Indonesian Proboscis Monkey PHVA

Cisarua - Bogor, West Java, Indonesia

4-6 December 2004

FINAL REPORT

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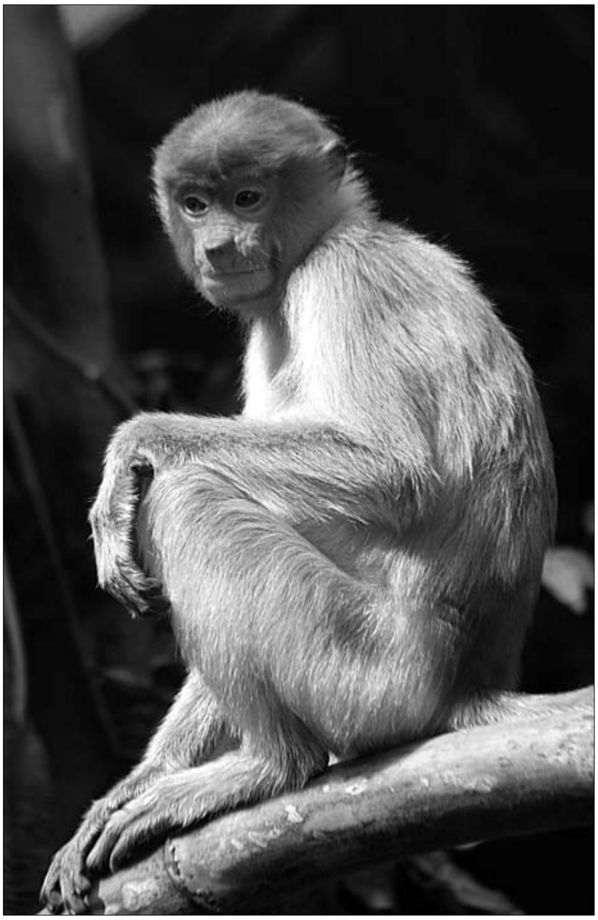

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A contribution of the IUCN/SSC Conservation Breeding Specialist Group.

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Additional copies of *Indonesian Proboscis Monkey Population and Habitat Viability Assessment* can be ordered within Indonesia through CBSG Indonesia, c/o Taman Safari Indonesia, Jalan Raya Puncak 601, Cisarua, Bogor, West Java 16750, or outside of Indonesia through the IUCN/SSC Conservation Breeding Specialist Group, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124, USA (www.cbsg.org).

Indonesian Proboscis Monkey
Population and Habitat Viability Assessment

Cisarua - Bogor, West Java, Indonesia
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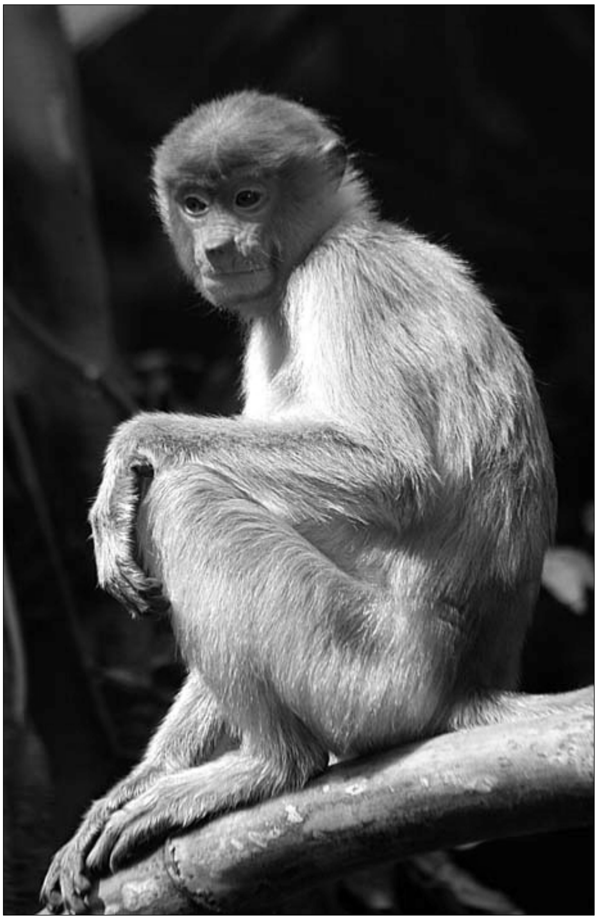

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SECTION 1

Executive Summary

Executive Summary

Endemic to Borneo, the proboscis monkey (*Nasalis larvatus*), also known as *monyet belanda* or *bekantan*, is an endangered primate that inhabits coastal mangrove, riverine and lowland forests. This species is easily identified by its prominent nose, which is particularly pendulous in adult males. Proboscis monkeys live in troops and are primarily diurnal and arboreal. Their specialized digestive system allows them to feed primarily on leaves and other plant material, and give them a pot-bellied appearance. They are also known to be good swimmers and may dive into water to escape danger. Wild proboscis monkey populations are threatened by habitat loss and conversion, hunting, and other human activities. A small captive population of this species is maintained by zoos in Indonesia and Singapore.

The Southeast Asia Zoo Association (SEAZA) and the Indonesian Zoological Parks Association (Perhimpunan Kebun Binatang Seluruh Indonesia, or PKBSI) have identified the proboscis monkey as a high priority species for *ex situ* and *in situ* conservation. As part of their conservation initiative, it was recommended to conduct a Population and Habitat Viability Assessment (PHVA) workshop for the proboscis monkey in Indonesia to assist in the development of conservation strategies for the species.

Two international conservation workshops were held in early December in Cisarua-Bogor, West Java, Indonesia under the coordination of CBSG Indonesia and its parent office of CBSG (Conservation Breeding Specialist Group of the IUCN-The World Conservation Union). A two-day training workshop in CBSG skills and processes was held at Safari Garden Hotel on 2-3 December, followed by an Indonesian Proboscis Monkey Population and Habitat Viability Assessment (PHVA) workshop on 4-6 December. Both workshops were attended by participants from several Asian countries and demonstrated strong international cooperation among a variety of organizations, both *in situ* and *ex situ*. These workshops were made possible through the concerted efforts of several CBSG offices: workshop organization was handled by CBSG Indonesia (Jansen Manansang, Convener), financial support was provided by CBSG Japan (Hiroshi Hori, Convener), and CBSG Europe and the CBSG main office provided trainers and workshop facilitators. Support and cooperation also were provided by the Southeast Asian Zoo Association (SEAZA), the Indonesian Zoological Parks Association (PKBSI), the Indonesian Forestry Department (PHKA), the Research Center for Biology (LIPI), and Taman Safari Indonesia (TSI). Participants ranged from nine countries and included representatives from Asian zoos, forestry, universities and conservation NGOs.

Officiating at the opening ceremony were Bpk. Widodo Ramono (Assistant Director, PHKA) and Bpk. Dwiatmo Siswomartono (Chairman, PKBSI), signifying the importance of these meetings to both *in situ* and *ex situ* conservation in Indonesia. A moment of silence was observed in remembrance of Bpk. Lukito Daryadi (former PKBSI Chairman) and Dr. Ulysses Seal (former CBSG Chairman), two conservation leaders whose work and dedication made these activities possible. Training then began for about 25 participants designed to increase their knowledge and skills in processes used by CBSG in its conservation workshops worldwide.

One of the main topics during training was population modeling using the *Vortex* software program. *Vortex* is a complex computer simulation program that has been used to investigate the viability of hundreds of wild populations of animals across the globe. *Vortex* can also be used to evaluate possible conservation management strategies for endangered or threatened species. Workshop trainees first learned about the *Vortex* program and then practiced working with population models themselves. This led to a greater understanding of risk assessment of small populations and assessment of potential management options. In addition to population modeling, trainees were introduced to the various types of CBSG workshops for wild populations, zoo populations and protected areas. The key components of CBSG philosophy were emphasized, which are designed to promote stakeholder inclusion, full and equal participation from workshop attendees, and the development of effective recommendations for conservation action. Among the materials presented were facilitation skills and tools that can be used to aid groups in decision-making processes. Although training was limited to two days, the trainees gained an understanding of and appreciation for several skills valuable to conservation efforts at their own institutions and in the region.

Additional participants joined the trainees on 4 December to begin the Proboscis Monkey PHVA workshop. The PHVA workshop process is one of several science-based tools developed by CBSG to assist species management decision-making. Information sharing is at the heart of the PHVA workshop process, which takes an in-depth look at the species' life history, history, status, and dynamics, and assesses the threats that may put the species at risk. These data then are incorporated into the *Vortex* simulation model to determine: 1) risk of population extinction under current conditions; 2) those factors that make persistence of the species problematic; and 3) which factors, if changed or manipulated, may have the greatest effect on improving the prospects for survival. In essence, these computer-modeling activities provide a neutral way to examine the current situation and what needs to be changed to meet defined goals.

Complementary to the modeling process is a communication process, or deliberation, that takes place during a PHVA. Participants work in small groups to discuss key issues. Each working group produces a report, which is included in the PHVA final report. A successful PHVA workshop depends on determining an outcome where all participants, coming to the workshop with different interests and needs, "win" in developing a model and management strategy that best represents the reality for the species and is reached by consensus. The workshop report is developed by the participants and is considered advisory to the relevant management authorities for this species.

The Indonesian Proboscis Monkey PHVA workshop began with a series of presentations regarding the current state of knowledge on wild and captive proboscis monkey populations. This was followed by an introduction to the CBSG workshop process and to the computer modeling tools to be used during the workshop. The participants then generated a list of issues relevant to proboscis monkey conservation. These issues were themed into topic areas that became the basis of four working groups centered around population biology and modeling, habitat loss, local community issues, and *ex situ* management.

Each working group discussed and analyzed the problems for this species, formulated goals to address those problems, and recommended specific actions to accomplish those goals, resulting in the framework of a conservation action plan for proboscis monkeys. At each stage of the process each working group presented their conclusions to all workshop participants during plenary sessions to provide everyone with the opportunity to contribute to the work of the other groups and to assure that issues were carefully reviewed and consensus achieved. Sections 2 through 5 of this report contain detailed results from each of the working groups. Summaries of the results of each working group report are presented below.

The *Population Biology and Modeling Working Group* began by accumulating information on the life history, available habitat and population sizes, and anthropogenic threats of the proboscis monkey. General life history information was scarce and specific demographic data almost nonexistent. Thus, the working group relied heavily on expert opinion and information from comparable species to parameterize the model. More reliable information regarding current population sizes and trends in carrying capacity (habitat loss) were available through scientific literature, expert opinion, and the use of GIS expertise within the working group. A baseline model was developed that was felt to most accurately reflect the current state of wild proboscis monkeys and which may represent a fairly optimistic view of the proboscis monkey's potential growth rate.

Although the total number of proboscis monkeys in the wild probably numbers >10,000 individuals, the species still has an unacceptable risk of extinction. This risk exists because of unsustainable (and largely illegal) rates of deforestation that devastate proboscis monkey habitat, because existing populations are almost entirely too small to be viable in the long-term and are highly isolated from each other, and because forest fires are becoming more frequent and severe – due mostly to anthropogenic factors.

The working group identified the following high priorities for research: 1) monitoring population sizes through time; 2) investigation of demographic rates across several populations; and 3) identify proboscis monkey habitat and measure its rate of loss. These data are essential for future models of proboscis monkey population viability. High priorities for management are to: 1) obtain greater management authority and enforcement capacity for the Forest Department by lobbying the Indonesian government for greater authority and law enforcement capabilities; and 2) develop methods and seek funding for habitat rehabilitation (e.g. reforestation of abandoned rice farms).

Overall the model results suggest that halting illegal logging should be the highest priority in conservation of the proboscis monkey, as slowing the current rate of habitat destruction by as little as 20% can drastically improve the future prospects of the proboscis monkey. The goal should be to eliminate illegal logging within the next 20 years and institute sustainable levels of legal logging as soon as possible after that. Efforts to reduce the risks associated with forest fires, through education, management and prevention should also be undertaken.

The *Habitat Loss Working Group* identified three key categories as the underlying causes of habitat loss in Kalimantan. Enabling conditions, such as policy and law enforcement, allow proboscis monkey conservation to occur. Sufficient conditions (e.g.., governance) allow institutions to deal with proboscis monkey conservation. Substantial problems are the key problems facing proboscis monkeys or their habitat directly and are more related to the biophysical and social conditions. These include habitat fragmentation and land use patterns such as habitat conversion, logging and mining, and were the key issues addressed by the group.

The four main problems resulting in habitat loss were identified as forest conversion, logging, weak governance, and the gap between policy and implementation. The group identified goals to address each of these problems, giving the highest priority to lowering the intensity of conversion of proboscis monkey habitat. Other goals included improving the decision-making process for forest planning, promoting sustainable forest management, reducing the intensity of illegal logging activities, and reducing inconsistency between policy and implementation relative to proboscis monkey protection, Specific short- and long-term actions were recommended to work toward achieving these goals, with responsible parties and resources suggested for each.

The *Local Community Issues Working Group* explored the impact of the local community on proboscis monkey habitats in Kalimantan. Many issues were identified as possibly leading to a decline in monkey populations. The priority issues that were identified by the group, in order of priority, are resource space conflict with humans, hunting, infrastructure development, toxin accumulation in the environment, lack of regulation and lack of standard operation procedures for tourism activities, and lack of research on human-proboscis monkey interactions.

The group next examined the goals needed to overcome the prioritized issues, and came up with relevant action plans as well as the timeline, parties involved in implementing the action plan and also resources required. Goals for the top priority issue (space conflict) are the creation of a land use system harmonious with proboscis monkeys, establishment of community-based reserves around water sources, and the creation of zonation areas within protected areas through community participation. Other identified goals include increasing community awareness, reinforcing traditional laws protecting monkeys, reconnecting isolated habitat through community reforestation initiatives, improving law enforcement, reducing road kills, and establishing ecotourism regulations to reduce impacts on proboscis monkeys.

The *Ex Situ Management Working Group* outlined three main goals for the captive population of proboscis monkeys: 1) to develop a long-term conservation program for the proboscis monkey, which can be used as a model for the captive management of other species; 2) to display proboscis monkeys in sufficient zoos to demonstrate that the species can be bred and displayed for public education programs; and 3) to breed sufficient proboscis monkeys to ensure that monkeys are not unnecessarily taken from the wild, to promote *ex-situ* and *in-situ* links, and to provide zoo attractions.

The major problems related to *ex situ* management, in order of priority, are lack of knowledge, insufficient communication between *in situ* and *ex situ* organizations, insufficient zoo standards, lack of genetic management, lack of funds, and lack of education programs on proboscis monkey conservation. Goals and actions recommended to address these problems include the formation of a Proboscis Monkey Conservation Group to act as a conduit to compile and increase knowledge in captive management and promote communication and cooperation among captive facilities. A studbook keeper was identified, and specified actions were recommended to compile a husbandry manual and improve record-keeping necessary for population analysis and genetic management. Generation of funds and development of public awareness and education programs were also addressed.

The Indonesian Proboscis Monkey PHVA is one of many CBSG PHVA workshops held in Indonesia over the past 15 years – others include PHVAs for the orangutan, tiger, elephant, rhino, Komodo monitor, Javan hawk-eagle, and other threatened species. This most recent PHVA not only promotes the conservation of another component of Indonesia's biodiversity – the proboscis monkey – but also provided real world experience for those participants who completed the CBSG training workshop. The successful completion of these two workshops has provided guidelines for future *in situ* and *ex situ* management of the proboscis monkey while also increasing the capacity of Indonesia and Southeast Asia to better understand and contribute to future conservation workshop activities.

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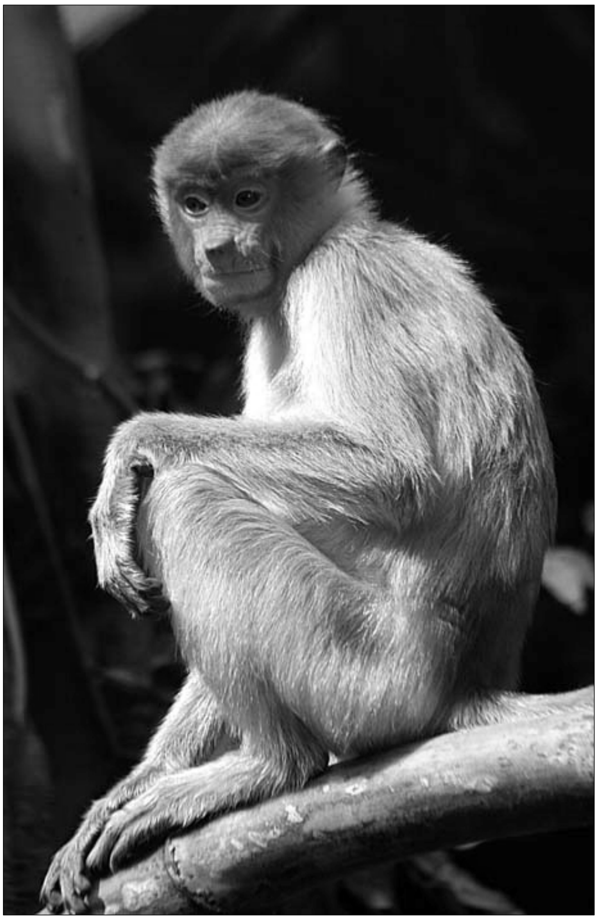

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SECTION 2
Population Biology and Modeling Working Group Report

Population Biology and Modeling Working Group Report

Members: Entang Iskandar, M. Syamsul Arifin Zein, Wibisono, Antong Hartadi, Hang Lee, David Reed (facilitator).

