Stasiun pengamatan orangutan semi liar dan tantanganya

Oleh

Ian Singleton
Direktur Konservasi
PanEco Foundation – Sumatran Orangutan Conservation Programme

INTRODUCTION

The decline of the wild orangutan

The orangutan once ranged all the way from southern China to Java, but today exists only on the islands of Borneo and Sumatra, as two distinct species; *Pongo pygmaeus* in Borneo and *Pongo abelii* in Sumatra. The Bornean orangutan is further subdivided into 3 distinct subspecies; *Pongo p. pygmaeus* (di bagian Barat Laut Kalimantan), *Pongo p. wurmbii* (di bagian Selatan dan Barat Daya Kalimantan) and *Pongo p. morio* (di Kalimantan Timur dan Sabah; Groves 2001)

Over recent decades the populations on both islands have decreased dramatically in size, as a result of legal and illegal logging, conversion of forests for palm oil estates, fires and the illegal killing and capture of wild individuals.

The most recent published estimates suggest only around 6,600 wild Sumatra orangutans and around 54,000 Bornean orangutans remain (Wich et al 2008).

Due to the steep declines in the populations of both islands in recent years the Bornean orang-utan is classified by the IUCN red list as Endangered and the Sumatran orangutan as Critically Endangered (IUCN/SSC 2000). Indeed both orangutan species, and especially the Sumatran orangutan, are in immediate and desperate need of more effective conservation measures.

Brief history of orangutan rehabilitation

Habitat destruction, hunting and persecution due to human-orangutan conflicts result in the deaths of numerous adult wild orangutans. In the case of adult females being killed, this often leads to the illegal capture and keeping of any surviving infants. To facilitate the confiscation of these illegal “pets” and to try to offset the losses from wild orangutan populations, a number of so-called ‘rehabilitation’ projects have been established over the last 40 years in Indonesia.

Rehabilitation implies a process in which animals in captivity are given medical treatment, protective care and the experience or training necessary for return to a successful life in the wild (Yeager 1997). The long-term goal of these projects was to give confiscated individuals a second chance to survive and reproduce in the wild after being released, without any further human intervention (van Schaik 1996). The short-term goal was to provide a place to which

confiscated orangutans could be taken. Without such places, the legal requirement to confiscate illegally held animals is necessarily problematic, and unlikely to be fulfilled.

When the first orangutan rehabilitation projects were established, back in the 1960s, it was thought that the orangutan was virtually extinct in its natural habitat. At that time it was estimated that the total number of wild orangutans was down to less than 5000, and possibly even fewer (Harrisson 1962). It was also predicted that with the drain on the wild population for zoos and the domestic pet trade, the animal would be extinct within a few years.

In response, several stations for orangutan rehabilitation were established throughout the orangutan's range. In all of these early stations roughly the same procedure was followed (van Schaik 1999). Upon arrival the animals were placed in rudimentary quarantine, and treated for any diseases or illnesses that were found. They were subsequently released into the forest if possible, and fed milk and bananas, one or two times a day, in quantities designed to encourage them to forage in surrounding forests. Those that were unable to build nests were often locked up again each night to protect them from predators.

In the Sumatran projects, rehabilitants were released during periods of fruit abundance and those considered able to fend for themselves were no longer given supplementary food. Some would go off into the forest on their own initiative. Those that stayed had their weight monitored and if after one month they showed no weight loss they were relocated and re-released further into the forest. At other centers there was normally no relocation. Instead, the hope was that the animals would spend longer and longer periods in the forest and eventually stay away from supplementary feedings for good.

When the majority of rehabilitation stations were established it was believed that whenever possible, all confiscated apes should be used to replenish the steadily declining wild orangutan populations (Rijksen and Meijaard 1999). Hence most released animals into forests that already contained wild orangutans (Galdikas-Brindamour 1975; Aveling and Mitchell 1982; Lardeux-Gilloux 1995; Smits *et*. *al*. 1995; Rijksen and Meijaard 1999). Indeed to date, only the projects in the Malaysian state of Sarawak, at Meratus in East Kalimantan and adjacent to Bukit Tigapuluh National Park in Sumatra, have released orangutans into forests that previously contained no existing wild population (Rijksen 1978; Smits *et*. *al*. 1995), in compliance with Indonesian Minister of Forestry Decree No. 280/kpts-II/1995

BRIEF HISTORY OF PUSAT REHABILITASI ORANGUTAN BOHOROK

Tourism

From the early days, when orangutan rehabilitation into existing orangutan habitat was considered both necessary and acceptable, the situation in the 1980s became one in which releasing additional orangutans into the wild at Bukit Lawang was now unacceptable and heavily criticized. This was recognized by the Ministry of Forestry and resulted in Keputusan Menteri Kehutanan no. 280/1995 which effectively outlawed further releases at the site. Nevertheless, a tourism industry continued to flourish. Theoretically, the park authorities had a rule restricting visitor numbers at feeding sessions to a maximum of 50, but this was seldom if ever enforced. In fact, many visitors simply wandered across the river and made their own way to the feeding platform (by themselves or with local guides), bypassing completely the official

entry point and ticketing process (it is easy to wade across for much of the time; Frey 1996; Rijksen 1997).

Extremely large numbers of local visitors regularly descended on the town every weekend and a steady stream of foreign tourists stayed for longer periods as they traveled through SE Asia on the backpacker trail. Originally the focus of tourism at the site was solely the orangutans themselves, but in the late 1990's, Bukit Lawang had developed into a mass tourism attraction complete with numerous bars, restaurants, internet cafe's, movie screenings etc. Very large numbers of Indonesian visitors would arrive with the primary intention of getting some fresh air, playing around in the river and listening to music (frequently very loud and all night). Alcohol and drugs were abundant and even a "red light' industry developed in what was locally known as *Kampong Thailand*. Instead of being a 'wildlife' attraction, Bukit Lawang became a countryside playground for Medan's urban population and the orangutans became little more than a side attraction (in fact the majority of visitors no longer even bothered to make the walk to the feeding platform to see them). As with most tourist attractions in North Sumatra it became a mess; an uncontrolled and haphazard collection of small losmen and warungs freely supplying beer, marijuana and just about anything else requested, and surrounded by noisy people and litter. The river, now the main attraction to most visitors, became badly polluted and unsafe to drink and unadvisable to even bathe in for risk of gastric infections.

In 1997 the Bukit Lawang resort was catering for between 17,000 (official) and 40,000 (assessed) foreign tourists per year, and around 450,000 local Indonesian visitors (1997). Each weekend around 8,000 people were to be expected in the area, in addition to local residents, and sometimes many more. A large proportion of domestic visitors did not even attend the orangutan feedings, choosing to simply relax by the river, swimming, tubing, eating and fishing etc instead. Nevertheless, the number that did attend the feedings still averaged around 100 per day, with peaks of up to 300 or more at weekends (Rijksen 1997).

It was then that northern Sumatra began to see numbers of foreign tourists visiting the region decline steeply. This was due to a combination of factors, including the political turmoil in Indonesia resulting from the fall of Soeharto in 1997, an escalation of the Aceh separatist conflict at about the same time and heightened terrorist threats indicated by the 2001 WTC disaster and the subsequent Bali Bombings of 2002. Numbers of domestic tourists remained high though, until the whole scene at Bukit Lawang was quite decisively and comprehensively destroyed by a massive flash flood in November 2003 that destroyed most of the town and claimed in excess of 200 lives.

