFIC Southeast Asia.
26. CITES. UNEP-WCMC Species Database. 2008 [cited; Available from: www.cites.org/eng/resources/species.html.
27. FWI/GFW, The State of the Forest: Indonesia. 2002, Washington, D.C.: Global Forest Watch: Bogor, Indonesia: Forest Watch Indonesia.
28. McGreal, S., Loris confiscations highlight need for protection. IPPL News, 2007. 34(3).

29. Nekaris, K.A.I. and V. Nijman, CITES proposal highlights rarity of Asian nocturnal primates (lorisidae: Nycticebus). Folia Primatologica, 2007. 78: p. 211–214.
30. Wich, S.A., Meijaard, E., Marshall, A.J., Husson, S., Ancrenaz, M., Lacy, R.C., van Schaik, C.P., Sugardjito, J., Simorangkir, T., Traylor-Holzer, K., Doughty, M., Supriatna, J., Dennis, R., Gumal, M., Knott, C.D., Singleton, I., Distribution and conservation status of the orangutan (Pongo spp.) on Borneo and Sumatra: how many remain? Oryx, 2008. 42: p. 332-339.
31. Singleton, I., et al., Orangutan Population and Habitat Viability Assessment: Final Report. 2004, Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group. 235.
32. McCarthy, J.F., Zen, Z., Learning from King Canute: Policy approaches to biodiversity conservation, lessons from the Leuser Ecosystem, in Biodiversity and Human Livelihoods in Protected Areas, G.A. N. Sodhi, M. Erb, A. Khee Jin Tan, Editor. 2007. p. 429-456.
33. Shumaker, R.M., Orangutans. Worldlife Library. 2007.
34. Caldecott, J., McConkey, K, Orangutan overview, in World Atlas of Great Apes and Their Conservation, J. Caldecott and L. Miles., Editors. 2005, University of California Press. p. 153-160.
35. Rijksen, H.D. and E. Meijaard, Our Vanishing Relative: The Status of Wild Orang-utans at the Close of the Twentieth Century. 1999, Dordrecht: Kluwer Academic Publishing. 480.
36. Chen, F.C., Li, W.H., Genomic divergences between humans and other hominoids and the effective population size of the common ancestor of humans and chimpanzees. American Journal of Human Genetics, 2001. 68: p. 444-456.
37. Kingsley, S., Causes of non-breeding and the development of the secondary sexual characteristics in the male orang utan: A hormonal study, in THE ORANG UTAN: ITS BIOLOGY AND CONSERVATION. 1982, Dr. W. Junk Publishers: The Hague. p. 215-229.
38. Maggioncalda, A.N., The socioendocrinology of orangutan growth, development, and reproduction-an analysis of endocrine profiles of juvenile, developing adolescent, developmentally arrested adolescent, adult, and aged captive male orangutans. 1995, Duke University: Durham.
39. Utami, S. and T. Mitra Setia, Behavioral changes in wild male and female Sumatran orangutans (Pongo pygmaeus abelii) during and following a resident male take-over, in THE NEGLECTED APE. 1995, Plenum Press: New York. p. 183-190.
40. Utami Atmoko, S. and J. van Hooff, Alternative male reproductive strategies: male bimaturism in orangutans, in SEXUAL SELECTION IN PRIMATES: NEW AND COMPARATIVE PERSPECTIVES. 2004, Cambridge University Press: New York. p. 196-207.
41. Utami, S.S., et al., Male bimaturism and reproductive success in Sumatran orang-utans. BEHAVIORAL ECOLOGY, 2002(13(5)): p. 643-652.
42. Uchida, A., Variation and evolution of extant and middle-late Miocene hominoids -- current state of research. Anthropological Science, 1996. 104(5): p. 365-383.
43. Fox, E.A., van Schaik, C.P., Sitompul, A., Wright, D.N., Intra- and interpopulational differences in orangutan (Pongo pygmaeus) activity and diet: implications for the invention of tool use. American Journal of Physical Anthropology, 2004. 125: p. 162-174.
44. Singleton, I. and C.P. van Schaik, Orangutan Home Range Size and Its Determinants in a Sumatran Swamp Forest. International Journal of Primatology, 2001. 22(6): p. 877-911.
45. van Schaik, C.P., Securing a future for the wild orangutan, in The Apes: Challenges for the 21st Century. 2001, Brookfield Zoo: Brookfield. p. 29-35.