This working group began by reviewing the literature concerning the proboscis monkey (*Nasalis larvatus*). We were particularly interested in three areas: 1) demography, life history, and behavior of the proboscis monkey; 2) distribution of this species within Indonesia, habitat requirements, and typical densities of individuals in different habitat types; and 3) major anthropogenic threats that populations of this species face. From the literature and from the opinion of experts within and outside of the working group, we developed the following baseline model for the proboscis monkey.

Input Parameters for Baseline Model in VORTEX

Parameter values used for the baseline model are given below.

Model Conditions: The simulation scenarios were run 2,000 times for 150 time steps (years). The choice of 150 years was thought to provide a good trade-off between the greater uncertainty with longer projections and the time scale over which the threatening processes were operating.

Extinction: Only one sex remaining.

Number of Populations: Twelve populations were identified from the literature (*e.g.,* Bennett 1988; Yeager and Blondal 1991; Bismark and Iskandar 1999; Bismark 2004). See *Carrying Capacity* below for more details.

Inbreeding Depression: We included inbreeding depression in these models. We used the median value for mammals in captivity of 3.14 lethal equivalents (Ralls *et al*., 1988). We modeled inbreeding depression for juvenile survival only. We assumed that 50% of the lethal equivalents were due to completely recessive lethal alleles and the other 50% was due to recessive alleles of smaller effect.

Environmental Concordance of Reproduction and Survival: The working group felt that the major causes of environmental variation (disease, drought, forest fires) were likely to impact both adults and juveniles in a way that would produce a strong correlation between the two demographic parameters.

Correlation among Populations in Environmental Variation: Because the populations modeled are scattered throughout Kalimantan and are thought to be genetically isolated from each other, the working group felt that the overall correlation among the individual populations was fairly low. However, widespread drought and the increased risk of forest fires is something that can impact all of Borneo in a correlated fashion. We set the correlation at 0.30.

Catastrophes: The working group felt that the single greatest non-anthropogenic threat to the proboscis monkey was the threat of forest fire. However, even this natural threat is increased in frequency and intensity due to its synergism with human-caused deforestation and global climate change. We modeled this as the single catastrophe facing these populations. It should be recognized, however, that what is being modeled as a single catastrophe (forest fires) often combines many interacting environmental perturbations. Forest fires are more likely during drought conditions that have already stressed the populations. Mortality from the forest fires may actually stem from starvation brought on by the loss of food resources after the fire. Malnutrition and crowding, due to habitat loss from forest fires, may trigger disease epidemics. Thus, the catastrophe regime may include a host of environmental factors directly or indirectly related to forest fires.

Dispersal: The working group strongly felt that there was no gene flow connecting the 12 populations we examined. In fact, in the literature and in the opinion of many at the workshop, many of the locations we modeled as a single population were actually made up of two or more genetically isolated populations.

Breeding System: The species is polygynous (long-term polygyny). Successful males were assumed to breed with an average of 1.6 females.

Age of First Reproduction: Expert opinion was five years of age for females and six years of age for males.

Maximum Age of Reproduction: Considerable variation existed among the experts' guess as to the maximum age of reproduction for female proboscis monkeys. We chose 22 years, because it was the median value suggested to the working group and agreed well with data from captive populations.

Proportion of Females Breeding: We used a combination of unpublished data (from Malaysia), expert opinion, and the life histories of other monkeys of similar size or similar ecology to arrive at an estimate of 46.1% with a standard deviation of 7.0%.

Offspring Number: Twinning in proboscis moneys is so rare that we assumed that all births consisted of a single individual.

Mortality Rates: No data on mortality rates were available for any age class of proboscis monkeys. The working group based mortality estimates on experience with other primates of similar size or life history. Mortality rates were assumed to be the same for females and males. Adult mortality is given as a quadratic equation where the probability of mortality in a given year increases with the age of the individual (see Table 1).

Table 1. Age-specific mortality rates used for proboscis monkeys and the standard deviations in those rates due to environmental variation.

Age (years)	Mortality rate (%)	SD (%)
0 - 1	40	8
1 - 2	10	2
2- Adult	5	1
Adult	$-10.9 + [(2)(\text{Age})] + [(0.04)(\text{Age}^2)]$	3.5

Catastrophe Rate and Severity of Catastrophes: Forest fires were modeled as occurring with a 5% probability per year (i.e., an average rate of once every 20 years). Forest fires were considered to be local catastrophes, and therefore the likelihood of a forest fire in one population did not impact the probability of a forest fire in another population. Forest fires were assumed to increase mortality of all age classes by 33% and decrease the percent of females breeding by 50%.

Carrying Capacity: Population size and trend in population size have been found to be major indicators of population health and viability (Reed *et al*. 2003; O'Grady *et al*. 2004). Thus, our working group spent considerable time and effort identifying possibly viable populations and estimating the number of individuals within each of these populations. Table 2 lists the 12 populations we felt might be viable in the long-term (populations of ≥ 100 individuals). These numbers were arrived at by a combination of literature searches, expert opinion from outside and within the working group, and by using GIS information produced within the working group.

Table 2. Estimated carrying capacities for different populations of the proboscis monkey in Kalimantan, Indonesia.

Population	Area Status	Estimated K
Central Kalimantan Rivers		500
Danau Sentarum Wildlife Reserve	Protected	700
Gunung Palung National Park	Protected	500
Kendawangan Nature Reserve	Protected	1000
Kutai National Park	Protected	1300
Lower South Barito		1700
Mahakam Delta		300
Sambas Paloh Nature Reserve	Protected	200
Sangkulirang		100
Sesayap, Sebuku, & Sembakung		700
South Mahakam		200
Tanjung Putting National Park	Protected	2000
Total (12 populations)		9200

Estimates of the total number of proboscis monkeys living in Borneo ranges over at least an order of magnitude, but is widely believed to number in the tens of thousands. The median value from the literature is 25,000 individuals. Due to the moderately large population sizes described in Table 2, it seems likely that the major threat to these populations is not stochastic effects, but anthropogenic threats.

Decline in Carrying Capacity: A number of publications and GIS information all pointed to the fact that proboscis monkey habitat is declining at the rate of about 2% per year. Thus, the baseline model includes this statistic. The real question is: How long will this rate of deforestation occur? It was the consensus of the working group that habitat destruction would continue at this rate for another 20 years inside of protected areas and for another 40 years outside of protected areas. There is no evidence that the rates of deforestation are currently different outside of protected areas as compared to within protected areas.

Results of Simulation Modeling

The baseline model was run for 2,000 iterations. The estimated probability of extinction of all proboscis monkey populations over the next 150 years is 19% given the many assumptions made in the model. The metapopulation had a very strong deterministic growth rate (r = 0.048), but the stochastic growth rate was just slightly negative (r = -0.006).

The building of the model and the results of the simulation runs presented us with several challenges. Since the demographic data were known with so little precision (most parameters were best guesses, with no actual data), we felt it was not productive to perform sensitivity testing on demographic inputs, since most of the inputs would have wide margins of uncertainty and their combined effects would almost certainly produce extremely variable results in the probability of persistence. This is especially true since the metapopulation's stochastic growth rate was so close to zero. Further, the metapopulation is so large and the projection forward in time is relatively short (< 15 generations). Thus, most stochastic factors are going to play only a relatively minor role in the viability of the proboscis monkey.

The working group decided to focus our assessment of model uncertainty on what we felt are the true causes of risk to this species: habitat loss through logging (mostly illegal), and environmental catastrophes (forest fires).

We first examined the effects of different rates of habitat loss (i.e., decline in carrying capacity). The current rate of habitat loss is 2% per year. The working group felt that the new government in Indonesia was serious about fighting illegal logging and that deforestation rates could become as low as 1%. Less optimistically, the rate of habitat loss has actually been increasing over the past decade, so we decided the worst case scenario would be a 2.5% loss per year. We altered the baseline model to include a 1.0%, 1.5%, 2.0% (baseline) and 2.5% decline in carrying capacity (*K*). These losses accrue over the first 20 years within protected areas and over the first 40 years in unprotected areas. After this period of time it is assumed that the government, or the citizens, will realize the environmental problems they are causing for themselves and desist from further deforestation. The results are summarized in Table 3 and Figure 1.

Table 3. Percent of simulations for which the metapopulation goes extinct, *P(E)*, when the rate of habitat loss per year is varied. *Total Loss* shows the total percent of the habitat lost after 20 years (40 years) for the protected populations (unprotected populations).

Rate of Loss (per year)	Total Loss	P(E) in 150 years
1.0%	18.1 % (33.0%)	0.0%
1.5%	25.9% (45.1%)	0.4%
2.0%	33.0% (55.1%)	18.9%
2.5%	39.3% (63.2%)	52.6%

We also varied the frequency of forest fires from the baseline model. Two scenarios were imagined. In the first scenario, the frequency of fires could as much as double due to habitat fragmentation (which allows easier access to the forest by people that might start fires intentionally or unintentionally, makes forests drier and more susceptible to fire due to edge effects, *etc*.) and global climate change. In the other scenario, fires could possibly be reduced to up to half of their current estimated frequency, by better forest management and improved response to forest fires. Halving or doubling the current estimated frequency of forest fires has effects that are very similar in magnitude to increasing or decreasing the rate of habitat loss by 0.5% per year (Table 4).

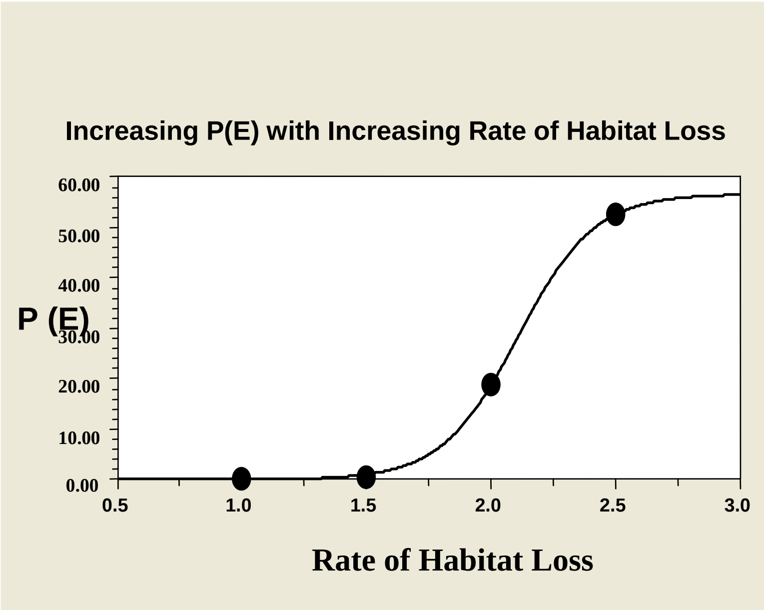

Figure 1. A best-fit logistic curve demonstrating the increase in the probability of extinction with an increase in the rate of habitat loss.

Table 4. The effects of increasing the frequency of catastrophes on the percent of the simulations for which the entire metapopulation goes extinct.

Probability of occurrence	Frequency	P(E)
2.5%	1 in 40 years	0.0%
5.0% (baseline)	1 in 20 years	18.9%
10.0%	1 in 10 years	53.4%

The working group also examined how the time frame over which deforestation occurred would impact the probability of extinction. Table 5 illustrates what happens if the timeframe over which habitat loss occurs is halved or doubled. Significant improvement in the probability of extinction can be made by stopping habitat destruction earlier.

Table 5. Effect of extending or shortening the period of time over which habitat loss is allowed to occur.

	Total Loss		
Years	Protected areas	Non-protected areas	P(E)
10 / 20	18.1%	33.0%	0.7%
20 / 40 (baseline)	33.0%	55.1%	18.9%
30 / 60	45.1%	69.9%	44.6%

Research Priorities

The working group identified the following 10 research priorities concerning the conservation of the proboscis monkey.

1. Estimates of mortality rates
2. Estimates of fecundity rates
3. Continued estimates of loss of proboscis monkey habitat
4. Estimates of genetic diversity within populations and gene flow among populations
5. More accurate and complete estimates of population size
6. Distribution maps and habitat requirements
7. Habitat condition (*e.g.*, carrying capacity, edge effects)

8. Frequency and severity of forest fires
9. Social behavior
10. Social economic factors impacting hunting

These ten priorities were ranked from most important (1) to least important (10) and labeled as a high, moderate or low priority area for research. These ranking were obtained by discussion and voting among members of the working group.

High Priorities

1. *Current Population Size / Trend in Population Size*: Monitoring population sizes through time will provide valuable information on the number of individuals. More importantly, it will reveal the trend in population size. Because the parameters of the model are so uncertain, the predictions of the model may be overly optimistic. It will be important to see if the decline in proboscis monkey numbers is due only to loss of habitat or if the habitat is also degraded to the point where populations may be in deterministic decline.
2. *Demographic Rates:* There are currently no data on either mortality rates or fecundity rates.
3. *Deforestation / Habitat Loss Rates:* It is important to identify clearly proboscis monkey habitat and measure its rate of loss.

Moderate Priorities

4. *Distribution of Proboscis Monkeys and their Habitat Requirements*
5. *Genetic Diversity*
6. *Habitat Condition*
7. *Frequency of Forest Fires and their Impact on Survival and Reproduction*

Low Priorities

8. *Social Behavior*
9. *Socio-Economic Factors Impacting Hunting*

Implementation of High Priorities

1. Contact past and current proboscis monkey researchers (e.g., Bennett, Bismark, Meijaard, Nijman, Sebastian, Yeager) to inform them of the results of the Proboscis Monkey PHVA workshop and encourage them to undertake projects related to high priority research needs.
2. Initiate collaboration among the Indonesian Institute of Sciences (LIPI), Nature Conservation and Forest Protection (PHKA), universities, and NGOs to establish research on the proboscis monkey.

Suggested Management Actions

The following eight problems were identified by the working group.

1. **Current laws are not being enforced**. The Forestry Department lacks the management authority and enforcement capacity to provide the protection already afforded proboscis monkey habitat under existing laws.
2. **Not enough is known about proboscis monkeys to allow for their efficient conservation. The numbers of trained personnel capable of undertaking research to fill the knowledge gaps are insufficient**. There is insufficient support and incentives from the Indonesian Government, International NGOs, and local NGOs for education in biology or continued population studies of the proboscis monkey.

3. **Forest fires pose a threat to the viability of the proboscis monkey**. There are not enough personnel and insufficient infrastructure for the control / suppression of forest fires.
4. **People living in or near proboscis monkey habitat kill the monkey directly for monetary gain and indirectly through habitat destruction for monetary gain or subsistence level needs.** Lack of economic opportunities, and a lack of awareness of the value of proboscis monkeys and their habitat (e.g. ecotourism), among local people living in or near proboscis monkey habitat leads to their unsustainable use of that habitat.
5. **Local governments make land use decisions that are detrimental to the viability of proboscis monkey populations.** Lack of integration of wildlife concerns into land-use planning by local government leads to short-sighted decisions based on local rather than national or international concerns.
6. **Lack of national funding and lack of prospects for obtaining international funding.** Indonesian scientists often lack the training necessary to be competitive in obtaining international funding.
7. **Slash and burn agriculture leads to loss of proboscis monkey habitat.** Losses do not need to be permanent. Methods for habitat restoration (*e.g.*, reforestation of abandoned rice farms) can be used to recover lost habitat.
8. **Illegal logging destroys proboscis monkey habitat**. Need to increase international awareness/pressure to halt illegal logging in Indonesia; pressure consumer nations to stop buying illegal logs.

These problems were prioritized and recommended actions by the working group are listed below.

<u>High Priorities</u>

1. Management authority/Enforcement capacity: Contact Siti Nuramaliati P. (Head of Zoological Division, Center for Research in Biology of the Indonesian Institute of Sciences), The Forestry Department, and Indonesian universities to lobby the government for greater authority and law enforcement capabilities.
2. Develop methods and seek funding for habitat rehabilitation (e.g. reforestation of abandoned rice farms).

<u>Moderate Priorities</u>

1. Increase personnel and infrastructure for control/suppression of forest fires.
2. Increase international awareness/pressure to halt illegal logging in Indonesia; pressure consumer nations to stop buying illegal logs.
3. Integration of wildlife concerns into land-use planning by local governments.

<u>Low Priorities</u>

1. Petition the Indonesian Government, International NGO's, and consumer nations for support for education of Indonesian population biologists and for continued population studies of the proboscis monkey.
2. Increase economic opportunities for people living in or near proboscis monkey habitats (e.g. ecotourism)
3. Training in proposal writing for international funding.

Conclusions

Although the total number of proboscis monkeys in the wild probably numbers >10,000 individuals, the species still has an unacceptable risk of extinction. This risk exists because of unsustainable (and largely illegal) rates of deforestation that devastate proboscis monkey habitat, because existing populations are almost entirely too small to be viable in the long-term and are highly isolated from each other, and because forest fires are becoming more frequent and severe – due mostly to anthropogenic factors.

The model results suggest that halting illegal logging should be the highest priority in conservation of the proboscis monkey. Slowing the current rate of habitat destruction by as little as 20% can drastically improve the future prospects of the proboscis monkey. The goal should be to eliminate illegal logging within the next twenty years and institute sustainable levels of legal logging as soon as possible after that. Efforts to reduce the risks associated with forest fires, through education, management and prevention should also be undertaken.