The orangutans themselves

Between 1972 and 1999 a total of 226 orangutans were received at Bukit Lawang (some after 1995, despite the Ministerial Decree). This averages about 7 to 8 individuals per year. Of these, at least 49 (22%) died during the rehabilitation process. And an unknown number (since no effective long-term monitoring of survival was ever carried out, except of the few that continued to visit the feeding platform) of released orangutans will also have died post release.

Some orangutans are still kept caged much of the time due to their perceived inability to survive full-time in the forest, or as a "guaranteed orangutan encounter" for tourists. At present this includes just 2 individuals, Sasa (nulliparous adult female) and Radaria. Sasa first arrived at Bukit Lawang in 1999 and has never really shown any inclination or desire for a full return to the wild, despite spending much time out of the cages. Radaria was actually born at Bukit Lawang,

in the forest, but his mother Cepe sadly died there when he was only 2 years old. Ironically, this sad fact might have actually saved his life, since the majority of infants born and raised by ex-captives at Bukit Lawang fail to survive beyond the age of 5 (see later)

Some of the orangutans that were released at Bohorok still attend daily public feedings at a "feeding platform" near the station. These feedings are attended by visiting tourists and take place twice per day at around 8.00 and 15.00 (although the feeding times reported to tourists can vary from person to person, such that some arrive on site too late, after the feeding has finished). Any orangutans that choose to attend the daily feedings are almost always offered bananas and diluted milk, with little or no variation to this.

In 1997, Rijksen (1997) noted that feeding sessions tended to be attended by no more than 10 individual orangutans at any one time (including dependent infants born to females after their release). Today, there are still around 10 or so individuals that will still come to the feedings from time but on an average day only a few show up and on occasions there are already days when no orangutans at all attend the feedings (e.g. in the fruiting season when there are plenty of alternative foods available in the forest).

Due to Minister of Forestry Decree 280/1995 no orangutans should legally have been released at Bukit Lawang for the last 14 years. Given the fact that some of the individual orangutans that were relatively frequent visitors to the feedings during this period have also died, we can conclude that there is a slow but steady decline in the number of animals attending these feedings and in another 10 to 20 years there could be few or no orangutans still doing so.

If that happens, tourism at Bukit Lawang will have to finally relinquish its steadfast dependence on these feeding "shows" using ex-pets, and develop more sustainable forms of eco-tourism based on wildlife and other attributes of the National Park and its environs. Or, lose its tourism altogether.

WHY DID THE REHABILITATION CENTRE CLOSE?

Legislation and guidelines

As stated, when most rehabilitation stations were established it was believed that confiscated orangutans should be used to replenish the steadily declining wild population. The possible risks were hardly contemplated, if at all (Rijksen and Meijaard 1999). There are, however, a number of major issues that must be considered. These have led to the current situation in which the release of ex-captive orangutans into existing wild populations is considered dangerous to the wild population and contrary to the recommendations of both national and international conservation bodies.

The World Conservation Union (IUCN) clearly states that "*If there is no conservation value in releasing primates to the wild, or no management programme exists in which such a release can be undertaken according to conservation guidelines, the possibility - however unlikely - of inadvertently introducing a disease or behavioural or genetic aberration not already present in the environment should rule out returning primates to the wild*" (IUCN 2000).

This is reinforced by the precautionary principle that states that "*Protection of Wild Populations is Always the Priority*" in the later IUCN Best Practice Guidelines for the Re-introduction of Great Apes (Beck et al 2007)

In addition, the Indonesian Ministry of Forestry effectively terminated the rehabilitation role of all centres that release animals into existing wild populations in its newest Ministerial guidelines for rehabilitation (Keputusan Menteri Kehutanan 280/kpts-II/1995). These state that "*every effort should be made to find suitable areas with no existing wild populations for all rehabilitation projects*."

The reasons behind these regulations and guidelines are many, but are summarised below.

Disease transmission

Probably the most potentially serious problem is the risk of disease transmission. Disease transmission between people and apes is not simply a concern for the individuals themselves, but for the whole population. If diseases were to be transferred from humans to the wild orangutan population, the results could be catastrophic. In these days of SARS, Avian flu and swine flu we should not need to be reminded how quickly diseases can spread and how difficult they can be to eradicate. Should an outbreak of a potentially dangerous disease infect the wild population of Sumatran orangutans, it is not inconceivable that it could result in the rapid extinction of the species here.

The fact that several orangutans from Bukit Lawang have required emergency veterinary intervention by the Sumatran Orangutan Conservation Programme (www.sumatranorangutan.org) in recent years supports this claim, as do the findings of tests then carried out. The most common cause of serious illness among Bukit Lawang orangutans is amoebic dysentry, which the orangutans can get from contact with humans, their toilets, unclean water, or tourist litter. One also had a form of salmonellosis. Another was very ill and later died as a result of severe infections sustained from being shot numerous times with an air rifle, but such illness is not contagious. All of them have intestinal parasite loads far higher than found among normal wild orangutans in other parts of the Park. The threat to the wild orangutan population from the transmission of these and other diseases, such as tuberculosis, hepatitis and others, is very real.

Increasingly there is evidence in the media and other fora of the devastating effects that epidemics and pandemics are already having on ape populations. Several populations of African apes have already been lost or seriously compromised by human/ape disease transmission. During recent years the much feared Ebola virus has wiped out whole populations of chimpanzees and gorillas (not to mention the large numbers of humans who have also died). Human respiratory diseases have also killed large numbers of chimpanzees in the Ivory coast (Boesch 2008). This is not an issue that can continue to be ignored and many countries and ecotourism programmes now impose very strict regulations on all visitors in recognition of the risks.

A simple search of the literature reveals that there are a considerable number of well documented examples of probable disease transmission between humans and primates (e.g. Hime et al 1975; Ott-Joslin 1986, 1993; Pernikoff and Orkin 1991; Hastings *et. al*. 1991; Pamungkas et al 1992; Mudakikwa *et. al*. 1998; Wallis and Lee 1999; Willy *et. al*. 1999). That visitors to national parks can and do carry infectious diseases is evident from a simple survey of visitors to the Kibale National Park in Uganda, Africa, in 1999. Of 43 randomly selected visitors (of which only 7 % were Africans), there were 5 cases of herpes virus infection, 4 cases of influenza, one case of chicken pox and 2 cases of tuberculosis that were all considered to be

infectious and contagious at the time of their visit (Adams *et*. *al*. 1999). This represents at least 1 case of an infectious disease in every 4 visitors, an extremely high risk!

An additional study examined human outpatients from hospitals in Western Uganda and found that 73.2 % of diagnoses were the result of an infection that could be transmitted to great apes (Sleeman and Rooney 2000). The review identified respiratory tract infections, intestinal parasites, diarrhoea (dysentery, acute and persistent), skin disorders (e.g. scabies), measles, tuberculosis and occasionally poliomyelitis, among others, as the most likely types of diseases to be transmitted from humans to non-human primates.