46. Utami Atmoko, S.S., Singleton, I., van Noordwijk, M.A., van Schaik, C.P., and Mitra Setia, T., Male-male relationships in orangutans, in Orangutans: Geographic Variation in Behavioral Ecology and Conservation, S.A. Wich, Utami Atmoko, S.S., Mitra Setia, T., van Schaik, C. P., Editor. 2009, Oxford University Press p. 225-234.
47. Utami, S.S. and J. van Hooff, Alternative male reproductive strategies: male bimaturism in orangutans, in Sexual Selection in Primates: New and Comparative Perspectives. 2004, Cambridge University Press: New York. p. 196 207.
48. Galdikas, B.M.F., Subadult male orangutan sociality and reproductive behavior at Tanjung Puting. American Journal of Primatology, 1985. 8(2): p. 87-99.
49. Lameira, A.R. and S.A. Wich, Unpublished data.
50. Hardus, M.E., Lameira, A. R., Singleton, I., Knott, C., Morrogh-Bernard, H., Ancrenaz, M., Utami, S., Wich, S. A., The Orangutan Vocal and Sound Repertoire: with a focus on Geographical variation, in Orangutans: Geographic Variation in Behavioral Ecology and Conservation, S.S.U.A. S.A. Wich, T. Mitra Setia, and C. P. van Schaik Editor. 2009, Oxford University Press.
51. Lameira, A.R. and S.A. Wich, Orangutan long call degradation and individuality through distance: a playback approach. International Journal of Primatology, 2008. 29(3): p. 615-625.
52. Delgado, R.A., The function of adult male long calls in wild orangutans (Pongo pygmaeus). Dissertations Abstracts International, 2004. A65(1).

53. Mitra Setia, T. and C.P. van Schaik, The response of adult orang-utans to flanged male long calls: Inferences about their function. Folia Primatologica, 2007. 78: p. 215-226.
54. Hardus, M.E., Lameira, A. R., van Schaik, C. P., Wich, S. A., Tool use modifies sound production in wild orangutans: a functionally deceptive innovation? Proceedings of the Royal Society, in review.
55. Lameira, A.R., Bastian, M., Naso, A., Sterck, L., van Noordwijk, M. van Schaik, C. P., Wich, S. A., Geographic variation in call repertoire: evidence for call cultures in wild orangutans (Pongo sp.)? Animal Cognition, in review.
56. Wich, S.A., Krützen, M., Arora, N., Bastian, M. L., Lameira, A. R., Morrogh-Bernard, H. C., Meulman, E., van Schaik, C.P., Orangutan calls reveal foundation of human language. Science, in review.
57. Rodman, P.S., Diversity and consistency in ecology and behavior. , in Orang-utan Biology. 1988, Oxford University Press: New York. p. 31-51.
58. Utami, S.S., et al., Food competition between wild orangutans in large fig trees. International Journal of Primatology, 1997(18(6)): p. 909-927.
59. Wich, S.A., et al., Life history of wild Sumatran orangutans (Pongo abelii). Journal of Human Evolution, 2004. 47(6): p. 385-398.
60. van Noordwijk, M.A. and C.P. van Schaik, Development of ecological competence in Sumatran orangutans. American Journal of Physical Anthropology, 2005. 127(1): p. 79-94.
61. Galdikas, B.M.F., Orangutan reproduction in the wild, in Reproduction Biology of the Great Apes: Comparative and Biomedical Perspectives. 1981, Academic Press: New York. p. 281-300.
62. Goossens, B., Chikhi, L., Ancrenaz, M., Lackman-Ancrenaz, I., Andau, P.,Bruford, M.W., Genetic signature of anthropogenic population collapse in orang-utans. PLoS Biology, 2006. 225: p. 285–291.
63. Marshall, A.J., Lacy, R., Ancrenaz, M., Byers, O., Husson, S.J., Leighton, M., Meijaard, E., Rosen, N., Singleton, I., Stephens, S., Traylor-Holzer, K., Utami Atmoko, S.S., van Schaik, C.P.,Wich, S.A., Orangutan population biology, life history, and conservation: Perspectives from population viability analysis models, in Orangutans: Geographic Variation in Behavioral Ecology and Conservation, S.A. Wich, Utami Atmoko, S.S., Mitra Setia, T., van Schaik, C. P., Editor. 2009, Oxford University Press
64. Meijaard, E. and S.A. Wich, Putting orang-utan population trends into perspective. Current Biology, 2007. R540,17.
65. Lackman-Ancrenaz, I., M. Ancrenaz, and R. Saburi, The Kinabatangan Orangutan Conservation Project (KOCP), in The Apes: Challenges for the 21st Century. 2001, Brookfield Zoo: Brookfield. p. 262-265.