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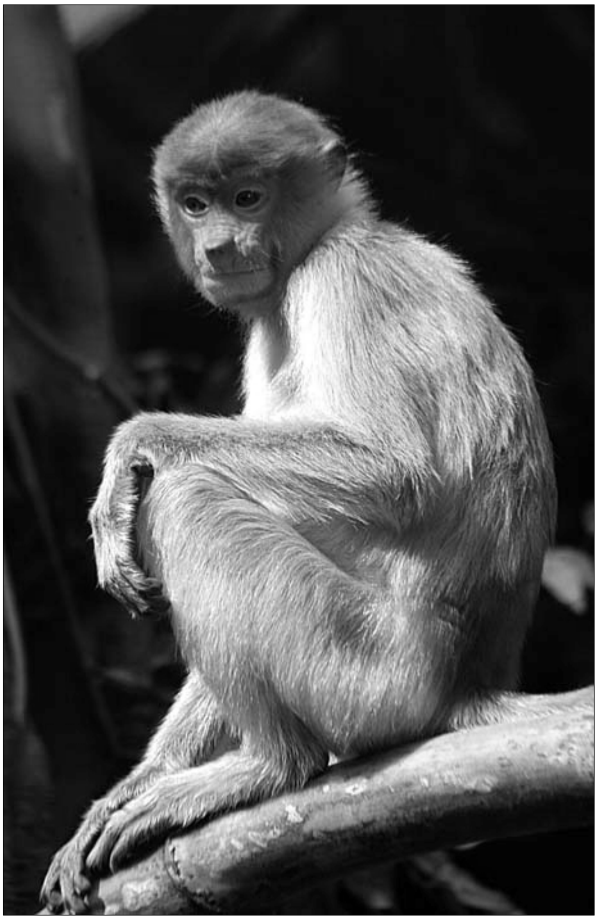


FINAL REPORT

SECTION 3
Habitat Loss Working Group Report

Habitat Loss Working Group Report

Members: Ivan Chandra, Ambar Dwiyono, Niken Wuri Handayani, Sofian Iskandar, Heather Leasor, Litasari, Jansen Manansang, Haryanto Putro, Kurnia Rauf, John Sha, Enny Sudarmonowati (facilitator).

Defining the Issues

The group was given two lists of issues, one pertaining to habitat issues and the other to policy implementation. Utilizing the following lists, compiled by the larger workshop participants, the group began to define and brainstorm on these issues. The issues in parentheses were also discussed by other groups and may or may not have been addressed by this group.

Habitat Issues

- Habitat destruction
- Habitat conversion
- Oil palm plantation
- Fisheries
- Mining – gold, coal
- Habitat fragmentation
- Fire
- Insufficient habitat (lack of food resources)
- Land use pattern: *(human population growth, legal protection of forest, link with ex-situ)*

Policy Implementation Issues

- Illegal logging
- Legal protection forest
- Natural resource governance
- Law enforcement
- Forest status
- Political will
- *(Hunting)*
- (*Human population growth*)

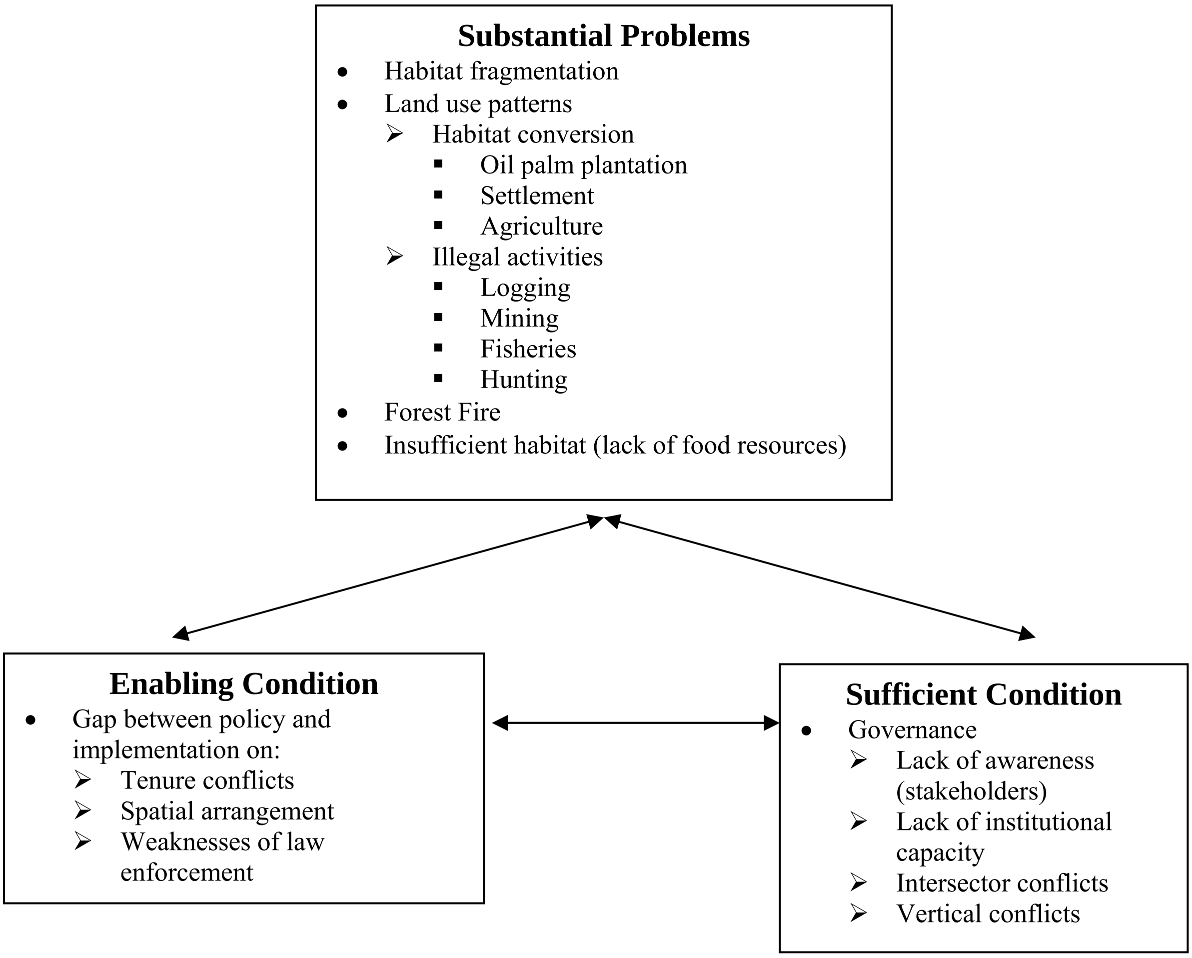
The group reorganized and combined the issues listed above into the following:

- Habitat conversion, habitat fragmentation, oil palm plantations (and other plantation types), conversion for use as fisheries, mining with traditional or old-fashioned practices, agriculture practice and settlement
- Fire, both natural and manmade
- Insufficient habitat
- Land use pattern (natural resource policy)
- Human population growth (being covered by another group and thus not addressed by this group)
- Legal protection of forest (grouped as follows):
  - Link with *ex situ* was seen more to do with solutions including animal, human resources and institutional capacity but is mentioned briefly within institutional capacity.

   - Hunting is an issue addressed in other groups but acknowledged to be an important factor to the proboscis monkey.
- Illegal logging (addressed in forest conversion)
- Legal protection forest
- Natural resource governance is seen as the gap between policy and implementation
   - Political will is combined with law enforcement in area management capacity with a commitment to institutional capacity.
- Forest status (not addressed by this group)

After further discussion the group came to the conclusion that the following three key categories are the underlying causes of the habitat loss that is the focus of this group (Fig. 1). Although we will not deal with all of these points we felt it important to outline them for a better understanding of the problem. This flow chart does not imply any hierarchical ranking by the positioning of any of the boxes. The definitions of each box in the chart are more clearly defined and explained below (also see Figs. 2 & 3).

Figure 1. Cause and effect flow of habitat loss issues.



Enabling Condition: Conditions that enable conservation of the proboscis monkey to be carried out. These usually relate to policy and political stability aspects within a region or country and law and regulation within a country.

- Gap between policy and implementation: High-level government officials make the law and they themselves disobey the law, possibly for financial reasons.
  - Tenure conflicts: This is between traditional use practices and the protected area governmental and regional policies (e.g. originally for one conservation area use, then claimed by traditional community for any purposes).
  - Spatial arrangement: The government designates areas as protected forest, production forest or other types but does not adhere to its own rulings.
  - Weaknesses of law enforcement: The government not enforcing its own policies (e.g. illegal logging).

Sufficient Condition: Conditions that make certain institutions, formal and informal, able to appropriately deal with proboscis monkey conservation.

- Governance (all stakeholders): How to manage in relation to natural resources:
  - Lack of awareness: On the importance of conserving proboscis monkeys at the stakeholder level (including community and policy makers).
  - Lack of institutional capacity: By all institutions involved there seems to be a lack of management skills (in regard to areas inside/outside of the conservation area).
    - Link with *Ex-Situ*:
      - Saving the proboscis monkey by sending them to *ex-situ* conservation institutions in cases of severe impact on the natural habitat such that they cannot survive *in-situ.*
      - Send to *ex-situ* conservation institutions for the purpose of new genetic/new blood/viable offspring by banking or keeping.
      - Upgrade the standards for *ex-situ* by research and education to all people. *Ex-situ* should be a miniature *in-situ.*
      - Reintroduce into viable habitat from *ex-situ* if possible and if all criteria set by the IUCN can be met.
  - Intersector conflicts: Conflicts between sections within the government, with each section having its own goals and targets and leading to high levels of conflict.
  - Vertical conflicts: Conflict between local and national policies (ministerial decree vs or contradicting the governor decree or district head decree).

Substantial Problems: These are the key problems facing proboscis monkeys or their habitat directly and are more related to the biophysical and social conditions. These are the key issues which should be addressed during this workshop by this group. Although we acknowledge there are interrelations between almost all issues we found it best to rank them in the following way. The flow charts (Fig. 1 & 3) demonstrate better the fluidity with which they all interact.

- Habitat fragmentation: The group chose the term fragmentation vs destruction because fragmentation directly affects proboscis monkeys. Loss of habitat will be disturbing to proboscis monkeys lives in terms of fecundity and population dynamics.
- Land use patterns: Natural resource policies, set forth by local and national governments, may contradict each other.
  - Habitat conversion: Opening the land to other uses, thus removing or fragmenting proboscis monkey habitat.
    - Oil palm plantation: Leading to the degradation of proboscis monkey habitat and areas upstream.

- Settlement: Converting forest to settlement area by governmental program or local initiative, causing loss of habitat and human disturbance to proboscis monkeys.
- Agriculture: Converting forest to agricultural land, causing loss of habitat to proboscis monkeys.

➢ Illegal activities
  - Logging: Loss of habitat by clear cutting or bad forestry practices.
  - Mining gold with mercury: Loss of habitat in upstream areas, utilizing the archaic method of mercury for separating the gold; this causes pollution in the rivers and to proboscis monkey habitat as well as siltation from deforesting for the process.
  - Mining coal: Opening proboscis monkey habitat or upstream areas by clear cutting, causing siltation and loss of habitat.
  - Fisheries: Large impact on proboscis monkey habitat by significant reductions in the riparian and upstream areas. Mangrove loss, which is also proboscis monkey habitat, due to clearing to make the fisheries is also significant. This is occurring in all coastal areas of Kalimantan.
  - Hunting: Covered by other groups but noted as relevant since takes viable individuals out of the wild population.

- Forest fire: Affects proboscis monkeys due to the large impact on the habitat; fires may occur almost every year and at times may be more substantial due to global climatic shifts.
  - ➢ Forest fire is worse when planting season starts due to dry season. Categorized into two causes: natural (catastrophe) and human activities.
  - ➢ Human activities related to opening land for cultivation by burning the area and for processing fish by smoking.
- Insufficient habitat (lack of food resources): It is site-specific in the instances of insufficient habitat (Pulau Kaget).

Figure 2. Substantial problems threatening proboscis monkeys.

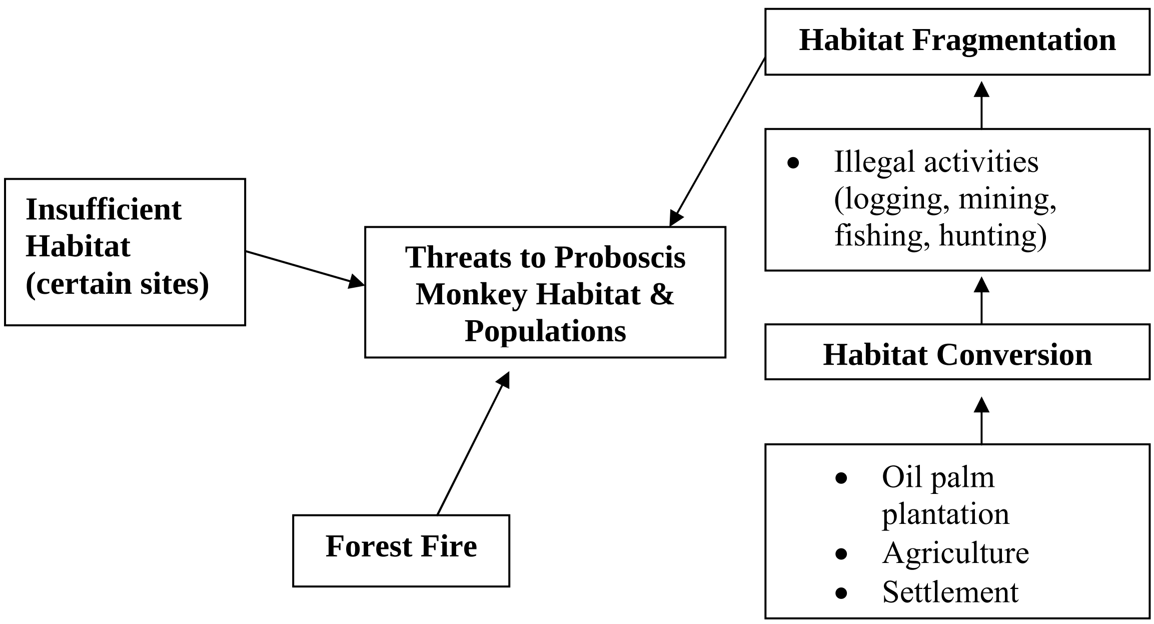
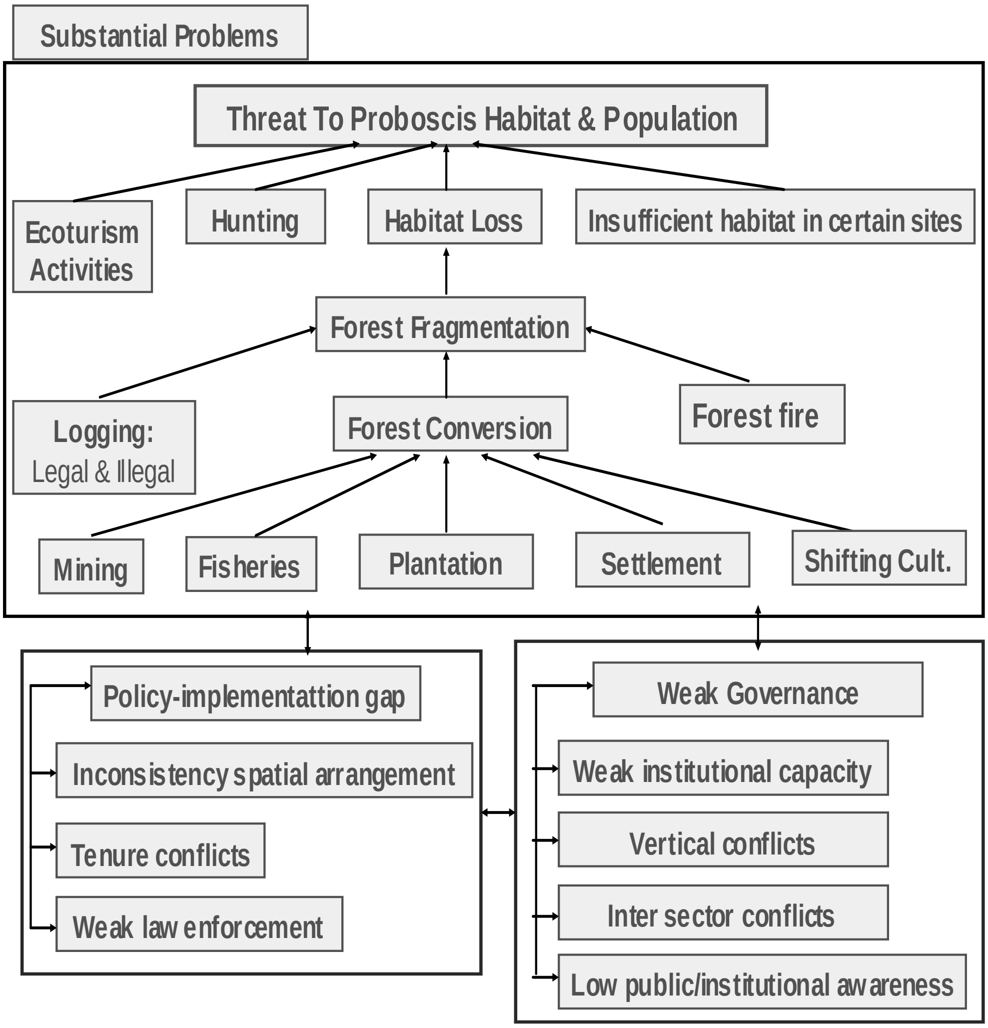


Figure 3. Interrelationship of issues and threats affecting proboscis monkey habitat and populations.



Terminology and Other Clarification

Some concern was expressed regarding the working group's choice of the terms *habitat fragmentation* and *habitat conversion* and omission of *habitat loss* or *destruction*. The group felt that habitat destruction was applicable to loss of small scale units; since the group was dealing with many habitats within a larger area, it was felt that the term fragmentation was more suitable. We recognize that habitat fragmentation is a well-used conservation term with a set definition, and we feel that our definitions are close to those used and should not cause extreme confusion.