Disease transmission between people and animals can occur through physical contact (including blood and saliva borne diseases, through bites), food sharing (deliberate or accidental), drinking contaminated water, access to human litter and other waste, and via airborne transmission.

Close contact between visitors and the animals should never occur for the simple reason that it is not known what diseases visitors may be carrying. The same should apply to volunteers and guides, and anyone else, including park staff if they are not routinely tested and/or vaccinated for key infectious diseases. It should also be noted that it is not in the visitor's bests interests either to contract any diseases that the animals might be carrying, but most domestic and foreign tourists tend to be poorly informed and hence unconcerned about this possibility.

Despite some rudimentary efforts in the past there was never an effective quarantine for new orangutans arriving at the Bohorok station (Frey 1996; Rijksen 1997). New arrivals were in no way separated from other feral (or semi-wild) orangutans or other wild primates. Macaques and feral orangutans routinely entered (and still do enter) the so-called 'quarantine compound' where all the cages are located, and scavenge among waste food and faeces for titbits. New orangutans were also never effectively separated from the public. Visitors often stray into the compound and numerous volunteers have helped clean cages and feed the animals over the years, with no prior medical screening, and afterwards had direct physical contact with the feral orangutans.

It has been argued that wild orangutans, as they tend to be solitary creatures, are perhaps less likely to transmit diseases between themselves than other, more sociable primates and apes. However, even wild orangutans have contact with each other in play and sexual encounters, and rehabilitant orangutans, particularly when in regular contact with each other and with people as they are at feeding sites, are far more sociable. Rehabilitants also interact with wild individuals. Instead of simply 'hoping' that nothing will happen, it is therefore essential that any risks are eliminated, or at very least reduced to an absolute minimum.

These issues are serious and must be addressed by any management authority having to deal with both apes and humans in close proximity to one another. As long as tourists are still encouraged to get as close as possible to orangutans, e.g. by feeding them in the forest during treks etc, the situation at Bukit Lawang will continue to pose unacceptable risks to the wild orangutan population, to tourists, and to residents in the Bukit Lawang area themselves.

Social disturbance and competition with the wild population

Wild orangutans may suffer or die by other means as a result of the introduction of additional orangutans to their forests, not only as a result of the introduction of new and unfamiliar diseases.

Food competition

Recent evidence suggests that at least female Sumatran orangutans do not readily shift their home range when it is damaged. Adult females at Suaq Balimbing on the west coast of Sumatra occupied home ranges of up to a potential size of 1,500 ha in extent (Singleton and van Schaik 2001). The boundaries of their home ranges were also consistent over time, even if a part of it was severely damaged by logging (Singleton et al 2009).

Additional evidence that orangutans do not readily move from their normal home ranges comes from the fact that over several years of regular nest censuses at Suaq Balimbing and at Ketambe, orangutans and nest densities in areas immediately adjacent to recently logged areas did not increase (see Singleton et al 2009). Thus again, despite the removal of a large proportion of the fruit resource from their home ranges, the orangutans do not appear to move.

It is therefore sensible to err on the side of caution and assume that when 'extra' orangutans are added to an area, some are likely to find it difficult to find enough food, with the end result being gradual malnutrition and eventual death. So the simple act of adding a few new individuals to a population whilst on the face of it may seem like a sensible and humanitarian thing to do, may in fact be a catalyst for a number of long slow, lingering deaths of other animals (if not the introduced animals themselves).

It might be argued, however, that supplementing the diets of the introduced animals with regular feedings as happens at Bohorok, will eliminate this risk, but since the food offered does not amount to a complete diet, it is more likely to simply reduce the problem slightly, rather than eliminating it altogether. It could also be argued that this supplementary food itself threatens the health of the orangutans, since it attracts them to the feeding site, where at times of the year alternative food sources might be few and far between, thus further encouraging and impoverished, low nutrition diet.

Other forms of competition

In contrast to females, some male orangutans do seem to disperse when they are subadults. However, they too appear to settle in to permanent home ranges as adults. Adult male home ranges are considerably larger than female home ranges though (Singleton and van Schaik 2001), and so the problem of food stress is unlikely to be as severe for the male members of the population. Nevertheless, whilst food competition between males may not be too severe, males do compete strongly for access to receptive females. Increasing the number of males in a given area will therefore result in increased competition between them, resulting in more conflicts and fights as they attempt to achieve dominant status, leading to more injuries and deaths.

An additional and extremely important point to note is that all remaining orangutan populations in Sumatra can be expected to be at or above the carrying capacity of the forests they are in. That is to say, the forests already contain the maximum number of animals that they are capable of supporting. This is a direct consequence of the extremely rapid rate of habitat loss now occurring. Whilst orangutans are reluctant to move their ranges, if the forest is destroyed completely they have no other option but to move and to attempt to settle elsewhere, in the remaining, and now smaller forest areas. Again however, for the reasons above this is unlikely

to be successful in many situations and a large number will almost certainly die as a direct result; perhaps not immediately, but eventually.

For these reasons, the release of additional Sumatran orangutans into existing wild populations is of no current benefit to conservation. Nor is it in the welfare interests of a large number of individuals, who are likely to suffer prolonged malnutrition and die as a direct consequence.

Instead, this old form of rehabilitation offers only potential risks to a critically endangered wild population. Because of this, the practice is no longer supported by the international community (see Yeager 1999; IUCN 2000; Beck et al. 2007), nor is it supported by the Indonesian government (S.K. Menteri Kehutanan 280/kpts-II/1995).

OTHER PROBLEMS AT BOHOROK

High Mortality of infants

In recent years it has become evident that the mortality rate of infants born to ex-captive orangutans living wild or feral at Bukit Lawang is extremely high. In fact, 56% of all infants born to rehabilitant mothers between1988 and January 2009 died before the age of 3 years old (Dellatore 2009a). This figure should be compared to observed infant mortality rates among wild orangutans which are considered to be as low as just 5 – 6% (see Singleton et al. 2004; Wich et al. 2004).

This extremely high infant mortality rate is not a unique phenomenon restricted only to Bukit Lawang. It is also the case at the well known Sepilok Orangutan Rehabilitation Centre (in the Malaysian state of Sabah), where mortality of infants aged 0 – 3 years was reported as 57% by Kuze et al. 2008. Given the similarity of these figures and the fact that both centers run very similar set ups (i.e. numerous ex-captives released in to natural forests and fed twice per day on bananas and milk) we must therefore suspect it is probably a common feature of all the centers that operate in this way (i.e. Tanjung Puting, Semengoh in Sarawak) but the data that would be needed to confirm this is either lacking or has not yet been evaluated.

We should therefore ask why might this be happening? Why should more than 5 out of every 10 infants born in these “public orangutan feeding visitor centers” die before the age of 3 years, when we know this figure amongst wild orangutans is far less than 1 in every 10.

Unfortunately, the behavior and health of ex-captive orangutans released in rehabilitation centers like Bukit Lawang has not been a priority focus in the past for detailed research, and in depth assessments of the health and fitness of these rehabilitant or “feral” populations still need to be carried out. Even when adequate veterinary expertise is available, often the forest rangers do not report deaths until long after the fact, and orangutan mothers frequently continue to carry their dead infants for several days after death. Both these facts make rapid autopsy’s extremely difficult and as such, there has to date never been any conclusive autopsy carried out on one of these infants.