66. Meijaard, E., et al., Life after logging: Reconciling wildlife conservation and production forestry in Indonesian Borneo. 2005, Jakarta: Center for International Forestry Research. 370.
67. PHKA, Strategi dan Rencana Aksi Konservasi Orangutan Indonesia 2007-2017. 2007, Departemen Kehutanan.
68. Wolfe, L.D. and A. Fuentes, Ethnoprimatology: contextualizing human and nonhuman primate interactions., in Primates in Perspective. 2007, Oxford University Press: New York. p. 691-702.
69. Rijksen, H.D., The neglected ape? NATO and the Imminent Extinction of Our Close Relative, in The Neglected Ape. 1995, Plenum Press: New York. p. 13-21.
70. Eudey, A.A., The impact of socioeconomic decisions on the status of the orangutan and other east Asian fauna, in The Neglected Ape. 1995, Plenum Press: New York. p. 23-27.
71. WWF, WWF's SPECIES ACTION PLAN for the Conservation of Orang-utans (Pongo pygmaeus and Pongo abelii) in the Wild. 2005, WWF. p. 1-38.
72. Singleton, I. and S. Aprianto, The semi-wild orangutan population at Bukit Lawang; a valuable 'ekowisata' resource and their requirements., in Unpublished paper presented at a "workshop on eco-tourism development at Bukit Lawang" held in Medan, April 2001. 2001, PanEco and Yayasan Ekosistem Lestari: Medan, Indonesia. p. 1-14.
73. Woodford, M.H. and P.B. Rossiter, Disease risks associated with wildlife translocation projects, in Creative Conservation: Interactive Management of Wild and Captive Animals, P.J.S. Olney, G.M. Mace, and A.T.C. Feistner, Editors. 1994, Chapman & Hall: London. p. 115-35.
74. May, R.M., The role of ecological theory in planning re-introduction of endangered species. Symposia of the Zoological Society of London, 1991. 62: p. 145-163.
75. Cheyne, S.M., Wildlife reintroduction: considerations of habitat quality at the release site. BMC Ecology, 2006. 6(1): p. 1-8.
76. Russon, A.E., Return of the native: Cognition and site-specific expertise in orangutan rehabilitation. International Journal of Primatology, 2002. 23(3): p. 461-478.
77. Grundmann, E., Back to the wild: will reintroduction and rehabilitation help the long-term conservation of orang utans in Indonesia? Social Science Information, 2006. 45(2): p. 265-284.

78. Russon, A.E., Rehabilitating orangutans (Pongo pygmaeus): Behavioral competence. Laboratory Primate Newsletter, 2001. 40(4): p. 8-9.
79. UNWTO, Tourism Market Trends. 2005, United Nations World Tourism Organization.
80. Kua, J. and T. Baum, Perspectives on the Development of Low-cost Airlines in South-east asia. Current Issues in Tourism, 2004. 7: p. 262-276.
81. Cochrane, J., Ecotourism and biodiversity conservation in Asia: institutional challenges and opportunities, in Critical Issues in Ecotourism, J. Higham, Editor. 2007, Butterworth-Heinemann Press.
82. BPS, Tourism Tables. 2009, Badan Pusat Statistik Republik Indonesia (Statistics Indonesia of The Republic Indonesia).
83. UNWTO, World Tourism Barometer Interim Update, April 2009. 2009, World Tourism Organization.
84. Russell, C.L., The Social Construction of Orangutans: An Ecotourist Experience. Society & Animals Journal of Human-Animal Studies, 1995. 3(2).
85. Reynolds, P.C. and D. Braithwaite, Towards a conceptual framework for wildlife tourism. Tourism Management, 2001. 22: p. 31-42.
86. Orams, M.B., Feeding wildlife as a tourism attraction: a review of issues and impacts. Tourism Management, 2002. 23: p. 281-293.
87. Chin, C.L.M., et al., Ecotourism in Bako National Park, Borneo: Visitors' Perspectives on Environmental Impacts and their Management. Journal of Sustainable Tourism, 2000. 8(1): p. 20-35.
88. WTO. Ecotourism, now one-fifth of market. WTO News 1998 [cited July 2, 2007]; Available from: http://www.worldtourism.org/newslett/janfeb98/ecotour.htm.
89. Cochrane, J., New Directions in Indonesian Tourism, in Tourism in South East Asia: New Perspectives, V.T.K. M. Hitchcock, M.J. Parnwell, Editor. 2008, University of Hawaii Press Honolulu.