Habitat fragmentation results in small fragmented areas due to sporadic illegal logging. This leads to isolated populations, which prevents genetic flow among populations. Habitat conversion is one cause of fragmentation. Fragmentation is the result of an accumulation of activities. It is the small- or large-scale breaking up of habitat available for proboscis monkey utilization.

Forest conversion is caused by human activities such as oil palm plantation development, settlement, and agricultural practices such as shifting cultivation. Some activities can occur because of policy market needs, land resources, and livelihood. This condition has developed because of the gap between policy and implementation. Tenure conflict among the landowners (stakeholders) and inconsistency in implementing spatial arrangements occurred because of low public and institution awareness.

Specific and significant actions to reduce illegal logging are needed for commitment of high-ranking position officials at the national level concerning illegal logging. Illegal logs are purchased by many consumers such as Singapore, Japan and China, which means that logging issue should be handled at the international level. To develop the data on the flow of illegal logs, companies, officials, areas involved and other related data need to be disseminated to other countries. Haryanto Puro will provide data concerning Indonesian illegal logs to be brought to Singapore and Japan.

The group recognizes that coal mining in South and East Kalimantan is a significant threat due to road construction through swamp forest and the construction of harbors in mangrove forest areas, both of which are viable proboscis monkey habitats.

Issues and Goals

It was decided within the working group that the main issue is habitat loss, because habitat loss is a result of many habitat changes due to human activities. The question of whether the issue was also the problem was raised. Usually, an issue describes a general condition. If habitat loss is a main issue, then focal problems will need to be identified. In this case we have four focal problems, i.e. forest conversion, logging, policy-implementation gap, and weak governance.

1. *Forest conversion:* High rates of forest conversion within proboscis monkey habitat, as a result of human activities such as mining, establishment of oil palm and other plantation types, human settlement, shifting cultivation, and fisheries ponds development, is dependent on the locality of the activity.
2. *Logging:* Logging activities can be a problem to proboscis monkey habitat due to bad logging practices that cause a negative impact to proboscis monkey habitat, i.e. loss of food resources, sleeping trees, water and cover.
3. *Weak governance:* The governance, in this context, is how the stakeholders deal with proboscis monkeys as part of the natural resource ecosystem. Weak governance means the decision-making process dealing with the natural resource ecosystem does not significantly consider the existence of proboscis monkeys.
4. *Gap between policy and implementation:* There are governmental policies that protect proboscis monkeys. Ideally, all forests with proboscis monkeys should be significantly considered within governmental policy framework as it can have adverse effects on the proboscis monkey. The reality is that the existence of the proboscis monkey may not be appropriately addressed in many national and local policies. Some of the important policies that are related to proboscis monkey habitat are spatial arrangement, decentralization, sector policies and environment.

The next task for the working group was to define the goal(s) of each focal problem. The following limiting factors were recognized:

- Spatial contexts: protected area, special habitat
- Institutional context: policy, action, local institution and custom.
- Management context: forest management unit, mining management unit, agriculture management unit.

Focal Problem: High intensity forest conversion
Goal: Lowering the intensity of habitat conversion within proboscis monkey habitat.

Focal Problem: Logging (legal)
Goal: It could legal or illegal logging. Promote the forest management unit of legal logging where proboscis monkeys exist to adopt the sustainable forest management certification, by independent party.

Focal Problem: Logging (illegal)
Goal: Reduce the intensity of illegal logging activities. (There is no possibility at this current stage to completely stop illegal logging activities but an attempt at reduction is feasible.)

Focal Problem: Weak governance
Goal: Improve the decision-making process mechanism on forests that appropriately considers the existence of proboscis monkeys.

Focal Problem: Gap between policy and implementation
Goal: Reduce inconsistency between policy and implementation related to proboscis monkey protection.

The group utilized the dot method to prioritize the five goals identified above. The following is the resulting order of priority:

1. Lowering the intensity of habitat conversion within proboscis monkey habitat.
2. Improve the decision-making process mechanism on forest that appropriately considers the existence of proboscis monkeys.
3. Promote the forest management unit of legal logging where proboscis monkeys exist to adopt the sustainable forest management certification, by independent party.
4. Reduce the intensity of illegal logging activities. (There is no possibility at this current stage to stop illegal logging activities but reduction can occur.)
5. Reduce inconsistency between policy and implementation related to proboscis monkey protection.

Recommended Actions
In determining appropriate actions to achieving the above goals, a timeline was stipulated and defined as short-term and long term. Short-term is 1-5 years and long term is within 5-20 years. Actions identified for each of these goals are given below.

Goal 1: Lowering the intensity of habitat conversion within proboscis monkey habitat.
Actions:
- Public awareness program for forest conversion.
- Awareness that fisheries are causing damage and consideration of alternatives for sound fishery practices.
- Strengthen local institutions to include the protection of proboscis monkeys.
- Land clearing activities must be in line with EIA statement.
- Clear reward/punishment mechanism, including clear incentive system for government and private entities as well as local community groups.
- Work with oil palm plantation (OPP) to protect riparian forest (maintain corridor, lessen flood effect on OPP).

Goal 2: Improve the decision-making process mechanism on forest that appropriately considers the existence of proboscis monkeys.

Actions:

- Incorporate research results into decision-making process.
- Involve participative, multi-stakeholder process in planning process.
- Develop program to measure performance of programs related to proboscis monkey habitats.
- To establish an inter-ministerial decree concerning proboscis monkey conservation as well as agreement with neighboring countries (transboundary agreement).

Goal 3: Promote the forest management unit of legal logging where proboscis monkeys exist to adopt the sustainable forest management certification, by independent party.

Actions:

- Conduct training course on sustainable use of forest resources related to proboscis monkey habitat.
- Accelerate the implementation of SFM certification by high priority forest management unit through available bridging program.

Goal 4: Reduce the intensity of illegal logging activities. (There is no possibility at this current stage to stop illegal logging activities but reduction can occur.)

Actions:

- Develop schemes related to alternative livelihood (e.g. alternative financial income for illegal loggers).
- Review existing problems in law enforcement efficiency and make appropriate improvements (e.g. military and intersectoral communication and joint training).
- Strengthen local community as well as NGO involvement and public movement to reduce intensity of illegal logging activities.
- Conduct campaign about negative impact of illegal logging and revive traditional forest management practices.

Goal 5: Reduce inconsistency between policy and implementation related to proboscis monkey protection.

Actions:

- Review existing rules/regulations concerning forest resources.
- Placement of competent human resources at Ministry of Forestry.
- Promote dialog between central local governments on policy making and evaluations.
- Promote dialog concerning natural resource management policy making and evaluation among different sectors.
- Implementation or socialization of rules from governments to local citizens that loss of proboscis monkey habitat is a serious problem.

Actions for each goal were ranked by the group using the dot method. These rankings along with the party responsible for the action, timeline and utilizable resources are outlined in Table 1.

Table 1. List of prioritized goals and recommended actions.

Goal	Action (Prioritized)	Responsible Party	Timeline	Resources
Goal 1. Reducing intensity of forest conversion.	a. Strengthen local institution to include the protection of proboscis monkeys.	PHKA/BKSDA/BPK Bupati/ Head of district	Short term	Report of PHKA/BPK Forest district agencies Local communities (personal communication with group leaders) Related NGOs SEAZA/PKBSI
	b. Intensify public awareness program for forest conversion.	PHKA/BKSDA, Linked local institutes, District Head/ Related NGOs (in specific areas)	Short and long term	Report of PHKA Forest district agencies Local communities (personal communication with group leaders) Related NGOs SEAZA/PKBSI
	c. Clear reward/punishment mechanism, including clear incentive system for government and private entities as well as local community groups.	Dept. Lingkungan (MoE) Dept. Dalam Negeri (MoIA) Dept. Kehutanan (MoF) Pusat Standardisasi Lingh Kehutanan BPK Regional police department	Short and long term	Report of PHKA/BPK Forest district agencies Local communities (personal communication with group leaders) Related NGOs MoE Pusat Standardisasi Lingh Kehutanan ILRC(Illegal Logging Response Center in west and central Kalimantan) Regional police department
	d. Awareness that fisheries are causing damage, alternatives for sound fishery practices.	Departemen Kelautan dan Perikanan (MoMF) Bupati	Short and long term	Report of fishery district agency Reports from Local Uni Report from journalists/reporters/news agencies SEAZA/PKBSI
	e. Land clearing activities must be in line with EIA statement.	MoE Bupati BEPPEDALDA BPK Pusat Standardisasi Lingkungan Kehutanan	Short and long term	MoE, Forest District agency Regional Planning Agency (BAPPEDALDA) BPK Pusat Standardisasi Lingkungan Kehutanan

Goal	Action (Prioritized)	Responsible Party	Timeline	Resources
	f. Work with oil palm plantation (OPP) to protect riparian forest (maintain corridor, lessen flood effect on OPP.	Departemen Pertanian (MoA) Estate Crop District Agency (Dinas Perkebunan)	Short and long term	NGOs Reports of MoA Estate Crop District Agency OPP, Biro Pusat Statistik (National Statistical Bureau)
Goal 2. Improve the decision making process mechanism on forest that appropriately considers the existence of proboscis monkeys.	a. Involve participative, multi-stakeholder process in planning process.	PHKA/BKSDA/ UNI NGOs	Short term	Management plan of each area from relevant governmental agencies Reports of NGOs Reports of Uni Private sector
	b. To establish an inter-ministerial decree concerning proboscis monkey conservation and agreement with neighboring countries (transboundary agreement).	Relevant Minister MoE, MoA, MoF, MoIA UNESCO transboundary program	Short term	Reports from relevant minister MoE, MoA, MoF, MoIA UNESCO transboundary program MAP/GIS
	c. Incorporate research results into decision making process.	PHKA/BKSDA LIPI Uni	Short and long term	Report of LIPI, PHKA, BKSDA, Uni, SEAZA/PKBSI, Conservation Institution, National Library Jakarta, PDII
	d. Develop program to measure performance of programs related to proboscis monkey habitats.	PHKA BKSDA LIPI Uni	Short and long term	Report of LIPI, PHKA, BKSDA, Uni, SEAZA/PKBSI, Conservation Institution
Goal 3. Promote SFM certification.	a. Accelerate implementation of SFM certification by high priority forest management unit through available bridging program.	PHKA/BKSDA RPA BPK Pusat Standardisasi Lingkungan Kehutanan	Short and long term	Report of MoE Forestry District Agency Regional Planning Agency BPK Pusat Standardisasi Lingkungan Kehutanan
	b. Conduct training course on sustainable use of forest resources related to proboscis monkey habitat.	NGOs Uni/research institutes	Short term	Handbooks/guideline books or reports of NGOs Reports of Uni/research institutes Scientific publications LIPI SEAZA/PKBSI

Goal	Action (Prioritized)	Responsible Party	Timeline	Resources
Goal 4. Reduce illegal logging intensity.	a. Develop schemes related to alternative livelihood (e.g. alternative financial income for illegal loggers).	Menteri Sosial (MoW) NGOs	Short term	Report of Uni/Research Institute NGOs Report of Departemen Perindustrian dan Departemen Perdagangan (MoI & MoT)
	b. Strengthen local community as well as NGOs involvement.	NGOs Group leaders (mainly for traditional group leaders)	Short term	Report of NGOs Personal communication with group leaders SEAZA/PKBSI
	c. Strengthen intersectoral communication and joint training of law enforcement	NGOs MoF and Departemen Kehakiman (MoLJ)	Short term	Report of NGOs MoLJ MoF
	d. Conduct campaign about negative impact of illegal logging and revive traditional forest management practices.	NGOs BKSDA Traditional group leaders	Short and long term	Report of NGOs MoF BKSDA Media Uni Personal communication with traditional group leaders SEAZA/PKBSI
Goal 5. Reduce policy-implementation inconsistency.	a. Promote intersector dialogue on natural resource management policy making and evaluation.	PHKA MoMF, MoF, MoA,	Short term	Report of PHKA District Agency Report of MoMF MoF MoAg NGOs
	b. Promote dialog between central local governments on policy making and evaluations.	MoF PHKA Bupati NGOs MoIA	Short term	Report of MoF PHKA District Agency NGOs Ministry of Internal Affair Report of meeting on decentralization by MoIA
	c. Implementation or socialization of rules from governments to local citizens that proboscis monkey habitat to be serious problem.	NGOs MoF (BKSDA)	Short term	Report, leaflet, brochure campaigning material of NGOs BKSDA

Goal	Action (Prioritized)	Responsible Party	Timeline	Resources
	d. Placement of competent human resources.	MoF Badan Kepegawaian Nasional (National Human Resource Department)	Short term	Report of MOF Badan Kepegawaian Nasional (National Human Resource Department)
	e. Review existing rules/regulations concerning forestry resources.	MoF MoIA	Short term	Report of MoF MoIA DPR(House of Representative)

Notes:

NGOs refers to site-specific Non-Governmental Organizations (NGOs)
University includes local university (local, national and international where applicable)
Timeline: Short term = 1-5 years; Long term = 5-20 years

Table 2. List of acronyms and abbreviations.

Acronym	English	Indonesian
EIA	Environmental Impact Assessment	Analisis Dampak Lingkungan
OPP	Oil Palm Plantation	Perkebunan Kelapa Sewit
SFM	Sustainable Forest Management	Pengelolaan Hutan Berkelanjutan
NGO	Non-Governmental Organization (site- and topic-specific)	Lembaga Swadaya Masyarakat
PHKA	Protection and Nature Conservation Agency	Perlindungan Hutan dan Konservasi Alam
BKSDA	District Forest Agency, District Nature Conservation Division	Balai Konservasi Sumber Daya Alam
BUPATI	Head of District	BUPATI
MoE	Ministry of Environment	Menteri Negara Lingkungan
MoF	Ministry of Forestry	Menteri Kehutanan
MoLJ	Ministry of Law and Justice	Menteri Kehakiman
MoIA	Ministry of Internal Affair	Menteri Dalam Negeri
MoW	Ministry of Welfare	Menteri Sosial
MoI&MoT	Ministry of Industry and Ministry of Trade	Departemen Perindustrian dan Departemen Perdagangan
MoA	Ministry of Agriculture	Menteri Pertanian
MoMF	Ministry of Marine and Fisheries	Menteri Kelautan dan Perikanan
Uni	University and research institutes (local, regional and international)	Universitas
UNESCO	United Nations Education Science and Culture Organization (specifically the trans-boundary program)	UNESCO
LIPI	Indonesian Institute of Sciences	Lembaga Ilmu Pengetahuan Indonesia
BAPPEDALDA	Regional Environment Impact Analysis Agency	Badan Perencana dan Pengendali Dampak Lingkungan Daerah
SEAZA/PKBSI	South East Asia Zoo Association/ Indonesia Zoo Association	Asosiasi Kebun Binatang Asia Tenggara Perhimpunan Kebun Binatang Se Indonesia

Acronym	English	Indonesian
BKN	National Human Resource Department	Badan Kepegawaian Nasional
DPR	House of Representatives	Dewan Perwakilan Rakyat
ILRC	Illegal Logging Response Center in west and central Kalimantan	
BPK	DG Forestry Product	Bina Pengusahaan Kehutanan
PDII	Scientific Documentation and Information Center	Pusat Dokumentasi dan Informasi Ilmiah

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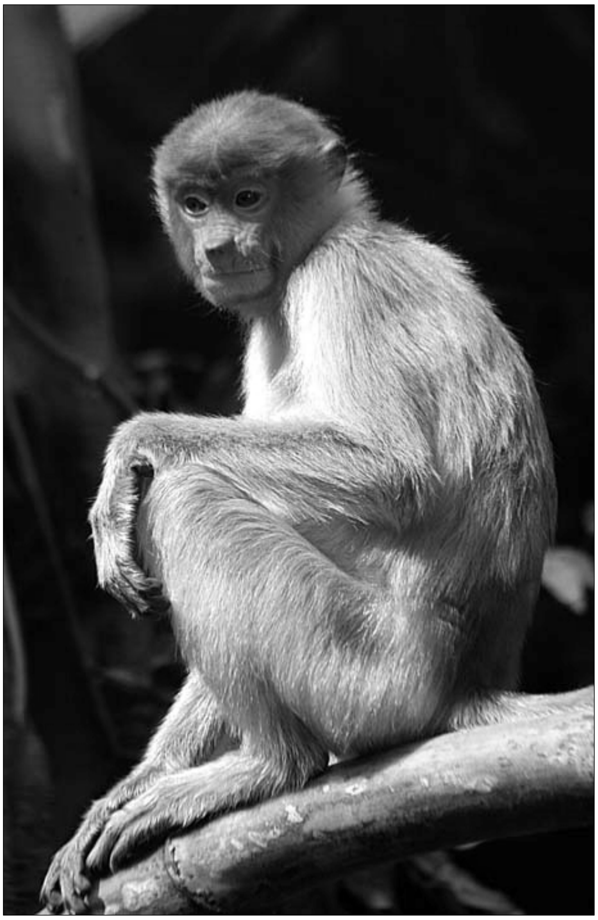


FINAL REPORT

SECTION 4
Local Community Issues Working Group Report

Local Community Issues Working Group Report

Members: Jatna Supriatna, J. Sugarjito, A. Setiawan, A. Taufik, A. Soendjoto, Jansen Manansang, Biswajit Guha, Noviar Andayani (facilitator).

The working group was tasked with exploring the impact of the local community on proboscis monkey (PM) habitats in Kalimantan, and to come up with the necessary goals and action plans to address these issues.