Attempts to determine what the causes of these deaths might be therefore remain speculative. Detailed monitoring of the health of all the “semi-wild” orangutans should be undertaken, whether or not they show signs of illness. Faecal and urine samples should be collected as a matter of routine for parasitology and urinalysis. And autopsies should be conducted as rapidly

as possible after any orangutan deaths that occur in the area, along with rapid transport of samples thus obtained to laboratories capable of evaluating them. This process should not be hindered by unnecessary bureaucratic red tape, as unfortunately it frequently is.

Behavioural studies are also necessary to shed light on this issue. It seems highly likely that the cause of these deaths is actually quite simple, that these infants are simply not exposed to enough opportunities to learn and acquire the necessary skills to find, process and consume solid foods. A wild orangutan mother spends around 50% of the day (circa 6 hours) feeding, during which she is often high in a large tree with abundant ripe fruit. Whilst she is feeding on these fruits, her infant is either still clinging to her body, if still very young, or hanging somewhere independently in the same tree crown. These infants therefore potentially have as much as 6 hours every day in which to explore foods and learn to process them.

However, if in contrast ex-captive mothers tend to hang around a feeding platform , where large trees with large fruit crops are scarce or completely absent for much of the year, we can expect opportunities for learning these skills would be much reduced. Instead of spending hours in the middle of a rich food source each day, these mothers fulfill their own dietary needs in about 15 - 30 minutes in the morning and 15 – 30 minutes in an evening, when they consume as many bananas and as much milk as they are able, as rapidly as they can (to prevent them being stolen by other orangutans). They then often go off to rest most of the remainder of the day or to search for tourists who might offer them additional bananas or other fruits. At most, a young and inexperienced infant (which tend to eat extremely slowly in any case) will be lucky to get as much as a half of one banana per day, and on many days probably does not even get that before his or her morsel is stolen by another.

Under such a scenario, it would be no surprise that these infants are ‘less fit” than their wild counterparts, making them more susceptible to illnesses and disease generally, but especially to malnutrition when they approach weaning. For this reason, it is strongly recommended that monitoring of the behaviour of orangutans at Bukit Lawang and other similar centers is intensified, and focuses on this issue of infant exposure to solid foods and opportunities for learning food acquisition and processing skills.

The problem of visitor proximity

The distance between the normal orangutan feeding platform and the visitor viewing area at Bukit Lawang is around 7 to 10 metres. Through this close proximity the apes are conditioned to associate the presence of groups of visitors with the provision of food. This results in them approaching tourists both at the feedings themselves and further into the forests posing an unacceptably high risk of disease transfer.

In addition to the legitimate feeding, several enterprising local guides have ‘privatised’ the ‘ape show’ during jungle treks with tourists. They have trained some of the apes to search for food at a predetermined spot and then lead tourists there, claiming to have found wild orangutans (Rijksen and Meijaard 1999, Dellatore). They have also in the past established feeding ‘camps’ at many of these sites. Estimates in the 1990’s suggested there were then over 50 such camps, many of which were badly littered and all of which offered visitors a chance to get closer to the animals than they would otherwise have been allowed (Frey 1996; Rijksen 1997).

Not surprisingly given the orangutan’s curiosity and its far superior strength, these situations have led to extremely dangerous encounters in which guides and tourists have been attacked.

There is even a documented report of an orangutan in Borneo raping a woman at a rehabilitation centre (Galdikas 1995). Orangutans are inquisitive by nature. They are also very unpredictable. As they are often solitary in the wild, they have not evolved the complex communication signals that their more social African cousins have (i.e. gorillas and chimpanzees). They therefore give very little warning, if any, of their intentions. These facts make them potentially lethal, and the risk to people should not be underestimated. In the year leading up to his report, Rijksen (1997) noted that at least five tourists and two guides were seriously bitten by the feral orangutans.

Also according to Rijksen and Meijaard (1997), not only have people been bitten in these incidents but at least four orangutans have been killed for their behaviour, sometimes in direct conflict by means of a jungle knife, and in at least two cases by poisoning. For the sake of both visitors and orangutans alike, such close proximity must be stopped. Even today, in 2009, a simple google search for Mena and Bukit Lawang will bring up numerous examples of aggressive and sometimes dangerous encounters between just one of the orangutans and tourists.

Ironically, Mena and some of the others have in fact been systematically trained by people to attack visitors over the years. Animals are normally trained in one of two ways, negative reinforcement (punishment when they do something wrong) or positive reinforcement (rewards when they do something correctly). Today, even the most honest and environmentally and safety conscious guides normally carry food in their backpacks. They do this as many of the orangutans will come down and grab tourists and try to run off with their bags. The guides only way to defend these unlucky tourists is to quickly give food to the orangutans so they will leave them alone and hopefully move away to the trees again. Without these “emergency” food supplies the potential for more frequent serious injuries is very high indeed. Nevertheless, the orangutans know that if they attach people then someone will quickly give them food,….they have in fact been *consistently and systematically rewarded over many years for attacking people* (they have been “trained” to do it) and it will be almost impossible to change this behavior.

For this reason alone, close encounters between people and these orangutan “regulars” should be vehemently discouraged, and visitors must be sufficiently warned that entering the forest where these orangutans live is potentially very dangerous. At present no such warnings are normally offered, and facilities to deal with serious injuries if they do occur are also seriously lacking.

DISCUSSION

Despite the devastating flood of November 2003 there remains some potential for a well managed and valuable orangutan viewing programme at Bukit Lawang that can raise funds and awareness for conservation and also serve as a disincentive for local communities to pursue more environmentally destructive activities.

The orangutan as a resource

Despite the problems outlined already there are two quite obvious facts that are relevant to this discussion.

a) Without an alternative source of income for local communities, the current political and economic climate in Indonesia will continue to encourage the large-scale wholesale destruction of its remaining forests.

b) At Bohorok there exists a population of feral orangutans, which are accustomed to being observed by visiting tourists, that live to ages in excess of 45 years (Leighton *et*. *al*. 1995), and that reproduce under feral conditions (if the high infant mortality can be addressed)

The second of these facts therefore represents a potentially valuable resource, and a unique opportunity to attempt to counter the first.

We know that large numbers of people spend large amounts of money visiting animals of a wide range of species and in a wide range of situations. Therefore, despite the government's decision to cease rehabilitating orangutans into existing wild populations, it is still possible for the existing feral orangutans (and wild ones) at Bohorok, and the forest in general, to benefit from continued, well organised and carefully managed ecotourism at the site

However, direct benefits to the animals or their habitat are only likely to arise if one of the following conditions are met:-

a) If visitors to the site can be persuaded to alter their political or consumer behaviour.

b) If local communities can earn sufficient revenues to guarantee that there is no financial incentive to log the forests in the surrounding area, or otherwise convert them to uses that are inappropriate within a conservation area.