90. Grossberg, R., A. Treves, and L. Naughton-Treves, The incidental ecotourist: measuring visitor impacts on endangered howler monkeys at a Belizean archaeological site. Environmental Conservation, 2003. 30(1): p. 40-51.
91. Ceballos-Lascurain, H., Tourism, Ecotourism, and Protected Areas: the State of Nature-based Tourism Around the World and Guidelines for its Development. 1996, IUCN: Gland.
92. Woodford, M.H., T.M. Butynski, and W.B. Karesh, Habituating the great apes: The disease risks. Oryx, 2002. 36(2): p. 153-160.
93. Dellatore, D.F., Waitt, C.D., Foitova, I., Two cases of mother-infant cannibalism in orangutans. Primates, 2009. DOI 10.1007/s10329-009-0142-5.
94. Dellatore, D.F., The Impact of Tourism on the Behaviour of Reintroduced Orangutans (Pongo abelii) in Bukit Lawang, North Sumatra, Indonesia, in Primate Tourism, A. Russon and J. Wallis, Editors. in press, American Society of Primatologists.
95. Cochrane, J., Organisation of Ecotourism in the Leuser Ecosystem. 1998, Leuser Management Unit.
96. Christ, C., et al., Tourism and Biodiversity: Mapping Tourism's Global Footprint. 2003, Conservation International: Washington, DC. p. 1-66.
97. MacKinnon, K. and J. MacKinnon, Habitat protection and re-introduction programmes. Symposia of the Zoological Society of London, 1991. 62: p. 173-198.
98. Hill, C.M., Primate Conservation and Local Communities—Ethical Issues and Debates. American Anthropologist, 2002. 104(4): p. 1184-1194.
99. de la Torre, S., C.T. Snowdon, and M. Bejarano, Effects of human activities on wild pygmy marmosets in Ecuadorian Amazonia. Biological Conservation, 2000. 94: p. 153-163.
100. Kruger, O., The role of ecotourism in conservation: panacea or Pandora's box? Biodiversity and Conservation, 2005. 14: p. 579-600.
101. Walpole, M.J. and H.J. Goodwin, Local attitudes towards conservation and tourism around Komodo National Park, Indonesia. Environmental Conservation, 2001. 28: p. 160-166.
102. Sherman, P.B. and J.A. Dixon, The economics of nature tourism: determining if it pays, in Nature tourism: managing for the environment, T.Whelan, Editor. 1991, Island Press: Washington DC. p. 89–131.
103. Honey, M., Ecotourism and sustainable development: who owns paradise? 1999, Washington DC: Island Press.
104. Tremblay, P., Wildlife Tourism Consumption: Consumptive or Non-consumptive? International Journal of Tourism Research, 2001. 3: p. 81-86.
105. Dunstone, N., O'Sullivan, J.N., The impact of ecotourism development on rainforest mammals, in The Exploitation of Mammal Populations, V.J. Taylor and N. Dunstone, Editors. 1996, Chapman & Hall: London. p. 313–333.
106. Burns, G.L. and P. Howard, When wildlife tourism goes wrong: a case study of stakeholder and management issues regarding Dingoes on Fraser Island, Australia. Tourism Management, 2003. 24: p. 699-712.
107. Adams, W.M. and M. Infield, Who is on the Gorilla's Payroll? Claims on Tourist Revenue From a Ugandan National Park. World Development, 2003. 31(1): p. 177-190.
108. Griffiths, M. and C.P. van Schaik, The Impact of Human Traffic on the Abundance and Activity Periods of Sumatran Rain Forest Wildlife. Conservation Biology, 1993. 7(3): p. 623-626.

109. Wallis, J. and D.R. Lee, Primate Conservation: The Prevention of Disease Transmission. International Journal of Primatology, 1999. 20(6): p. 803-826.
110. Mueller-Graf, C.D.M., et al., Schistosoma mansoni infection in a natural population of olive baboons (Papio cynocephalus anubis) in Gombe Stream National Park, Tanzania. Parasitology, 1997. 115(6).
111. Frazier-Taylor, H., B.M.F. Galdikas, and W.B. Karesh, A survey of intestinal parasites in wild, ex-captive, and captive orangutans (Pongo pygmaeus), in An American Assocation of Zoo Keepers Research Project. 1984, AZA: Seattle, WA.
112. Foitova, I., Parasites in Orangutans (Pongo pygmaeus) under different ecology and ethology factors. PhD Thesis. 2002, Veterinary and Pharmaceutical University: Brno, Czech Republic.