A definition for local people was required, and the suggestion was for this to refer to people coming into direct contact with PM. However, from a larger perspective, the group decided to include the whole of Borneo into the definition of local people, as decisions made by people not in direct contact with PM have considerable impact on the local community and their relationship to PM.

The initial issues leading to a decline in PM populations were perceived to be: hunting as bait; tourism; gold mining; human population growth; slash and burn agriculture and other land use issues; lack of awareness; and education.

Brainstorming brought up the following other issues; the hunting of PM for the bushmeat and pet trade; pests and crop raiders; road kills and accidents; transmigration of people; nomadic tribes; population displacement; resource and space conflict competition with humans leading to habitat loss; mining leading to water pollution caused by arsenic and mercury; firewood collecting; noise disturbance; boat traffic and infrastructure development.

Heather Leasor, a researcher working in the field, explained the issues on tourism impact to the group. One observed issue is that boat traffic and noise disturb the PM when the animals are preparing to sleep for the night. The PM would then leave the area and have to find a resting place elsewhere. Boat traffic also created habitat fragmentation, as the heavier the traffic, the more difficult it would be for the PM to cross the water body to get to the other side. Disease transmission from humans to PM through close contact or even direct contact with animals that were unafraid of human proximity may have an impact. Two of the potential diseases mentioned are hepatitis and scabies.

There is also a behavior change in the PM; they are becoming less shy of human proximity, and accepting human food may have effects on the physiology through a diet change and also make the PM susceptible to human threat and cruelty.

Competitive exclusion with long-tailed macaques is an issue brought about by an increased tourist flow leading to increasing population of long-tailed macaques (LTM) that are opportunistic and habituated to humans. Increase in human food wastes can cause an increase in the LTM population leading to increased incidence of conflict and aggression against PM. Tourism was thus concluded to have multiple effects on PM populations.

The above issues were re-examined to identify the basic issue underlying each, and the following were agreed by all group members.

1. No regulation for tourism activities. What this means is that there is no legislation and official input in this matter and tour operators have a freehand in how and where tours are conducted.

2. Lack of signs, information and educational material. This is with reference to tour lodges and locations where viewing of PM takes place.

3. Lack of standard operational procedure (SOP) for tourism activities, on aspects of proximity to PM, acceptable tourist behavior, etc.

4. Lack of research on human - PM interaction. This was brought up because of the lack of knowledge on physiological effects of PM consuming human food, as well as the impact of tourists on existing PM populations.

5. Mining and the water pollution associated with tailing disposal leading to systemic accumulation of toxic compounds such as mercury, arsenic, etc. (as seen in the waters of the *bekantan* habitat), and later in the PM because of exposure to such polluted waters through drinking, swimming, etc.

6. Resource and space conflict was discussed quite extensively. Various issues were added to this category due to direct or indirect conflict and some of these deal with issues of habitat loss caused by human population growth and transmigration of people from the other islands to Kalimantan, and because of this movement, displacing various populations which in turn move into areas occupied by PM and coming into direct conflict with them. Movement of nomadic tribes was also brought up as an issue contributing to the decline in PM, but the group agreed that this was not a significant. PM are also persecuted because they are considered a pest and crop raider.

7. Illegal hunting for bait and bushmeat. This was also discussed extensively and various examples of hunting for PM to be used as bait for monitor and snake traps, bushmeat and the pet trade were brought up.

8. Infrastructure development. This pertains to the construction of roads, human settlements and other associated "barriers" to PM movement. This includes noise pollution from boats and human settlements, as well as usage of waterways for human traffic.

9. Socioeconomic activities of local people, e.g. firewood collecting, slash and burn agriculture.

10. Bushmeat cultural transmission: initially PM were hunted by Dayak as a food source; however with transmigration of Javanese to Kalimantan, Javanese have also adopted the practice of hunting PM for food. Hunting by Dayak is done with dogs and Pak Arif related how a troop of 60 PM was hunted and killed during a drought season.

We further refined our categories by grouping issues with similar root causes, and simultaneously prioritized them in decreasing level of impact on PM populations.

Priority Issues

1. Resource space conflict with humans: This includes the items discussed earlier as well as socioeconomic activities of local people.
2. Hunting: This includes trapping and killing PM for bait, bushmeat, pet trade and also bushmeat cultural transmission
3. Infrastructure development
4. Systemic accumulation of toxic compound to the habitat and PM: From the mining tailing
5. No regulation for tourism activities
6. Lack of SOP for tourism activities and awareness materials (2 & 3 combined together)
7. Lack of research on human – PM interaction

The group next examined the goals needed to overcome the prioritized issues, and came up with relevant action plans as well as the timeline, parties involved in implementing the action plan and also resources required. We defined timeline as how soon the action plan can be reasonably implemented and came up with 3 categories; short: 1 to 2 years, mid: 3 to 5 years, and long: 5 to 10 years.

The action plan is arranged according to Prioritized Issues, followed by Goals associated with each issue, and then by the Action Plan associated with each Goal in decreasing order of priority.

The group takes the responsibility to deliver the completed Proboscis Monkey PHVA report and accompanying documents to the key coordinators that have been indicated in the tabulated Action Plans below.

Dr. J. Sugardjito, through Fauna & Flora International, will assist with the administration of West Kalimantan.

Dr. A. Soendjoto, through Lambung Mangkurat University will assist with the administration of South Kalimantan.

Table 1. Prioritized issues, goals and action plan for local community issues relating to proboscis monkey conservation.

ISSUE 1: Resource and space conflict with humans						
No	**Goals**	**Action plan**	**Indicators of Success**	**Timeline**	**Parties involved**	**Resources needed**
1	**Goal 1:** Creation of land use system that harmonizes with PM habitat.	**Action Plan 1:** Develop forum at the district level to integrate important PM habitats into land use plan	1. All stakeholders commit, and sign an agreement, to implement a land use system that takes into account the PM habitat. 2. An integrated land use plan system to conserve PM habitat is produced.	Short	Local governments, Ministry of Public Works, Ministry of Home Affairs, adat institutions, Regional Planning Agency BAPPEDA (the key coordinator).	-Existing land use plan -Associated data and information - PHVA results and report
		Action Plan 2: Rotation of crop management into a block system. This is an important issue as PM now live in and around rubber plantations. Farmers currently practice a system that involves completely felling large tracts of rubber plantations, and other crops such as rice are planted here for the next two years. This effectively destroys the PM habitat and forces them to move elsewhere. What is recommended is to fell various blocks of rubber trees at various intervals to allow PM to remain within the same habitat area.	1. Farmers agree and the system is implemented.	Short	Crop estate, community-based organizations (CBO), local NGOs (the key coordinator)	-Data on crop yield -Land ownership information
2	**Goal 2:** Establishment of community based reserves around temporary waterbody (“Baruh”). This follows a similar system already in place whereby the community protects a water body such as a lake, referred to as a “reserve” for fishing and community use. In the rubber plantations, there are	**Action Plan 1:** Identify the locations of “baruh” in and around rubber plantations (temporary water bodies) **Action Plan 2:** Influence community leaders and private landowners to accept the idea. **Action Plan 3:** Establishment of community forum to control the implementation of “baruh” system	1. System “baruh” reserves is established and managed well. 2. Reduced rubber crop raiding by PM (because PM prefer to be in and around the “baruh” area)	Short	Community and universities (the key coordinator)	-Land owner mapping -Research grant

	numerous low ground areas that accumulate water and are not used by the farmers as crop land called "baruh". These "baruh" are temporary, and in certain areas can be found between 200 and 300 meters from one another. PM frequently use and rest around these "baruh", which have good vegetation growth and low human disturbance. The main plant around "baruh" is *Sizigium stapfiana*, which is fed upon by PM. When the "baruh" dries up, PM will move to another "baruh" location.					
3	**Goal 3:** Creation of zonation areas within Protected Areas (PA) through community participation Rivers in PA are used by the local communities and with the implementation of zonation areas, communities can still use the rivers, but the PM habitat will not be disturbed.	**Action Plan 1:** Habitat analysis and biodiversity assessment of Protected Areas frequently used by PM. **Action Plan 2:** Participatory mapping	1. Zonation system established by local the community	Mid	Conservation Agency (BKSDA), local community, local university, local NGO, National Parks Department (the key coordinator)	-Existing land use map (RTRWP)
ISSUE 2: **Hunting**						
4.	**Goal 1:** Increase community understanding on the status and value of PM for their livelihood	**Action Plan 1:** Public awareness program inserted into formal and informal education **Action Plan 2:** Preparation of educational awareness materials	1. Community perception of PM improved 2. PM included into the school syllabus as local content and context	Short	Ministry of education, media, NGO (the key coordinator)	-Information on biology of PM -State regulations on protected species, -Sponsorship from private sector

		Action Plan 3: To conduct Knowledge, Attitude and Perception Survey (KAP Survey) on PM **Action Plan 4:** Regular campaigns in public places such as community center (balai desa)				
5.	**Goal 2:** Reinforce traditional laws which protect PM	**Action Plan 1:** Study and review existing traditional regulations **Action Plan 2:** Establish community-based patrol units led by "polhut" (Polis Hutan) (Forestry Dept) to strengthen law enforcement in the district land **Action Plan 3:** Socialization of traditional regulations **Action Plan 4:** Regular campaigns in public places such as community centre (balai desa)	1. Traditional laws acknowledged and implemented 2. Reduction in frequency of hunting by outsiders	Short	Community leaders, local NGO Anthropological departments of universities	-Existing traditional regulations
6.	**Goal 3:** Establishment of Conservation Community for PM	**Action Plan1:** Conduct a review and assessment on community that derives income primarily through hunting of natural resources. **Action Plan 2:** Facilitated community dialogue on conservation issues of PM **Action Plan 3:** Develop conservation program to reduce killing PM	1. The formation of community conservation institution. 2. Community is involved in protection of PM 3. "Hunters" are able to derive alternative income	Short	Universities, local government community leaders and NGO (the key coordinator)	-Institutional tools and resources (for Human Resource)

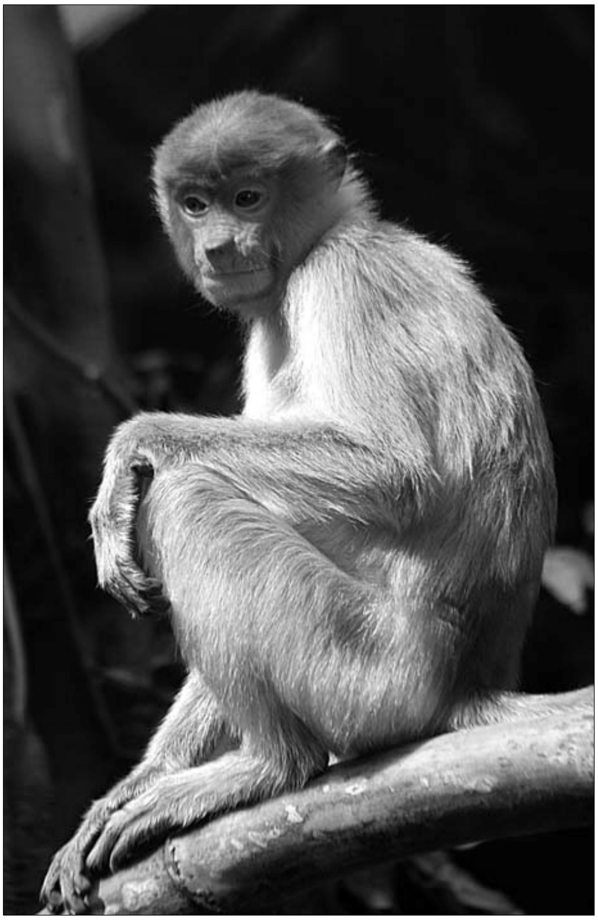
ISSUE 3: **Infrastructure development**						
7.	**Goal 1:** Reconnect isolated PM habitats through community reforestation initiatives	**Action Plan 1:** Identify potential location in PM habitat for reforestation initiative. **Action Plan 2:** Identify suitable plants that can be used for reforestation and make seedlings available **Action Plan 3:** Influence community through active dialogue to participate in forest rehabilitation program **Action Plan 4:** Enforce state regulations on protected areas along or around water bodies	1. Isolated/fragmented habitats are connected	Mid	Dept of Forests, Forestry service, Community groups, universities, private sector, NGO (the key coordinator)	-Maps of fragmented area -Seedlings stock -Fertilizer -Sponsorship
8.	**Goal 2:** Reduce road kills of PM	**Action Plan 1:** Install traffic signs to protect PM movement between habitats with currently known road kills **Action Plan 2**: Identify fragmented PM habitat areas with highest number of PM crossings **Action Plan 3:** Set up monitoring program for PM road kills **Action Plan 4:** Socialization of the sign through media	1. Reduced number of road kills	Short	Transportation agencies, logging companies, media, police dept (the key coordinator)	
ISSUE 4: **Systemic accumulation of toxic compounds**						
9.	**Goal 1:** Improve law enforcement (for both illegal mining and tailing disposal)	**Action Plan 1:** Establish community patrol units in collaboration with the police and forest rangers.	1. Reduction in toxic levels in major rivers close to the high PM population	Short	Local universities, local environmental departments of local governments BAPEDALDA (the key coordinator)	-Existing regulations -Standards of threshold toxic levels

		Action Plan 2: Implement reward and punishment through traditional regulations. **Action Plan 3:** Socialization of regulations on environmental pollution **Action Plan 4:** Initiate and sustain awareness program on toxic effect of tailing compounds. **Action Plan 5:** Regular monitoring on toxic levels of rivers in habitats with high PM population.				- PM distribution map
10.	**Goal 2:** Stop water pollution	**Action Plan 1:** Regular campaigns on effects of environmental pollution. **Action Plan 2:** Identify and register illegal miners, to be offered training for alternative income activities	1. Reduce mining activities	Mid	Local governments, regional planning agencies (BAPPEDA), local community, media, local NGOs (the key coordinator)	-Mapping of illegal mining activities
ISSUE 5: **No regulation for tourism activities + lack of SOP for tourism activities and awareness materials**						
11.	**Goal 1:** Establish ecotourism rules and regulations to minimize impact on PM habitat, behavior and health	**Action Plan 1:** Conduct study on vigilant behavior of PM **Action Plan 2:** Produce eco-tourism rules and regulations **Action Plan 3:** Produce guidelines for tour agencies and tourists. **Action Plan 4:** Train local people to become guides and boat drivers	1. Formal rules and regulations being implemented 2. Eco-tourism activities conducted to promote conservation of PM 3. Increased income of local people through eco-tourism	Mid	Community, universities, tourism agencies, Dept of Tourism, local tourism NGOs	-Funding and sponsorships -Experienced trainers to train local people on touring and boating

		Action Plan 5: Set up monitoring and evaluation program of eco-tourism impact **Action Plan 6:** Production of awareness material				
ISSUE 6: **Lack of research on PM-human interaction**						
12.	**Goal 1:** Establishment & management of database on PM behavior and ecology, disease transmission and physiology	**Action Plan 1:** Conduct research on behavior change observed in PM at frequently visited areas **Action Plan 2:** Collection of data and reports on disease transmission to PM from zoos **Action Plan 3** Collection of data and reports on physiological studies of PM from zoos **Action Plan 4:** Establishment of local research group and development of associated regional and international network on PM	1. Data and information collected and published 2. Data and information being used for ecotourism management	Short	Zoos, universities (the key coordinator)	-Funding and sponsorships

Indonesian Proboscis Monkey PHVA

Cisarua - Bogor, West Java, Indonesia
4 - 6 December 2004



FINAL REPORT

SECTION 5

Ex Situ Management Working Group Report

Ex Situ Management Working Group Report

Members: Sammy Prugsamatz, Endang Budi Utami, Ligaya Tumbelaka, Daraka Tongthainan, Hiroshi Hori, Sharmy Prastiti, Noor Fhriziningsihs, Fathul Bari, Mimi Utami, Hiroyuki Nishimura, Chellaiyaia (Sam) Alagappasamy, G. Agoramoorthy, Tri Wahjono, Yohana Tri Hastuti, Bernard Harrison, Jansen Manansang, Karn Lekagul, Kristin Leus (facilitator).

Goals for the *Ex Situ* Population of Proboscis Monkey (PM)

In order for an *ex situ* breeding program to be managed efficiently and appropriately, it is important that clear goals for the program are stated and agreed upon by all participants. After all, one has to know what one wants to achieve before one can work on the methods for achieving the objectives.

The participants of the working group identified the following goals for the captive population of PM:

Main goals for the captive population of proboscis monkeys

1. **To develop a long term conservation program for the proboscis monkey, which can be used as a model for species that are difficult to keep in captivity, emphasizing the genetic, physical and behavioral wellbeing of the species with the long-term aim of possible reintroduction.**

2. **To display proboscis monkeys in sufficient zoos to demonstrate that the species can be bred and displayed for public education programs.**

3. **To breed sufficient proboscis monkeys:**
   - **to ensure animals are not unnecessarily taken from the wild.**
   - **so that *ex-situ* and *in-situ* links can be promoted.**
   - **so that the exhibits can be used as zoo attractions & expertise, materials and animals can be exchanged.**

Reintroduction as a goal was discussed by the group, but it was deemed not to be an urgent requirement in the near future. However, it was deemed to be important that the *ex situ* population of PM should be maintained with the highest genetic diversity possible for possible reintroductions in the future, should that be required/possible.

Main Problems for *Ex Situ* Management of Proboscis Monkey (PM)

The first discussion of the PM *ex situ* population management working group focused on the identification of the main problems faced by institutions keeping PMs in captivity.