Improving 'environmental awareness' is often cited as a justification for many activities in the sphere of conservation. Wherever public 'environmental' education can be conducted in a way that does not pose an unnecessary threat to conservation then it should of course, be actively pursued. Since its effectiveness is difficult to measure, however, it is our duty to ask whether or not the potential benefits outweigh the potential costs to the environment, or to a particular species. In itself it would not be enough to justify compromising the safety of the wild orangutan population. Nevertheless, if environmental education goes hand in hand with increasing revenues for the local communities, meaning they do not convert the forests, then it should be pursued to its full potential. Since the primary threat to the orangutans is loss of habitat, the local community should be encouraged to obtain revenue from the animals that are already on site, but only in a sustainable and acceptable (meaning safe) way that does no further damage and poses no additional risk to the wild population, or to the forests and other wildlife.

Recommendations for the orangutans

It is recognised that any attempt to develop ecotourism at Bukit Lawang is likely to involve some compromise between what is 'ideal' and what is 'practical'. Nevertheless, every effort to achieve an ideal situation should be made.

Any redevelopment of the facilities or program at Bukit lawang must take into account the existence of at least three 'kinds' of orangutans.

a) Truly wild, and some feral ex-captive orangutans, that live continually in the forest, do not attend feedings and which may be habituated to human presence or not.
b) Some feral, ex-captive orangutans, that live continually in the forest, have direct physical contact with wild apes and other primates, and still have direct contact with people.
c) At least one un-releasable orangutan, that is unable to survive in the forest and a second kept captive for unknown reasons.

In addition to the above there is also another type of orangutan. That is, those born in the wild to feral ex-captive females. It is important to note that when infants are born in the wild to females that regularly attend feedings, the infants often continue to attend the feedings even after they are independent of their mothers. This has happened at Bukit Lawang and also in Tanjung Putting in Borneo. The current ex-captive orangutans, and any of their present and future offspring that survive beyond infancy should thus continue to return as long as 'easily' obtainable food is offered to them, and more importantly, as long as the rainforest in the area remains intact. It is therefore reasonable to utilise this resource as an added incentive for tourists to visit the area, and hence an additional source of revenue to the local community, as long as we strive to follow some important guidelines.

Ideally, all orangutans that potentially have direct contact with wild orangutans should be completely, physically isolated from visitors to minimise the risks of disease transmission to the wild population. A common distance requirement of quarantine procedures is at least 20 metres (IUCN 2000). This distance is therefore suggested as a minimum prerequisite for visitor proximity to feral or wild apes, unless the barrier was a physical one that prevented air-borne disease transmission. Un-releasable animals, that must by default have close contact with at least the staff that care for them, should not have any contact with feral or wild orangutans, or indeed with any other wild primates. The area in which their cages are located should be completely contained so as to preclude all visits by such animals.

Provisioning of the feral apes should be thoroughly re-organised. It could still be facilitated, without the need for direct contact with people, by means of a remotely operated system. Such a system would not necessarily be too difficult or costly to design. It could be achieved relatively simply by the use of long ropes or cables, for example, and a remotely stationed operator hauling food high into the treetops. More complex systems might involve concrete or metal work but with careful thought remote feeding should not present too much of a problem. This kind of distance separation would also reduce the risks to people or their property, and of reprisals on the apes themselves in the event of dangerous encounters.

Another issue that needs to be addressed is the free access of 'volunteers' to the apes. In the past a large number of western visitors have volunteered to help the PHKA staff in their daily duties of feeding and cleaning out these animals. This is despite the fact that in the vast majority of cases, the volunteers have had no experience of working with animals in this kind of setting or of basic quarantine procedures. The designated caretakers should be sufficiently trained and motivated to perform their duties to an acceptable standard, without outside assistance. If this is done there should be no future need for volunteers of this nature.

Aside from not having direct contact with people the orangutans should not have contact with buildings either. This includes the buildings themselves, sewerage systems, outside toilets, overhead electricity cables or any such items. At Bukit Lawang, all facilities should ideally be on the opposite side of the river from the orangutans.

One of the major attractions for foreign tourists at least, is not the orangutans at Bohorok, but the surrounding rainforests. The centre itself and Bukit Lawang village offers one of very few areas from which visitors can enter and explore the Gunung Leuser National Park. As such, it is strongly recommended to begin concentrating tourism on Bukit Lawang's other, non-orangutan assets, such as the forests themselves and other species, and begin to rely less on the ex-captive orangutans. The forest in the area is still of sufficient quality that Bukit Lawang could become a rainforest and conservation education centre of world standard. If this could be achieved, large numbers of tourists would continue to come to the area, with or without the ex-captive orangutans. It could be done at distance from the former rehabilitation station, so as to minimise the chances of inappropriate encounters in the forest. This would also give a greater opportunity to other members of the community to benefit from visitors to the area, instead of all the revenues always going to those with facilities nearest to the orangutan station.

Suggested minimum requirements for acceptable orangutan viewing and jungle trekking

Orangutan feeding:-
Any orangutan feeding platform should only be accessible from one route (and NOT accessible to trekkers). This requires a minimum 2 km radius "trekking exclusion zone" (see below) surrounding the feeding site, in which no trekking is allowed.

Any public feeding of the orangutans must be managed extremely professionally. The system, procedures and facilities should be designed by experts to ensure meeting acceptable standards (minimize risk of disease transmission, contact between people and apes). Contact between people and apes should not be possible at all, at least to a minimum distance of 20 metres. People should not be allowed to bring bags or food in pockets. People entering the orangutan viewing area must ALL leave by the same route they entered from, and not return, and access into the trekking exclusion zone should only be allowed at the designated times.

All staff working in the zone and with the orangutans should be regularly screened and vaccinated against key diseases. They should also be trained in avoiding and deterring aggressive encounters with the orangutans.

Trekking exclusion zone
Tourists and guides should be excluded from a large zone, with a radius of at least 2km from the feeding site(s) in all directions, except where the river is a natural barrier to orangutans. The 'Trekking Exclusion Zone' would need to be strictly policed and patrolled regularly and anyone infiltrating the exclusion zone must be adequately punished.

2 km is an essential requirement to minimize the risks of tourists encountering "aggressive" and "unafraid" orangutans in the forest during jungle treks. Wild orangutans travel on average around 1km in a single day and around 0.5 km nest to nest (straight line distance). A radius of 2 km surrounding any feeding site in all directions in which no trekkers were allowed should result in fewer encounters with 'tame' or aggressive orangutans that recently visited the feeding site. Encounters with such animals will still occur from time to time, as individual's home ranges are normally larger than 4 km diameter but it would be virtually impossible to completely remove this risk. At best it can be kept to a minimum, and assuming that it is unlikely that anyone would meet an orangutan that regularly attends the feeding platform, within 2 -3 days of its last visit there, would go a long way towards achieving that goal. It is also known that a number of orangutans frequently head directly to the Bukit Lawang Eco-Lodge, even arriving before dark

after leaving the 3 pm feeding at the station. This is a straight line distance of ca 700 m, so once again, any exclusion zone would indeed have to be large to be effective.

This trekking exclusion zone would need to be regularly patrolled. The exclusion zone would have some trails within it and also a regularly patrolled trail around its perimeter. This should be patrolled a minimum of twice every day by several rangers. Anyone caught within the exclusion zone would immediately have their license rescinded (guides) or national park permits cancelled (tourists) and not renewed. They would have no complaints about this action since there will be plenty for warning signs and documents in the area, as well as notice written into the licenses and permits themselves.