113. Lyles, A.M. and A.P. Dobson, Infectious disease and intensive management: population dynamics, threatened hosts, and their parasites. Journal of Zoo and Wildlife Medicine, 1993. 24: p. 315-326.
114. Adams, H.R., et al., Self-reported medical history survey of humans as a measure of health risk to the chimpanzees (Pan troglodytes schweinfurthii) of Kibale National Park, Uganda. Oryx, 2001. 35(4): p. 308-312.
115. Scott, M.E., The Impact of Infection and Disease on Animal Populations: Implications for Conservation Biology. Conservation Biology, 1988. 2(1): p. 40-56.
116. Moore, J., Parasites and the behavior of animals. 2002, New York: Oxford University Press
117. Hart, B.L., Behavioral adaptations to pathogens and parasites: five strategies. Neuroscience and biobehavioral reviews, 1990. 14(3): p. 27394.
118. Ezenwa, V.O., Host social behavior and parasitic infection: a multifactorial approach. Behavioral Ecology, 2004. 15(3): p. 446-454.
119. Mul, I.F., et al., Intestinal Parasites of Free-ranging, Semicaptive, and Captive Pongo abelii in Sumatra, Indonesia. International Journal of Primatology, 2007. 28: p. 407–420.
120. Meyer, D., Adaptation an den natürlichen Lebensraum: Verhaltensbeobachtungen an zu rehabilitierenden Sumatra Orang Utans (Pongo abelii) im Bukit Tigapuluh National park Sumatra. 2005, University of Berlin: Germany.
121. Goller, K., Verhaltensbeobachtungen an ausgewilderten Sumatra Orang-Utans. 2004, University of Munich, Germany.
122. Yeager, C.P., Orangutan rehabilitation in Tanjung Puting National Park, Indonesia. Conservation Biology, 1997. 11(3): p. 802-805.
123. Tilson, R., Seal, U., Soemarna, K., Ramono, W., Sumardja, E., Poniran, S., van Schaik, C., Leighton, M., Rijksen, H., Eudey, A., Orangutan population and habitat viability analysis report of the captive breeding specialist group species survival commission of the IUCN, I.S.C.B.S. Group, Editor. 1993: Apple Valley, MN.
124. Berman, C.M., et al., Primate Tourism, Range Restriction and Infant Risk Among Macaca thibetana at Mt Huangshan, China. International Journal of Primatology, 2007.
125. Kuze, N., Sipangkui, S., Malim, T.P., Bernard, H., Ambu, L.N.,Kohshima, S., Reproductive parameters over a 37 year period of free-ranging female Borneo orangutans at Sepilok Orangutan Rehabilitation Centre. Primates, 2008. 49: p. 126-134.
126. Lerche, N.W., Emerging viral diseases of nonhuman primates in the wild, in Zoo and Wild Animal Medicine, M.E. Fowler, Editor. 1993, Saunders: Philadelphia. p. 340-344.
127. Quammen, D., Deadly Contact: How animals and humans exchange disease, in National Geographic. 2007.
128. Rosen, N., A. Russon, and O. Byers, Orangutan Reintroduction and Protection Workshop: Final Report. 2001, Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group. 180 pp.
129. Baker, L.R., IUCN/SSC Re-introduction Specialist Group: Guidelines for nonhuman primate re-introductions. Re Introduction News, 2002. 21: p. 29-57.
130. Homsy, J., Ape Tourism and Human Diseases: How Close Should We Get?, in A Critical Review of the Rules and Regulations Governing Park Management & Tourism for the Wild Mountain Gorilla, Gorilla gorilla beringei. 1999, International Gorilla Conservation Programme. p. 1-86.
131. IUCN, Best Practices for Great Ape Tourism, in IUCN Best Practices. in prep., International Union for the Conservation of Nature.

Damar tree in GLNP forest (photo : Binur Naibaho)

Together with Bukit Barisan Selatan and Kerinci Seblat National Parks, the Gunung Leuser National Park (GLNP) forms the Tropical Rainforest Heritage of Sumatra UNESCO World Heritage Site (TRHS). The World Heritage status was inscribed in 2004, along with previously attributed status of being recognized as a Biosphere Reserve in 1981 and an ASEAN Heritage Park in 1984. Here exists a complex, amazingly species rich and fragile environment, with a delicately balanced network of animal and plant life. The GLNP is the core of many endangered species' remaining habitat. The area is considered to be of huge environmental importance, and the unique flora and fauna are in critical need of conservation and protection.

This book was produced with support from :