The long list of problems mentioned could be grouped into six categories. These six problems were then ranked by the working group as follows:

1. Lack of knowledge
2. Insufficient communication between *in situ* and *ex situ* organizations
3. Insufficient zoo standards

4. Lack of genetic management
5. Lack of money
6. Lack of education programs on PM conservation

The ranking was carried out using the "dot method": each group member received 3 dots, and put them next to the 3 issues they thought were most important. The facilitator tallied the dots next to each issue and assigned the rank.

After the ranking, the group then more carefully described the problems as issues, looked at each issue in turn and identified goals to answer the problem. For each goal actions to achieve the goal were listed, including persons responsible, timelines, resources needed etc.

Issues/ Goals/Actions

Issue 1: *There is a lack of knowledge about husbandry - mainly diet, exhibit design and veterinary care - and insufficient forums for sharing and disseminating information. (Key Word: KNOWLEDGE)*

Goals:

1. *To increase knowledge in husbandry, exhibit design, dietary and in situ information relevant to preserve a viable captive population for long term conservation and possible reintroduction.*

2. *Increase and strengthen communication between zoos and other captive facilities to impart knowledge and increase cooperation and improve management*

    Action:

    1. To form the Proboscis Monkey Conservation Group (PMCG).

        The PMCG was first proposed to represent zoos with PMs. Later the group decided that there should also be representatives from *in situ* conservation: government forestry officials, representatives of LIPI and APAPI and field researchers.

        The PMCG will be an advisory group composed of one representative of each zoo that has proboscis monkeys in their collection (currently Ragunan, Bandung, Yogyakarta, Surabaya, Taman Safari Indonesia (TSI) and Singapore Zoo) + representatives from other captive facilities who have PMs + representatives from forestry department both for *in situ* and *ex situ* + representative(s) of LIPI + representative(s) of APAPI (Indonesian Primatological Society) + field researchers. The Chairman of the group should be appointed at the first meeting of the group.

        The PMCG should meet a minimum of once per year in Indonesia in conjunction with the annual meeting of PKBSI (Indonesian Zoological Parks Association).

        The tasks of the PMSG are to ensure the production and publication of a husbandry manual, facilitate communication, discuss management plans and transfers, identify knowledge gaps and conduct appropriate research, workshops and training.

Surabaya Zoo (previously appointed by PKBSI as the zoo to hold the studbook for proboscis monkey) appointed *Lita Sari and Sri Pentawati as studbook keepers*. They will produce the first studbook by 1 May 2005.

The news of the appointment by Surabaya Zoo of the actual staff members responsible for compilation of the studbook and coordination of the breeding program was only received on the last day of the workshop. Before this news was known, G. Agoramoorthy had offered to function as the temporary breeding program coordinator and studbook keeper, on behalf of TSI, PKBSI and SEAZA (South East Asian Zoo Association), until Surabaya Zoo could appoint (a) person(s) to take up this task.

G. Agoramoorthy will make sure a first meeting of the PMCG is organized.

Issue 2: ***There is a lack of communication between ex situ and in situ institutions and a lack of opportunities to interact to develop strategies to conserve proboscis monkeys (Keywords: EX-SITU and IN-SITU LINKS)***

Goal: *Fostering relationships and trust between ex situ and in situ institutions to develop shared strategies to preserve PMs.*

Actions:

1. Invite officials from *in situ* organizations for all zoo-related events, e.g. workshops, regional/international conferences. *G. Agoramoorthy will speak to Jansen Manansang*.

2. Solicit invitations from *in situ* institutions in order for zoos to be present at *in situ* related meetings. *Ask Tri Wahjono*.

3. Send zoo-related publications to forestry. *SEAZA already does this.*

4. Strengthen personal relations with *in situ* institutions. *It is the responsibility of everyone to do this at every possible opportunity*.

Issue 3: ***There is a lack of zoos with good standards and a suitable climate for PMs. Zoos in temperate areas have the standards but lack the climate (i.e. daily fresh browse), whereas zoos in the tropics have the climate but lack the quality of housing and care. (Key Word: ZOO STANDARDS)***

The group believes that the PM is a unique animal which would make an interesting exhibit for the public in many zoos. However, western zoos were not successful in keeping PMs because of lack of understanding of diet and availability of fresh browse. Meanwhile some zoos in range countries should improve their standards for keeping PMs.

Goal: *To identify and assist zoos in the tropics which can maintain standards for PM*

Actions:

1. Once established, get the PMCG recognized by PKBSI, SEAZA, PHKA and relevant authorities in Singapore.

- *Chellaiyaia (Sam) Alagappasamy will speak to relevant authorities in Singapore*
- *G. Agoramoorthy will form the link to SEAZA*
- *Endang Budi Utami will form the link to PKBSI*

2. At the first meeting of the PMCG agree on working regulations to be followed by current and new members. This includes advising zoos on what to do when they hear of PM held by private people (PHKA is represented in PMCG).
   - *Action for PMCG*
   - Zoos are often donated abandoned pet PMs from private owners. But Indonesian law does not permit the zoo to legally accept the monkey. All such animals must be sent to the rescue centers. Indonesian rescue centers are licensed by the forestry department and run by NGOs. So standards vary from institution to institution. *PMCG will try to assist to raise the standards of rescue centers to good levels.*

3. PMCG to first help existing zoos with PM to reach the agreed standard.
   - *Action for PMCG*

4. Once established, announce the existence of the PMCG to WAZA and SEAZA and announce that new zoos interested to hold PM can contact the PMCG who will work with them to make sure they can reach the standards. (No new animals will be actively acquired from the wild. New zoos interested in keeping PMs must meet the standard requirements set by PMCG in order to receive animals.)
   - *Jansen Manansang, Dr. Agoramoorthy, Bernard Harrison*

Goal: *To set professional standards for maintaining PM in captivity.*

Actions:

1. Announce the making of a husbandry manual for PM at the PKBSI meeting on 13 December and ask the zoos currently holding PM to compile the husbandry information from their own institutions and send this to PKBSI. (The working group believes that every bit of information is valuable. An institution that has just one animal might be successful in keeping the animal in good health for a long life. So each individual institution should explain in writing how the PM is kept.)
   - *Endang Budi Utami will make sure this is on the PKBSI agenda*

2. Singapore zoo to collect husbandry information from their institution and send to PKBSI.
   - *Chellaiyaia (Sam) Alagappasamy will collect and send the Singapore husbandry data*

Issue 4: *The lack of a regional, zoo based specialist group leads to inbreeding and a lack of genetic management. (Key Word: GENETICS)*

Goal: *To create a proper data recording system.*

***Actions*:**

1. Assign a person in each zoo to compile the data of that zoo and send these to the studbook keeper by fax and mail.

- *PKBSI has already asked zoos to assign people for the transfer of data*
- *Chellaiyaia (Sam) Alagappasamy will do this for Singapore Zoo*

2. Presently only one zoo in Indonesia uses the ISIS software SPARKS. Contact ISIS to provide SPARKS to non-ISIS zoos in Indonesia.
   - *Bernard Harrison will remain in contact with ISIS*

3. Develop and send a data collection form to each zoo.
   - *Lita Sari* (*Surabaya Zoo*) *will design and send the data form.*

4. Help Lita Sari and Sri Pentawati (the studbook keepers) get proficient in SPARKS.
   - Sri Pentawati has already attended a SPARKS course, but if necessary can get help from TSI.

5. Make sure every animal is identified by microchip or tattoo.
   - *PHVA participants of the zoos with PM to bring this message to their own zoo.*

Goal: *To set up an international specialist group to help maintain population size, prevent inbreeding, do genetic management, make recommendations about transfers and advise zoos on husbandry of PM.*

Action:

1. See Issue 1: Creation of the Proboscis Monkey Conservation Group.

Issue 5: *In many range country zoos there is a lack of funding for breeding and display programs. (Key Word: MONEY)*

Goal: *To generate funds for zoos that requires money to breed and display PMs.*

Actions:

1. Set up a PM Fund, managed by SEAZA and with recommendations from the PMCG as to how the money should be spent. The fund should also support *in situ* conservation.
   - *PMCG will work out the technicalities of setting up the fund.*

2. Organize adoption of PM in zoos.
   - *Jansen Manansang to talk to zoo directors during PKBSI meeting on* 13 *December.*

3. Encourage temperate zoos that are interested in keeping PM to already financially support range country zoos through the PM Fund.
   - *PMCG*

4. Present and popularize PM on TV and in press.
   - *Jansen Manansang will make sure PKBSI makes a press release that will be sent to each zoo so they can pass it to their local media.*
   - *Bernard Harrison will talk to Animal Planet.*

5. Design and create PM souvenirs by SEAZA and distribute to SEAZA zoos and zoos in other regions.
   - *Chellaiyaia (Sam) Alagappasamy will talk to Marketing people in Singapore zoo for the use of existing designs.*
   - *Singapore Zoo to send designs to Indonesia for manufacture of souvenirs.*
   - *Design to be approved by PMCG.*
   - *Send souvenirs to zoos on consignment* (*payment after sale*).

Issue 6: ***There is a lack of public awareness and educational programs for both the public, politicians, policy makers and senior zoo management. (Key Word: EDUCATION)***

Goal: *To create public awareness programs and education programs for the public, politicians, policy makers and senior zoo management.*

Actions:

1. Include the PM in the existing conservation education programs in the current zoos with PM.
2. Train some science teachers on PM.
3. Organize token feedings/keeper talks in the zoos.
4. Make posters (use funds from PM Fund).
5. Design good education material (leaflets, posters etc) that can be used in communities and schools in Kalimantan.
   - *For Actions* 1-5: *Provide and present a summary of the PHVA and the ex situ working group report in Bahasa to the zoo directors at the meeting of PKBSI on* 13 *December. The directors may instruct their education departments.*
   - *Ami from TSI will give the English report to the PKBSI secretariat for translation.*

6. Work with local government to distribute info on PM to local people and schools.
   - *PHKA, BKSDA and national parks together with the zoos.*

7. Organize workshops in local community range area.
   - *BKSDA in South Kalimantan*

8. In South Kalimantan, the PM is the provincial symbol. Invite the governor of South Kalimantan to hold a seminar on the PM in South Kalimantan and to invite the governors of the other provinces.
   - *Pak Ambar from BKSDA Kalimantan Selatan will ask the regional forestry agency.*

9. Include information about wild population in education material.
   - *Use published sources and encourage PHKA to do census research.*

Indonesian Proboscis Monkey PHVA

Cisarua - Bogor, West Java, Indonesia
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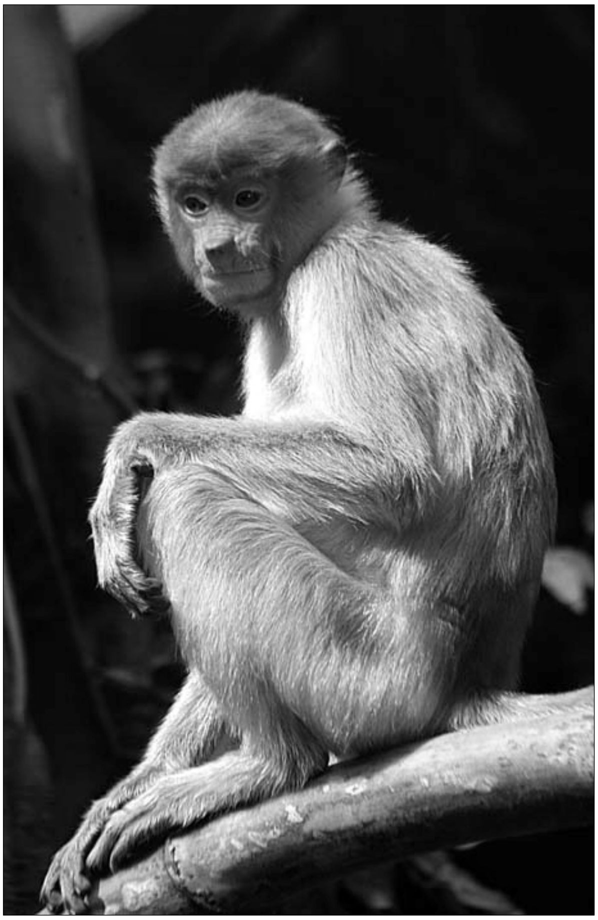


FINAL REPORT

APPENDIX I
Workshop Participants and Welcoming Addresses

PHVA Workshop Participants

Heather Leasor
Australia National University
AUSTRALIA

Kristin Leus
CBSG Europe/Royal Zool. Soc. of Antwerp
BELGIUM

Hiroshi Hori
CBSG Japan
JAPAN

Hiroyuki Nishimura
Yokohama Zoo
JAPAN

Fathful Bari
Bandung Zoo
INDONESIA

Niken Wuri Handayani
BKSDA West Kalimantan
INDONESIA

Haryanto R. Putro
Bogor Agricultural University-IPB
INDONESIA

Ligaya Tumbelaka
Bogor Agricultural University-IPB/TSI
INDONESIA

Jatna Supriatna
Conservation International
INDONESIA

Antong Hartadi
Directorate Flora Fauna Conservation
INDONESIA

Tri Wahyono
Directorate Flora Fauna Conservation
INDONESIA

Udin Subagyono
Ex-Situ Conservation Division, Forestry Dept.
INDONESIA

Enny Sudarmonowati
Fauna & Flora International-IP/LIPI
INDONESIA

Ambar Dwiyono
Forestry Department, South Kalimantan
INDONESIA

Kurnia Rauf
In-Situ Conservation Division, Forestry Dept.
INDONESIA

J.Garjito
LIPI/FFI
INDONESIA

Wibisono
Fauna & Flora International (FFI)
INDONESIA

Sofian Iskandar
Litbang Kehutanan
INDONESIA

Entang Iskandar
Primate Research Center, IPB
INDONESIA

M. Syamsul Arifin Zein
Pusat Penelitian Biologi-LIPI
INDONESIA

Mimi Utami
Ragunan Zoo
INDONESIA

Litasari
Surabaya Zoo
INDONESIA

Ismanto
Taman Safari Indonesia
INDONESIA

Jansen Manansang
Taman Safari Indonesia
INDONESIA

Retno Sudarwati
Taman Safari Indonesia
INDONESIA

Sharmy Prastiti
Taman Safari Indonesia
INDONESIA

Tony Sumampau
Taman Safari Indonesia
INDONESIA

Yohana Trihastuti
Taman Safari Indonesia
INDONESIA

Ivan Chandra
Taman Safari Indonesia II Prigen
INDONESIA

Endang Budi Utami
TMII Birdpark
INDONESIA

Mochamad Arief Soendjoto
University of Lambung Mangkurat
INDONESIA

Iwan Willyanto
University of Airlangga
INDONESIA

Noviar Andayani
Wildlife Conservation Society
INDONESIA

Noor Fitrianingsih S.
Yogyakarta Zoo
INDONESIA

A. Setiawan
INDONESIA

Agustinus Taufik
Directorate Flora Fauna Conservation
INDONESIA

Pudji Pratjihno
BKSDA West Kalimantan
INDONESIA

Bambang Darmadja
Tanjung Puting National Park, Kalimantan
INDONESIA

Yohanes Sudarto
BKSDA Kalimantan Tengah
INDONESIA

R. Harmidi C
BBB Raya National Park, Kalimantan
INDONESIA

Muniful
BKSDA DKI Jakarta
INDONESIA

Mudji Astuti
BKSDA DKI Jakarta
INDONESIA

B.P. Setiohindrianto
Gunung Palung National Park, Kalimantan
INDONESIA

Agus Budiono
Kutai National Park, Bontang
INDONESIA

Aep
Kutai National Park, Bontang
INDONESIA

Dody Setiabudi
Loka Litbang Primata
INDONESIA

Indra Exploitasia
Directorate Flora Fauna Conservation
INDONESIA

J. Sugarjito
INDONESIA

C. Alagappasamy (Sam)
Singapore Zoo
SINGAPORE

Biswajit Guha
Singapore Zoo
SINGAPORE

Bernard Harrison
BH & Friends, Singapore
SINGAPORE

John Sha Chih Mun
Singapore Zoo
SINGAPORE

Hang Lee
Seoul National University
SOUTH KOREA

G. Agoramoorthy
National Sun Yat-sen University
TAIWAN

Karn Lekagul
Dusit Zoo
THAILAND

Sammy Prugsamatz
AWC Thailand
THAILAND

Daraka Tongthainan
Khao Kheow Open Zoo
THAILAND

David Reed
CBSG/University of Mississippi
USA

Kathy Traylor-Holzer
IUCN Conservation Breeding Specialist Grp
USA

Welcome Speech

Drs. Jansen Manasang, MSc.
President SEAZA, CBSG Indonesia Convenor, PKBSI

Cisarua, 2 December 2004

Good morning and welcome to:

- The Director General of PHKA, Director of Biodiversity Conservation and staff
- The Indonesian Research Center, LIPI
- Representatives of the Indonesian Zoo Association (PKBSI)
- Forestry officers from BKSDA and National Park from Kalimantan National
- My colleagues from Singapore, Thailand, Taipei, Korea, Japan, and Ragunan, Bandung, Gembira Loka, Surabaya zoo, Kathy from CBSG/SSC/IUCN, Dr. Hori-CBSG Japan, David Reed, Kristin Leus, and others
- Researchers form IPB, Airlangga University, Lampung Amangkurat, Nasional University, FFI, CI, Birdlife International and other organizations.

Today we are lucky to have been given the challenge of holding the CBSG Processes Training on 2-3 December followed by a Proboscis Monkey PHVA workshop on 4-6 December 2004.