In order to make patrols more interesting and exciting to staff they could be carried out using elephants. Use of elephants could fulfill several goals.

1) Offenders are intimidated by them.
2) They need regular exercise (work) and therefore must be taken out each day, regardless of the feelings or "mood" of the rangers.
3) They could be accommodated at special facilities across the river, and bathed in the river each evening, thereby creating an additional sustainable and environmentally acceptable attraction for visitors.

New 'gateway' for trekking
All trekking should be removed to areas that are remote and isolated from all other activities, ESPECIALLY FEEDING OF ORANGUTANS. Trekking does not require, and must not permit, visitors being able to meet and hand feed tame orangutans in the forest.Trekking should only be permitted outside the 2km radius trekking exclusion zone.

Trekkers should be steered towards an area of sufficient aesthetic value and wildlife interest, where topography is able to provide easy, intermediate and difficult treks.The area around Sungai Landak, several km from the feeding station is one possible location for trekkers to enter the forest. From here a new trail system can be established in the forest and designated camping (pondok) areas set up at appropriate sites.

There might be complaints from some visitors that only being able to camp in 'formal' areas in the forest does not provide the adventure they are seeking. If that is the case they should be advised that opportunities to trek longer distances into the park and establish more basic pondoks in more remote areas still exists. There are already established treks to Berastagi, Kutacane, Tangkahan etc. that could fulfill their ideals. Opportunities might also be explored for establishing forest treks starting from Sungai Musam, another picturesque location several km to the north of Bukit Lawang.

The old rehabilitation station itself
This was always poorly designed and badly located. In order to minimize the risks of contact (and hence disease transmission) between humans and apes, all staff facilities should be located at the opposite side of the river from the feeding platform. This includes offices, medical facilities, food storage and ticketing facilities. Thus visitors would gather at the new location, show their permits or pay for tickets, deposit bags and any food items they might be carrying in a special facility until they return, and then be escorted by qualified staff across the river to the feeding site. After the short feeding period, they should then be escorted directly back again. At no time should they be left unsupervised at any location on the orangutan's side of the river and

they should go in as an orderly group, with only those belongings that they need at the viewing platform, and return as an orderly group.

Financing

The Indonesian authorities continue to under-achieve in the field of tourism and recreation due to a perceived lack of funding. Many within the PHKA are aware, however, of the scale of potential revenues that might be obtained from high-quality, high-cost tourism, if managed effectively. The usual example is the viewing of gorillas and chimpanzees in countries such as Rwanda, Uganda, Zaire, where an average 1 day gorilla watching permit can cost more than 400 USD and require waiting on a waiting list for several weeks. Nobody would be willing to pay this kind of sum to watch orangutans being fed bananas and milk on a platform just 5 metres away, but with good design, careful planning and experienced management, the revenues that could be obtained from a better managed tourism infrastructure in and around national assets like the Gunung Leuser National Park should be capable of being increased dramatically. For comparison, a daily park permit currently costs just 2 USD.

Removing people and buildings from across the river

Maintaining a large staff presence and infrastructure across the river will only encourage orangutans and other primates to scavenge there. Staff presence at that side should be restricted to a very small number of essential staff (enough to monitor orangutans, carry out patrols [see below] and assist in emergency situations) and ideally they would also return home across the river in the evening.

In an ideal world, all hotels, guesthouses, restaurants and remaining villagers houses would also be removed from that side of the river. This would have its problems, and no doubt be extremely expensive if an attempt is made to compensate for loss of property and income, but nevertheless, if Bukit Lawang is to develop into a first class tourism facility this option should certainly be considered. It would involve voluntary sale of property (infrastructure, agricultural land etc) and compensation for loss of incomes, but whilst expensive, should not be ruled out. Similar relocation activities have been successful in other parts of northern Sumatra and throughout the world, and therefore warrant serious consideration here.

The alternative to this is to recognize and accept that Bukit Lawang will never evolve in to a first class facility. The incredible amount of unsightly concrete used in the redevelopment of the river banks and the design and location of new housing in the village seriously impede the potential for future "high quality" tourism development in this area.

Rangers and Guides

The concept of a guide training school has been proposed many times in the past by various institutions. It would train guides to high standards and credit licenses to those who qualify. These licenses could then be revoked if the guide then fails to uphold regulations and guidelines. However, unless a body exists that is capable and committed to enforcing these regulations and guidelines, there is no reason to assume that training guides would actually result in any change from current practices in the field. Serious discussions should focus on what the precise role of TNGL staff in the area should be, especially in relation to local community guides. In many countries (e.g. African nations) the tourist guides and rangers working within protected areas are ALL staff of the government conservation department. They are adequately trained and adequately policed. In some cases tourist concessions are managed

by private companies, who apply and are granted a tender to manage a particular site under clear rules. If these rules are then broken, the concession can then be revoked and offered to a competing company. The principles involved are not difficult to understand. But, they can only work if rules and regulations are ENFORCED.

Unlike in Indonesia, similar wildlife viewing programmes in Africa and elsewhere tend to use ONLY park rangers as guides to view animals in protected areas. In theory this should lead to better control of all activities in the forest and around orangutans. To achieve this, existing staff would have to be trained to a much higher standard than they are now. The possibility of hiring experienced and reliable non-TNGL guides as TNGL rangers should be explored if this will avoid tension in the community. TNGL should strive to make considerably more revenue for tourism in the park than it has in the past……but this can only be achieved with a radically improved staff capacity and much better organization. Lessons can and should be learned from Africa (e.g. Chimpanzee and Gorilla tourism in Uganda).

Enhanced Interpretation Centre
The old visitor interpretation centre next to the National Park office and established by WWF in 1993 has recently been renovated. It is highly desirable to continue to expand on this though. More information available in a variety of different locations and presented in a variety of different ways will undoubtedly foster greater understanding of the issues and support for conservation, and speed up the process of reform.

CONCLUDING REMARKS

Despite the devastation it reaped and the tragic loss of lives it caused, the 2003 flood presented an opportunity to rebuild Bukit Lawang from a clean slate, into something far more up to date, organized, acceptable and sustainable. Unfortunately, however, as a result of a lack of political will and commitment from most stakeholders, this has not happened, and the town is undergoing a gradual rebuilding (with copious amounts of unsightly concrete) and a return to business as usual, prior to the flood.

As a result of the above (and attached) we have noted the following fundamental guidelines that should be adhered to in any plan to manage orangutan tourism at Bukit Lawang. *Above all, to meet acceptable standards (and therefore to minimise risks to humans and orangutans alike), tourists and 'tame' or "unafraid" orangutans must be kept separated from each other at all times, except for the possible exception of a controlled and suitably designed feeding site, that is managed and operated by well trained personnel.*

Fundamentals

a) No more orangutans should be released at Bukit Lawang. This contravenes Keputusan Menteri Kehutanan 280/kpts-II/1995 which states clearly that "*every effort should be made to find suitable areas with no existing wild populations for all rehabilitation projects*" and international guidelines from the World Conservation Union (IUCN) which state that "*If there is no conservation value in releasing primates to the wild, or no management programme exists in which such a release can be undertaken according to conservation guidelines, the possibility - however unlikely - of inadvertently introducing a disease or behavioural or genetic aberration not already present in the environment should rule out returning primates to the wild*".

b) Tourism that allows proximity to “wild living” apes cannot be justified unless the health of both visitors and apes can be assured and it makes a significant contribution to conservation. This can be in the form of removing the threat of illegal logging in the area (direct conservation potential) and/or dramatically improving awareness and understanding of conservation issues among visitors (indirect conservation potential).

c) Any proximity of visitors to apes can only be justified under heavily controlled conditions with strict supervision and should therefore only be permitted at recognized sites (e.g. a feeding platform) and at recognized times when full supervision can be guaranteed. It should also be restricted to manageable numbers of people, again so that effective supervision and control of the situation is guaranteed.

d) A health monitoring programme must be established to watch for any indications of any potential disease threat to the wild orangutan population in these forests. If such a threat is found, and cannot be avoided in any other way, all proximity between people and the apes should be discontinued immediately. Health monitoring must extend to staff who have contact with the apes and possibly also to visitors as well (though it is undoubtedly far easier to simply keep them at a safe distance away from the animals).

e) It should be impossible for unsupervised guides or tourists or anyone else to gain close proximity to any of the orangutans. This requires a “visitor exclusion zone” around any location where there are orangutans that are not afraid to approach people, to ensure that even ape initiated contacts cannot occur. Such a zone is a pre-requisite for any orangutan tourism programme in the area as without it the above fundamentals cannot be adequately met.

New guidelines for Ape tourism

The IUCN/SSC Primate Specialist Group; Section on Great Apes is currently compiling Guidelines of Best Practices for Great Ape Tourism although a finished product is not yet available. This is in response to the recognition that the risk of transmission of zoonoses between tourists and great apes (most populations of which are already seriously endangered) is considerable.

Sustainability

Sustainability is the key to any future developments. To even attempt to achieve it, any developments must be:-

i) Entirely legal and compliant with existing laws
ii) Following recognized guidelines for ecotourism and conservation practices (e.g. Guidelines of Best Practices for Great Ape Tourism; IUCN, in prep.)
iii) Designed in a way to have maximum benefit to the environment and communities and minimum negative effects
iv) Professionally implemented and managed with full backing and support of the Ministry of Forestry and local government.
v) Sustainable in the long term

If just one of the above points is not met, it will fail.

The key to sustainability in this area would seem to depend on:-

1) A stable, healthy and reproducing orangutan population within which infants born do not die at an early age, but mature to become breeding adults themselves.
2) Fewer tourists paying higher prices.
3) Much improved capacity among TNGL staff and a commitment from PHKA to enforce guidelines and regulations pertaining to tourism and Park management at Bukit Lawang.
4) Transparency in all aspects of the project's management and implementation.
5) Full backing from the local government with a commitment not to allow any unplanned activities in the area that are not agreed by an implementing committee (below) .
6) Complete support of the local community and establishment of new local regulations (perda) to be designed by the implementing committee.

Monitoring of success

A committee of acknowledged experts should oversee the planning, design, implementation and monitoring of the entire project. This committee would include selected members of PHKA/TNGL, local government, relevant NGO's, approved community representatives and expert consultants brought in who have experience of similar ventures in other areas (e.g. Africa, Latin America).

A key aspect of monitoring will focus on the condition of the orangutans and other wildlife populations there (behaviour, numbers, and especially health) and the condition of the forest (i.e. assessing the success of tourism in preventing illegal logging and other damaging activities). Water quality in the river and general environmental health (pollution [including noise pollution], littering) should also be monitored continuously.

Finally

The aim of this paper has been to give the reader an overview of the needs of the orangutans, not only at Bukit Lawang itself, but also in the surrounding forests. It is often difficult to reconcile the needs of orangutans with the needs of tourists, but both require large expanses of natural habitat and neither needs polluted rivers and illegal loggers. If we could supplant the latter with high paying, environmentally friendly tourists, who do not get close enough to the animals themselves to pose a disease risk, we would be halfway to securing an immediate future for the orangutans in the area.

It must be remembered at all times, however, that the existing wild population of orangutans must be given absolute priority over any captive or feral individuals. The current rate of destruction of the remaining orangutan habitat puts them in an extremely vulnerable position and we simply cannot afford to take any unnecessary risks concerning their future.

REFERENCES

Adams, H.R., Sleeman, J. and New, J.C. 1999. A medical survey of tourists visiting Kibale National Park, Uganda, to determine the potential risk for disease transmission to Chimpanzees (*Pan troglodytes*) from ecotourism. *1999 Proceedings American Association of Zoo Veterinarians*.

Aveling, R. and Mitchell, A. 1982. Is rehabilitating orang utans worth while? *Oryx* 16(3): 263-271.

Beck, B., Walkup, K., Rodrigues, M., Unwin, S., Travis, D., and Stoinski, T. 2007. Best Practice Guidelines for the Re-introduction of Great Apes. Gland, Switzerland: SSC Primate Specialist Group of the World Conservation Union. 48pp. Occasional Paper of the IUCN/SSC No 35.

Boesch, C., 2008. Why Do Chimpanzees Die in the Forest? The Challenges of Understanding and Controlling for Wild Ape Health. *American Journal of Primatology* 70:722–726

Dellatore, D.F., Waitt, C.D., and Foitova, I. (2009). Two cases of mother-infant cannibalism in orangutans. *Primates*. Published online 26 March 2009 (DOI 10.1007/s10329-009-0142-5).

Dellatore D.F. 2009a. Behavioural health of reintroduced orangutans at Bukit Lawang, Sumatra, Indonesia. In: Russell C, Russon A, Wallis J (eds) *Primate focused tourism*. Am Soc Primatol (in press)

Dellatore, D.F., Waitt, C.D., and Foitova, I., 2009b. Two cases of mother–infant cannibalism in orangutans. *Primates*

Frey, A.R. 1996. *Report on Present Situation and Proposal for Establishment of Sustainable Management of Bohorok Orangutan Centre*. Unpublished report.

Galdikas-Brindamour, B.M.F. 1975. Orangutans, Indonesia's "people of the forest". *National Geographic* 148(4): 444-472.

Galdikas, B.M.F. 1995. *Reflections of Eden: My life with the orangutans of Borneo*. Victor Gollancz, London.

Harrisson, B. 1962. The immediate problem of the Orang-utan. *Malayan Nature Journal* 16: 4-5.

Hastings, B.E., Kenny, D., Lowenstine, L.J. and Foster, J.W., 1991. Mountain gorillas and measles: ontogeny of a wildlife vaccination program. *1991 Proceedings American Association of Zoo Veterinarians*.

Hime, J.M., Keymer, I.F. and Baxter, C.J., 1975. Measles in recently imported colobus monkeys (*Colobus guereza*). *Short communication: The veterinary Record, November 15, 1975*.

IUCN/SSC 2000. *IUCN Red List of Threatened Species*. Compiled by Hilton-Taylor, C. IUCN/SSC, Gland Switzerland.

IUCN. 2000. *Guidelines for Nonhuman Primate Re-introductions*. Prepared by the IUCN/SSC Re-introductions Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Knott, C.D., 1998. Orangutans in the wild. *National Geographic* 194(2):30-57.