As you know, CBSG is part of the IUCN. It has over 10 years of experience in developing, testing, applying and teaching scientifically based tools for risk assessment and decision-making in the context of *in-situ* and *ex-situ* species management. One of the tools used by CBSG is the PHVA.

The Population and Habitat Viability Assessment workshop process is used to assist in the development of a strategic recovery plan for a threatened species and its habitat. Computer models are used to evaluate current and future risk of population decline or extinction under alternative management scenarios.

The recommendations from a PHVA workshop are to be used as guidelines, strategies, and master plans for each region. Workshops carried out in Indonesia have been those on Sumatran tigers, Sumatran rhinos and Sumatran elephants.

As mentioned in the SEAZA Future 2005 document, in the future SEAZA aims to conduct its own PHVAs, especially for SEAZA flagship species.

This is an enormous challenge and means a lot of hard work and a big financial investment, but SEAZA – in partnership with CBSG and the Indonesian Zoo Association – recognizes the vital importance of this significant step.

Thank you to all of you who are supporting this program and, therefore, helping SEAZA take this huge step forward.

Keynote Speech

Koes Saparjadi
Director General of Forest Protection and Nature Conservation, Republic of Indonesia
Delivered on his behalf by Widodo Ramono, Forest Protection and Nature Conservation

Cisarua, 2 December 2004

Distinguished delegates, experts, researchers, managers, observers, ladies and gentlemen,

I am delighted to be here at Safari Park Hotel – Cisarua, to speak on behalf of the Directorate General of Forest Protection and Nature Conservation and present my keynote address for a Training of Trainer for PHVA Workshop and PHVA Workshop for the Proboscis Monkey (*Nasalis larvatus*). I am personally honored that I have been given the privilege and opportunity to welcome you to this important workshop.

At this juncture, I would like to express my sincere appreciation to SEAZA, CBSG and PKBSI for making this valuable workshop possible.

As we are all aware, Indonesia is one of the richest countries in biological resources in the world with its diverse and unique flora and fauna. There are 37 species of primates in Indonesia distributed in various habitats, in particular in lowland areas. Only two species of these Indonesian primates are not currently protected.

One of these protected primate species is the proboscis monkey that locally we call *bekantan* or *monyet belanda*, which means Dutchman monkey, referring to the big and long nose this species has. As you must have been aware, under the IUCN criteria this species is categorized as an endangered species and can only be found on the island of Borneo (Indonesian Kalimantan and Malaysian Sabah and Sarawak).

The exact population of the species is unknown, but local surveys, such as in Tanjung Putting National Park and Pulau Kaget (Central and South Kalimantan) Nature Reserves, has shown the population decline. This declining population may be attributed to habitat loss or habitat destruction for other purposes, such as agriculture.

Because the animal consumes exclusively on leaves of plant species dominating mangrove ecosystem (more than 90% of the diet is the leaves of rambai, *Sonneratia caseolaris*) the animal is susceptible to extinction caused by habitat destruction or habitat loss. It is then known that the existence of this species can be the indicator of the environment and habitat quality. The low capacity to breed naturally in the wild is not supported by its ability to breed in captivity. The species is known to be difficult to breed in captivity. No zoos or captive breeding operation has reported success in the captive breeding of this species.

Therefore, the highest priority for the conservation of this endemic primate in the wild is to secure and protect all remaining habitats in the forms of protected areas. The second priority is to develop conservation management goals and intervention strategies for the endangered species, including among others through captive breeding programs for the reinforcement and recovery of wild populations.

Distinguished participants, ladies and gentlemen,

PHVA workshop has been organized many times here in this place for many species for the last two decades. Now again, we convene here to undertake a PHVA workshop for the proboscis monkey, a species which does not receive sufficient attention, at least compared with its relative the orangutan. This is why information on the biology of this species is not that much. The PHVA we are about to undertake is very much useful to compile scattered information into one compilation, and analyze these information to distinguish and predict what is going to happen to the species in the near or long future.

I am entirely convinced that PHVA can be a useful tool to facilitate decision making process based on knowledge and information from biologist, park managers, zoo managers, and other knowledgeable people. This workshop will be able to identify management intervention which needs to be applied to the species. It will also be useful if the workshop can provide practical recommendations to the government, scientists, and probably non-government organizations on “who-should-do-what” within a framework of conservation strategy and action plan for the species. On this basis, we can do together, in accordance with our authority, to conserve the species.

I am also happy to see that, we also organize a PHVA Training of Trainer workshop, back-to-back with the PHVA workshop on the proboscis monkey. So that the knowledge in utilizing the tools can be transferred to other people. Therefore I hope we can undertake the PHVA workshop more frequently in the future.

Distinguished participants,

Finally, I wish you all a fruitful discussion that will fulfill the aims of this workshop and I also wish you a pleasant stay here in Safari Park with its beautiful landscape and warm environment and hope that you have some time to savor the sights, food and shopping around the Cisarua area.

Keynote Speech

Dwiatmo Siswomartono
Caretaker Chairman, PKBSI

Cisarua, 2 December 2004

Sdr. Direktur KKH,
Sdr. President of SEAZA,
Para Hadirin yth,
Assalam'ulaikum warachmatullahi wa barokatuh.
Salam sejahtera bagi kita semua.

Pertama, saya perlu memberitahukan bahwa Ketua Umum PKBSI Bp. Ir. Loekito Daryadi telah mendahului kita menghadap sang Khalik pada tgl. 6 Nopember 2004 yang lalu. Sementara mengisi kekosongan jabatan Ketua Umum PKBSI oleh Dewan Pembina saya telah ditunjuk untuk melaksanakan tugas Ketua Umum PKBSI sampai Munas.

Ke dua, karena masih bulan Syawal perkenankan kami menyampaikan selamat Idul Fitri dan mohon saling bermaafan bila kita mempunyai kekhilafan.

Ke tiga PKBSI menyambut gembira diselenggarakannya training pada trainer PHVA workshop ini. Sebagai kita maklum, program kerja SEAZA antara lain adalah penyelenggaraan PHVA workshop untuk flagship species yang terancam punah di regional kita, oleh kita sendiri.

Untuk melaksanakan workshop tersebut tentu saja diperlukan keahlian dan wawasan yang luas akan pentingnya konservasi. Training ini akan memberikan pelatihan kepada calon penyelenggara workshop PHVA oleh tenaga ahli dari CBSG/SSC/IUCN. Dengan diberikannya latihan dan praktek penyelenggaraan PHVA workshop Bekantan (*Nasalis larvatus*) kami yakin selesai mengikuti training ini kita mampu menyelenggarakan PHVA workshop atas satwa langka kita sendiri-sendiri, atau paling tidak bekerja sama di regional kita.

Kepada Presiden SEAZA, CBSG Indonesia khususnya, CBSG/SSC/IUCN, dan Taman Safari Indonesia, saya ucapkan terima kasih atas kerja samanya sehingga training ini dapat dilaksanakan.

Selamat mengikuti workshop semoga memperoleh hasil maksimal.

English translation:

First of all, I would like to inform you all that Mr. Loekito Daryadi, the previous Chairman of PKBSI, has passed away on 6 November 2004. To avoid vacancy, therefore, the chairman of the Advisory Board assigned me, Dwiatmo Siswomartono, to carry on the chairmanship up to the coming National Congress.

Secondly, within this Lebaran month, I convey Selamat Idul Fitri and apology to whom who celebrate.

Thirdly, PKBSI fully appreciates the training of trainer for PHVA workshop, which will be started today. As we are aware, one of the SEAZA action plans is to conduct PHVA workshops of our endangered flagship species by ourselves.

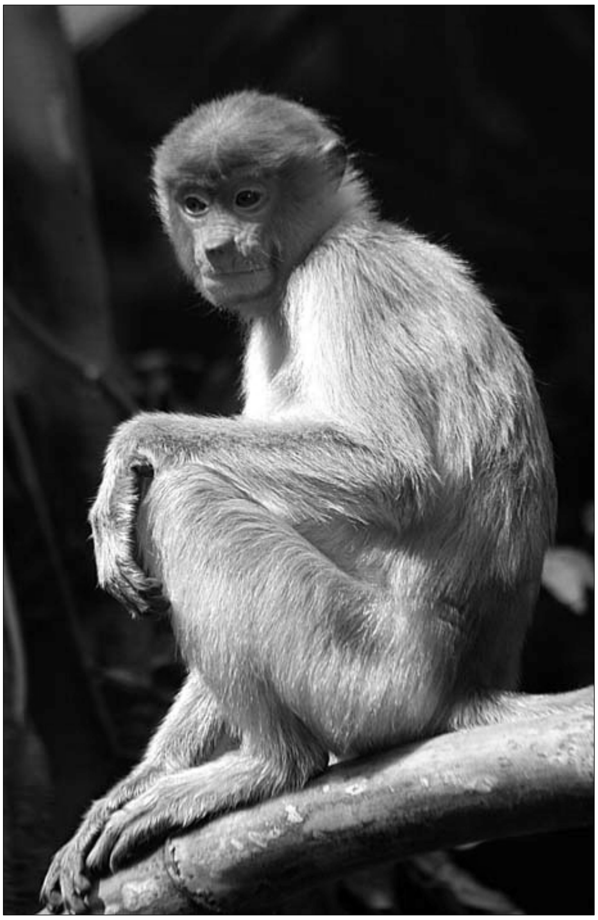
To work on the workshop, of course, we need skills and orientation of our mindset to the importance of conservation. Today's training and workshop by expert facilitators from the headquarters of CBSG/SSC/IUCN will enrich us, the SEAZA member, with knowledge and know-how on how to conduct PHVA workshops in the future. Furthermore, by attending the PHVA workshop on Bekantan (*Nasalis larvatus*), as a case study, I am sure we will have capabilities to conduct similar workshops on our endangered flagship species by ourselves as well as by cooperation among us in the region.

To the President of SEAZA, CBSG both headquarters and Indonesia, and Taman Safari Indonesia, I express my sincere thanks and appreciation for the cooperation that makes this workshop possible.

Have a good workshop, and hopefully have fruitful results.

Indonesian Proboscis Monkey PHVA

Cisarua - Bogor, West Java, Indonesia
4 - 6 December 2004



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APPENDIX II
Introduction to CBSG Processes

CBSG Workshop and Training Processes

Information on capabilities of the IUCN/SSC Conservation Breeding Specialist Group

Introduction

There is a lack of generally accepted tools to evaluate and integrate the interaction of biological, physical, and social factors on the population dynamics of threatened species and populations. There is an urgent need for tools and processes to characterize the risk of species and habitat extinction, on the possible impacts of future events, on the effects of management interventions, and on how to develop and sustain learning-based cross-institutional management programs.

The Conservation Breeding Specialist Group (CBSG) of IUCN's Species Survival Commission (SSC) has more than 15 years of experience in developing, testing and applying a series of scientifically based tools and processes to assist risk characterization and species management decision making. These tools, based on small population and conservation biology (biological and physical factors), human demography, and the dynamics of social learning are used in intensive, problem-solving workshops to produce realistic and achievable recommendations for both *in situ* and *ex situ* population management.

Our workshop processes provide an objective environment, expert knowledge, and a neutral facilitation process that supports sharing of available information across institutions and stakeholder groups, reaching agreement on the issues and available information, and then making useful and practical management recommendations for the taxon and habitat system under consideration. The process has been remarkably successful in unearthing and integrating previously unpublished information for the decision-making process. Their proven heuristic value and constant refinement and expansion have made CBSG workshop processes one of the most imaginative and productive organizing forces for species conservation today (Conway 1995; Byers and Seal 2003; Westley and Miller 2003).

Integration of Science, Management, and Stakeholders

The CBSG PHVA Workshop process is based upon biological and sociological science. Effective conservation action is best built upon a synthesis of available biological information, but is dependent on actions of humans living within the range of the threatened species as well as established national and international interests. There are characteristic patterns of human behavior that are cross-disciplinary and cross-cultural which affect the processes of communication, problem-solving, and collaboration: 1) in the acquisition, sharing, and analysis of information; 2) in the perception and characterization of risk; 3) in the development of trust among individuals; and 4) in 'territoriality' (personal, institutional, local, national). Each of these has strong emotional components that shape our interactions. Recognition of these patterns has been essential in the development of processes to assist people in working groups to reach agreement on needed conservation actions, collaboration needed, and to establish new working relationships.

Frequently, local management agencies, external consultants, and local experts have identified management actions. However, an isolated narrow professional approach which focuses primarily on the perceived biological problems seems to have little effect on the needed political and social changes (social learning) for collaboration, effective management and conservation of habitat fragments or protected areas and their species components. CBSG workshops are organized to bring together the full range of groups with a strong interest in conserving and managing the species in its habitat or the consequences of such management. One goal in all workshops is to reach a common understanding of the state of scientific knowledge available and its possible application to the decision-making process and to needed management actions. We have found that the decision-making driven workshop process with risk characterization tools, stochastic simulation modeling, scenario testing, and deliberation among stakeholders is a powerful tool for extracting, assembling, and exploring information. This process encourages developing a shared understanding across wide boundaries of training and expertise. These tools also support building of working agreements and instilling local ownership of the problems, the decisions required, and their management during the workshop process. As participants appreciate the complexity of the problems as a group, they take more ownership of the process as well as the ultimate recommendations made to achieve workable solutions. This is essential if the management recommendations generated by the workshops are to succeed.

Participants have learned a host of lessons in more than 120 CBSG Workshop experiences in nearly 50 countries. Traditional approaches to endangered species problems have tended to emphasize our lack of information and the need for additional research. This has been coupled with a hesitancy to make explicit risk assessments of species status and a reluctance to make immediate or non-traditional management recommendations. The result has been long delays in preparing action plans, loss of momentum, and dependency on crisis-driven actions or broad recommendations that do not provide useful guidance to the managers.

CBSG's interactive and participatory workshop approach produces positive effects on management decision-making and in generating political and social support for conservation actions by local people. Modeling is an important tool as part of the process and provides a continuing test of assumptions, data consistency, and of scenarios. CBSG participants recognize that the present science is imperfect and that management policies and actions need to be designed as part of a biological and social learning process. The workshop process essentially provides a means for designing management decisions and programs on the basis of sound science while allowing new information and unexpected events to be used for learning and to adjust management practices.

Workshop Processes and Multiple Stakeholders

Experience: The Chairman and Program Staff of CBSG have conducted and facilitated more than 120 species and ecosystem workshops in 50 countries including the USA during the past 6 years. *Reports from these workshops are available from the CBSG Office*. We have worked on a continuing basis with agencies on specific taxa (e.g., Florida panther, Atlantic Forest primates in Brazil, Sumatran tiger) and have assisted in the development of national conservation strategies for other taxa (e.g., Sumatran elephant, Sumatran tiger, Mexican wolf).

Facilitator's Training and Manual: A manual has been prepared to assist CBSG workshop conveners, collaborators, and facilitators in the process of organizing, conducting, and completing a CBSG workshop. It was developed with the assistance of two management science professionals and 30 people from 11 countries with experience in CBSG workshops. These facilitator's training workshops have proven very popular with 2 per year planned through 2000 in several countries including the USA. *Copies of the Facilitator's Manual are available from the CBSG Office.*

Scientific Studies of Workshop Process: The effectiveness of these workshops as tools for eliciting information, assisting the development of sustained networking among stakeholders, impact on attitudes of participants, and in achieving consensus on needed management actions and research has been extensively debated. We initiated a scientific study of the process and its long term aftermath four years ago in collaboration with an independent team of researchers (Westley and Vredenburg, 2003). A survey questionnaire is administered at the beginning and end of each workshop. They have also conducted extensive interviews with participants in workshops held in five countries. A book detailing our experiences with this expanded approach to Population and Habitat Viability Assessment workshops (Westley and Miller, 2003) will provide practical guidance to scientists and managers on quantitative approaches to threatened species conservation. The study also is undertaking follow up at one and two years after each workshop to assess longer-term effects. To the best of our knowledge there is no comparable systematic scientific study of conservation and management processes. *We would apply the same scientific study tools to the workshops in this program and provide an analysis of the results after the workshop.*

CBSG Workshop Toolkit

Our basic set of tools for workshops include: small group dynamic skills; explicit use in small groups of problem restatement; divergent thinking sessions; identification of the history and chronology of the problem; causal flow diagramming (elementary systems analysis); matrix methods for qualitative data and expert judgments; paired and weighted ranking for making comparisons between sites, criteria, and options; utility analysis; stochastic simulation modeling for single populations and metapopulations; and deterministic and stochastic modeling of local human populations. Several computer packages are used to assist collection and analysis of information with these tools. We provide training in several of these tools in each workshop as well as intensive special training workshops for people wishing to organize their own workshops.

Stochastic Simulation Modeling

Integration of Biological, Physical and Social Factors: The workshop process, as developed by CBSG, generates population and habitat viability assessments based upon in-depth analysis of information on the life history, population dynamics, ecology, and history of the populations. Information on demography, genetics, and environmental factors pertinent to assessing population status and risk of extinction under current management scenarios and perceived threats are assembled in preparation for and during the workshops. Modeling and simulations provide a neutral externalization focus for assembly of information, identifying assumptions, projecting possible outcomes (risks), and examining for internal consistency. Timely reports from the workshop are necessary to have impact on stakeholders and decision makers. Draft reports are distributed within 3-4 weeks of the workshop and final reports within about 3 months.

Human Dimension: We have collaborated with human demographers in 5 CBSG workshops on endangered species and habitats. They have utilized computer models incorporating human population characteristics and events at the local level in order to provide projections of the likely course of population growth and the utilization of local resources. This information was then incorporated into projections of the likely viability of the habitat of the threatened species and used as part of the population projections and risk assessments. We are preparing a series of papers on the human dimension of population and habitat viability assessment. It is our intention to further develop these tools and to utilize them as part of the scenario assessment process.