Kuze, N., Sipangkui, S., Malim, T.P., Bernard, H., Ambu, L.N., and Kohshima, S., 2008. Reproductive parameters over a 37-year period of free-ranging female Borneo orangutans at Sepilok Orangutan Rehabilitation Centre. *Primates* 49:126–134

Lardeux-Gilloux, I. 1995. Rehabilitation centers: Their struggle, their future. Pp 61-68 in *The Neglected Ape*. Nadler, R.D., Galdikas, B.F.M., Sheeran, L.K. and Rosen, N. (eds). Plenum Press, New York.

Leighton, M., Seal, U.S., Soemarno, K., Adjisasmito, Wijaya, M., Mitra Setia, T., Shapiro, G., Perkins, L., Traylor-Holzer, K., and Tilson, R. 1995. Orangutan life history and Vortex analysis. Pp 97-107 in *The Neglected Ape*. Nadler, R.D., Galdikas, B.F.M., Sheeran, L.K. and Rosen, N. (eds). Plenum Press, New York.

Mudakikwa, A.B., Sleeman, J., Foster, J.W., Meader, L.L., and Patton, S., 1998. An Indicator of Human Impact: gastrointestinal parasites of mountain gorillas (*Gorilla gorilla beringei*) from the Virunga Volcanoes region, central Africa. *1998 Proceedings AAZV and AAWV Joint Conference*.

Ott-Joslin, J.E., 1986. Viral Diseases in Nonhuman Primates. Pp674-697 in *Zoo and Wild Animal Medicine*. Fowler, M.E. and Saunders, W.B. (eds.). Philadelphia.

Ott-Joslin, J.E., 1993. Zoonotic Diseases of Nonhuman Primates. In *Zoo and Wild Animal Medicine*. Fowler, M.E. and Saunders, W.B. (eds.). Philadelphia

Pamungkas, J., Bielitzki, J.T., Watanabe, R.A., Thouless, M., Kuller, L., Schmidt, A.M., Tsai, C-C., Sajuthi, D. And Morton, W.R., 1992. Prevalence of certain diseases in feral *Macaca fascicularis* from Indonesia*. 1992 Proceedings Joint Meeting AAZV / AAWV*.

Pernikoff, D.S., and Orkin, J., 1991. Bacterial Meningitis Syndrome: an overall review of the disease complex and considerations of cross infectivity between great apes and man. *1991 Proceedings American Association of Zoo Veterinarians*.

Rijksen, H.D. 1997. *Orang utan viewing centre in Sumatra: recommendations for improving of the Bohorok facility*. Unpublished report commisioned by the Director General, PHPA.

Rijksen, H.D. and Meijaard, E. 1999. *Our vanishing relative: The status of wild orang-utans at the close of the twentieth century*. TROPENBOS, Netherlands & Kluwer Academic Publishers.

Russel, C.L. 1995. The social construction of orangutans: an ecotourist experience. *Society and Animals* 3(2):151-169.

Schaik, C.P. van, 1996. Orangutan Rehabilitation. Pp 264-268 in Schaik, C.P. van and Supriatna, J. (eds). *Leuser*: *A Sumatran Sanctuary*. Yayasan Bina Sains Hayati Indonesia, Depok, Indonesia.

Schaik, C.P. van, Monk, K.A. and Robertson, J.M.Y., 2001. Dramatic decline in orang-utan numbers in the Leuser Ecosystem, Northern Sumatra. *Oryx* 35(1):14-25.

Singleton, I., 2000. *Ranging behaviour and seasonal migration of Sumatran orangutans (Pongo pygmaeus abelii) in swamp forests*. Ph.D. Thesis, DICE, University of Kent, UK.

Singleton, I. and van Schaik, C.P*.,* 2001*.* Orangutan home range size and its determinants in a Sumatran swamp forest. *International Journal of Primatology*.

Singleton, I. and Aprianto, S. 2001.The semi-wild orangutan population at Bukit Lawang; a valuable 'ekowisata' resource and their requirements. Unpublished paper presented at a "workshop on eco-tourism development at Bukit Lawang" held in Medan, April 2001.

Singleton, I., Wich, S., Husson, S., Stephens, S., Utami Atmoko, S., Leighton, M., Rosen, N., Traylor-Holzer, K., Lacy, R. and Byers, O. 2004. *Orangutan Population and Habitat Viability Assessment: Final Report.* Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group.

Singleton, I., Knott, C.D., Morrogh-Bernard, H.C., Wich, S.A., and van Schaik, C.P. 2009. Ranging behavior of orangutan females and social organization. Pp 205-213 in *Orangutans; geographic variation in behavioural ecology and conservation*. Wich, S.A., Utami Atmoko, S.S., Mitra Setia, T., and van Schaik, C.P (eds). Oxford University Press.

Sleeman, J.M., and Rooney, M.B., 2000. Determining the human diseases transmissible to the great apes of western Uganda. *2000 Proceedings AAZV and IAAAM Joint Conference.*

Smits, W.T.M., Heriyanto and Ramono, W.S. 1995. A new method for rehabilitation of orangutans in Indonesia: A first overview. Pp 69-77 in *The Neglected Ape*. Nadler, R.D., Galdikas, B.F.M., Sheeran, L.K. and Rosen, N. (eds). Plenum Press, New York.

Soehartono, T., Djoko Susilo, H., Andayani, N., Utami Atmoko, S. S., Sihite. J., Saleh, C., and Sutrisno. A., 2007. *Strategi dan rencana aksi konservasi orangutan Indonesia 2007-2017*, published by Dirjen PHKA, Ministry of Forestry RI

Wallis, J. and Lee, D.R. 1999. Primate conservation: the prevention of disease transmission. *International Journal of Primatology* 20(6): 803-826.

Wich, S. A., Utami, S.S. and Singleton, I. 2000. *A Survey for Orangutans in Sumatra Utara, Riau and Sumatra Barat*. Unpublished report.

Wich, S.A., Utami-Atmoko, S.S., Mitra Setia, T., Rijksen, H.D., Schürmann, C., van Hooff, J.A.R.A.M., and van Schaik, C.P. 2004. Life history of wild Sumatran orangutans (Pongo abelii). *Journal of Human Evolution* 47: 385-398

Willy, M.E., Woodward, R.A., Thornton, V.B., Wolff, A.V., Flynn, B.M., Heath, J.L., Villamarzo, Y.S., Smith, S., Bellini, W.J. and Rota, P.A., 1999. Management of a Measles Outbreak

Among Old World Nonhuman Primates. *Laboratory Animal Science*. The American Association for Laboratory Animal Science 49 (1): 42-48.

Yeager, C.P. 1997. Orangutan rehabilitation in Tanjung Puting National Park, Indonesia. *Conservation Biology* 11(3): 802-805.

Yeager, C.P. (ed.), 1999. *Orangutan Action Plan*. Unpublished report; PKA,WWF,CERC.

Zdziarski, J.M., 1997, Zoonotic Diseases. Pp 108-112 in *Orangutan Species Survival Plan Husbandry Manual*. Sodaro, C. (ed.), Chicago Zoological Park.