Risk Assessment and Scenario Evaluation: A stochastic population simulation model is a kind of model that attempts to incorporate the uncertainty, randomness or unpredictability of life history and environmental events into the modeling process. Events whose occurrence is uncertain, unpredictable, and random are called stochastic. Most events in an animal's life have some level of uncertainty. Similarly, environmental factors, and their effect on the population process, are stochastic - they are not completely random, but their effects are predictable within certain limits. Simulation solutions are usually needed for complex models including several stochastic parameters.

There are a host of reasons why simulation modeling is valuable for the workshop process and development of management tools. The primary advantage, of course, is to simulate scenarios and the impact of numerous variables on the population dynamics and potential for population extinction. Interestingly, not all advantages are related to generating useful management recommendations. The side-benefits are substantial.

- Population modeling supports consensus and instills ownership and pride during the workshop process. As groups begin to appreciate the complexity of the problems, they have a tendency to take more ownership of the process and the ultimate recommendations to achieve workable solutions.
- Population modeling forces discussion on biological and physical aspects and specification of assumptions, data, and goals. The lack of sufficient data of useable quality rapidly becomes apparent and identifies critical factors for further study (driving research and decision making), management, and monitoring. This not only influences assumptions, but also the group's goals.
- Population modeling generates credibility by using technology that non-biologically oriented groups can use to relate to population biology and the "real" problems. The acceptance of the computer as a tool for performing repetitive tasks has led to a common ground for persons of diverse backgrounds.
- Population modeling explicitly incorporates what we know about dynamics by allowing the simultaneous examination of multiple factors and interactions - more than can be considered in analytical models. The ability to alter these parameters in a systematic fashion allows testing a multitude of scenarios that can guide adaptive management strategies.
- Population modeling can be a neutral computer "game" that focuses attention while providing persons of diverse agendas the opportunity to reach consensus on difficult issues.
- Population modeling results can be of political value for people in governmental agencies by providing support for perceived population trends and the need for action. It helps managers to justify resource allocation for a program to their superiors and budgetary agencies as well as identify areas for intensifying program efforts.

Modeling Tools: At the present time, our preferred model for use in the population simulation modeling process is called *VORTEX*. This model, developed by Bob Lacy (Chicago Zoological Society), is designed specifically for use in the stochastic simulation of the extinction process in small wildlife populations. It has been developed in collaboration and cooperation with the CBSG PHVA process. The model simulates deterministic forces as well as demographic, environmental, and genetic events in relation to their probabilities. It includes modules for catastrophes, density dependence, metapopulation dynamics, and inbreeding effects. The *VORTEX* model analyzes a population in a stochastic and probabilistic fashion. It also makes predictions that are testable in a scientific manner, lending more credibility to the process of using population-modeling tools.

There are other commercial models, but presently they have some limitations such as failing to measure genetic effects, being difficult to use, or failing to model individuals. *VORTEX* has been successfully used in more than 90 PHVA workshops in guiding management decisions. *VORTEX* is general enough for use when dealing with a broad range of species, but specific enough to incorporate most of the important processes. It is continually evolving in conjunction with the PHVA process. *VORTEX* has, as do all models, its limitations, which may restrict its utility. The model analyzes a population in a stochastic and probabilistic fashion. It is now at Version 9.45 through the cooperative contributions of dozens of biologists. It has been the subject of a series of both published and in-press validation studies and comparisons with other modeling tools. More than 2000 copies of *VORTEX* are in circulation and it is being used as a teaching tool in university courses.

We use this model and the experience we have with it as a central tool for the population dynamic aspects of the workshop process. Additional modules, building on other simulation modeling tools for human population dynamics (which we have used in 3 countries) with potential impacts on water usage, harvesting effects, and physical factors such as hydrology and water diversion will be developed to provide input into the population and habitat models which can then be used to evaluate possible effects of different management scenarios. No such composite models are available.

CBSG Resources as a Unique Asset

Expertise and Costs: The problems and threats to endangered species everywhere are complex and interactive with a need for information from diverse specialists. No agency or country encompasses all of the useful expert knowledge. Thus, there is a need to include a wide range of people as resources and analysts. It is important that the invited experts have reputations for expertise, objectivity, initial lack of local stake, and for active transfer of wanted skills. CBSG has a volunteer network of more than 800 experts with about 250 in the USA. More than 3,000 people from 400 organizations have assisted CBSG on projects and participated in workshops on a volunteer basis contributing tens of thousands of hours of time. We will call upon individual experts to assist in all phases of this project.

Indirect cost contributions to support: Use of CBSG resources and the contribution of participating experts provide a matching contribution more than equaling the proposed budget request for projects.

Manuals and Reports: We have manuals available that provide guidance on the goals, objectives, and preparations needed for CBSG workshops. These help to reduce startup time and costs and allow us to begin work on organizing the project immediately with proposed participants and stockholders. We have a process manual for use by local organizers, which goes into detail on all aspects of organizing, conducting, and preparing reports from the workshops. Draft reports are prepared during the workshop so that there is agreement by participants on its content and recommendations. Reports are also prepared on the mini-workshops (working groups) that will be conducted in information gathering exercises with small groups of experts and stakeholders. We can print reports within 24-48 hours of preparation of final copy. We also have CD-ROM preparation facilities, software and experience.

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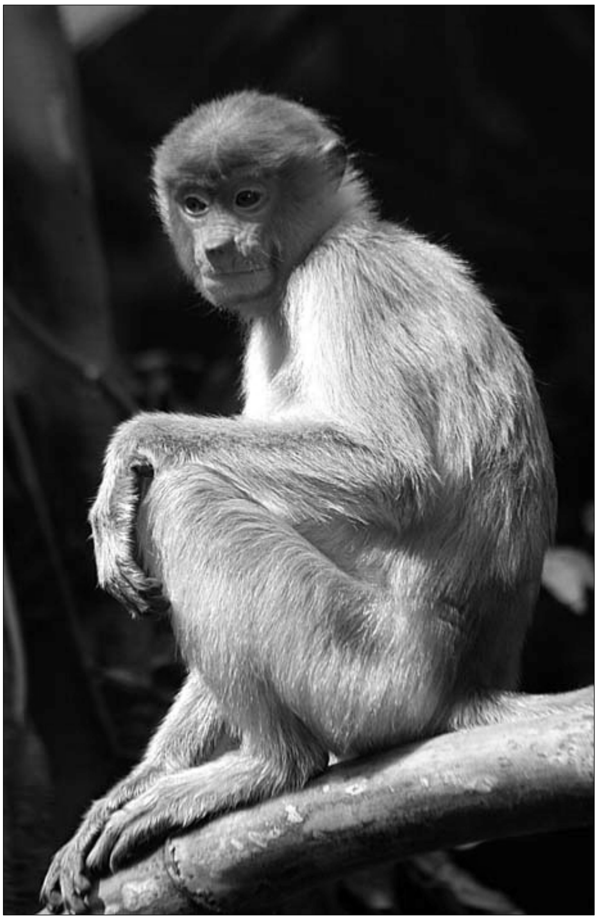
Indonesian
Proboscis Monkey PHVA

Cisarua - Bogor, West Java, Indonesia
4 - 6 December 2004



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APPENDIX III
Simulation Modeling and PVA

Simulation Modeling and Population Viability Analysis

Jon Ballou – Smithsonian Institution / National Zoological Park
Bob Lacy – Chicago Zoological Society / Conservation Breeding Specialist Group
Phil Miller – Conservation Breeding Specialist Group (IUCN)

A model is any simplified representation of a real system. We use models in all aspects of our lives, in order to: (1) extract the important trends from complex processes, (2) permit comparison among systems, (3) facilitate analysis of causes of processes acting on the system, and (4) make predictions about the future. A complete description of a natural system, if it were possible, would often decrease our understanding relative to that provided by a good model, because there is "noise" in the system that is extraneous to the processes we wish to understand. For example, the typical representation of the growth of a wildlife population by an annual percent growth rate is a simplified mathematical model of the much more complex changes in population size. Representing population growth as an annual percent change assumes constant exponential growth, ignoring the irregular fluctuations as individuals are born or immigrate, and die or emigrate. For many purposes, such a simplified model of population growth is very useful, because it captures the essential information we might need regarding the average change in population size, and it allows us to make predictions about the future size of the population. A detailed description of the exact changes in numbers of individuals, while a true description of the population, would often be of much less value because the essential pattern would be obscured, and it would be difficult or impossible to make predictions about the future population size.

In considerations of the vulnerability of a population to extinction, as is so often required for conservation planning and management, the simple model of population growth as a constant annual rate of change is inadequate for our needs. The fluctuations in population size that are omitted from the standard ecological models of population change can cause population extinction, and therefore are often the primary focus of concern. In order to understand and predict the vulnerability of a wildlife population to extinction, we need to use a model which incorporates the processes which cause fluctuations in the population, as well as those which control the long-term trends in population size (Shaffer 1981). Many processes can cause fluctuations in population size: variation in the environment (such as weather, food supplies, and predation), genetic changes in the population (such as genetic drift, inbreeding, and response to natural selection), catastrophic effects (such as disease epidemics, floods, and droughts), decimation of the population or its habitats by humans, the chance results of the probabilistic events in the lives of individuals (sex determination, location of mates, breeding success, survival), and interactions among these factors (Gilpin and Soulé 1986).

Models of population dynamics which incorporate causes of fluctuations in population size in order to predict probabilities of extinction, and to help identify the processes which contribute to a population's vulnerability, are used in "Population Viability Analysis" (PVA) (Lacy 1993/4). For the purpose of predicting vulnerability to extinction, any and all population processes that impact population dynamics can be important. Much analysis of conservation issues is conducted by largely intuitive assessments by biologists with experience with the system. Assessments by experts can be quite valuable, and are often contrasted with "models" used to evaluate population vulnerability to extinction. Such a contrast is not valid, however, as *any* synthesis of facts and understanding of processes constitutes a model, even if it is a mental model within the mind of the expert and perhaps only vaguely specified to others (or even to the expert himself or herself).

A number of properties of the problem of assessing vulnerability of a population to extinction make it difficult to rely on mental or intuitive models. Numerous processes impact population dynamics, and many of the factors interact in complex ways. For example, increased fragmentation of habitat can make it more difficult to locate mates, can lead to greater mortality as individuals disperse greater distances across unsuitable habitat, and can lead to increased inbreeding which in turn can further reduce ability to attract mates and to survive. In addition, many of the processes impacting population dynamics are intrinsically probabilistic, with a random component. Sex determination, disease, predation, mate acquisition -- indeed, almost all events in the life of an individual -- are stochastic events, occurring with certain probabilities rather than with absolute certainty at any given time. The consequences of factors influencing population dynamics are often delayed for years or even generations. With a long-lived species, a population might persist for 20 to 40 years beyond the emergence of factors that ultimately cause extinction. Humans can synthesize mentally only a few factors at a time, most people have difficulty assessing probabilities intuitively, and it is difficult to consider delayed effects. Moreover, the data needed for models of population dynamics are often very uncertain. Optimal decision-making when data are uncertain is difficult, as it involves correct assessment of probabilities that the true values fall within certain ranges, adding yet another probabilistic or chance component to the evaluation of the situation.

The difficulty of incorporating multiple, interacting, probabilistic processes into a model that can utilize uncertain data has prevented (to date) development of analytical models (mathematical equations developed from theory) which encompass more than a small subset of the processes known to affect wildlife population dynamics. It is possible that the mental models of some biologists are sufficiently complex to predict accurately population vulnerabilities to extinction under a range of conditions, but it is not possible to assess objectively the precision of such intuitive assessments, and it is difficult to transfer that knowledge to others who need also to evaluate the situation. Computer simulation models have increasingly been used to assist in PVA. Although rarely as elegant as models framed in analytical equations, computer simulation models can be well suited for the complex task of evaluating risks of extinction. Simulation models can include as many factors that influence population dynamics as the modeler and the user of the model want to assess. Interactions between processes can be modeled, if the nature of those interactions can be specified. Probabilistic events can be easily simulated by computer programs, providing output that gives both the mean expected result and the range or distribution of possible outcomes. In theory, simulation programs can be used to build models of population dynamics that include all the knowledge of the system which is available to experts. In practice, the models will be simpler, because some factors are judged unlikely to be important, and because the persons who developed the model did not have access to the full array of expert knowledge.

Although computer simulation models can be complex and confusing, they are precisely defined and all the assumptions and algorithms can be examined. Therefore, the models are objective, testable, and open to challenge and improvement. PVA models allow use of all available data on the biology of the taxon, facilitate testing of the effects of unknown or uncertain data, and expedite the comparison of the likely results of various possible management options.

PVA models also have weaknesses and limitations. A model of the population dynamics does not define the goals for conservation planning. Goals, in terms of population growth, probability of persistence, number of extant populations, genetic diversity, or other measures of population performance must be defined by the management authorities before the results of population modeling can be used. Because the models incorporate many factors, the number of possibilities to test can seem endless, and it can be difficult to determine which of the factors that were analyzed are most important to the population dynamics. PVA models are necessarily incomplete. We can model only those factors which we understand and for which we can specify the parameters. Therefore, it is important to realize that the models probably underestimate the threats facing the population. Finally, the models are used to predict the long-term effects of the processes presently acting on the population. Many aspects of the situation could change radically within the time span that is modeled. Therefore, it is important to reassess the data and model results periodically, with changes made to the conservation programs as needed (see Lacy and Miller (2002), Nyhus et al. (2002) and Westley and Miller (2003) for more details).

The *VORTEX* Population Viability Analysis Model

For the analyses presented here, the *VORTEX* computer software (Lacy 1993a) for population viability analysis was used. *VORTEX* models demographic stochasticity (the randomness of reproduction and deaths among individuals in a population), environmental variation in the annual birth and death rates, the impacts of sporadic catastrophes, and the effects of inbreeding in small populations. *VORTEX* also allows analysis of the effects of losses or gains in habitat, harvest or supplementation of populations, and movement of individuals among local populations.

Density dependence in mortality is modeled by specifying a carrying capacity of the habitat. When the population size exceeds the carrying capacity, additional morality is imposed across all age classes to bring the population back down to the carrying capacity. The carrying capacity can be specified to change linearly over time, to model losses or gains in the amount or quality of habitat. Density dependence in reproduction is modeled by specifying the proportion of adult females breeding each year as a function of the population size.

VORTEX models loss of genetic variation in populations, by simulating the transmission of alleles from parents to offspring at a hypothetical genetic locus. Each animal at the start of the simulation is assigned two unique alleles at the locus. During the simulation, *VORTEX* monitors how many of the original alleles remain within the population, and the average heterozygosity and gene diversity (or “expected heterozygosity”) relative to the starting levels. *VORTEX* also monitors the inbreeding coefficients of each animal, and can reduce the juvenile survival of inbred animals to model the effects of inbreeding depression.

VORTEX is an *individual-based* model. That is, *VORTEX* creates a representation of each animal in its memory and follows the fate of the animal through each year of its lifetime. *VORTEX* keeps track of the sex, age, and parentage of each animal. Demographic events (birth, sex determination, mating, dispersal, and death) are modeled by determining for each animal in each year of the simulation whether any of the events occur. (See figure below.). Events occur according to the specified age and sex-specific probabilities. Demographic stochasticity is therefore a consequence of the uncertainty regarding whether each demographic event occurs for any given animal.

VORTEX requires a lot of population-specific data. For example, the user must specify the amount of annual variation in each demographic rate caused by fluctuations in the environment. In addition, the frequency of each type of catastrophe (drought, flood, epidemic disease) and the effects of the catastrophes on survival and reproduction must be specified.

Rates of migration (dispersal) between each pair of local populations must be specified. Because *VORTEX* requires specification of many biological parameters, it is not necessarily a good model for the examination of population dynamics that would result from some generalized life history. It is most usefully applied to the analysis of a specific population in a specific environment.

Further information on *VORTEX* is available in Miller and Lacy (1999) and Lacy (2000).

Dealing with Uncertainty

It is important to recognize that uncertainty regarding the biological parameters of a population and its consequent fate occurs at several levels and for independent reasons. Uncertainty can occur because the parameters have never been measured on the population. Uncertainty can occur because limited field data have yielded estimates with potentially large sampling error. Uncertainty can occur because independent studies have generated discordant estimates. Uncertainty can occur because environmental conditions or population status have been changing over time, and field surveys were conducted during periods which may not be representative of long-term averages. Uncertainty can occur because the environment will change in the future, so that measurements made in the past may not accurately predict future conditions.

Sensitivity testing is necessary to determine the extent to which uncertainty in input parameters results in uncertainty regarding the future fate of the pronghorn population. If alternative plausible parameter values result in divergent predictions for the population, then it is important to try to resolve the uncertainty with better data. Sensitivity of population dynamics to certain parameters also indicates that those parameters describe factors that could be critical determinants of population viability. Such factors are therefore good candidates for efficient management actions designed to ensure the persistence of the population.

The above kinds of uncertainty should be distinguished from several more sources of uncertainty about the future of the population. Even if long-term average demographic rates are known with precision, variation over time caused by fluctuating environmental conditions will cause uncertainty in the fate of the population at any given time in the future. Such environmental variation should be incorporated into the model used to assess population dynamics, and will generate a range of possible outcomes (perhaps represented as a mean and standard deviation) from the model. In addition, most biological processes are inherently stochastic, having a random component. The stochastic or probabilistic nature of survival, sex determination, transmission of genes, acquisition of mates, reproduction, and other processes preclude exact determination of the future state of a population. Such demographic stochasticity should also be incorporated into a population model, because such variability both increases our uncertainty about the future and can also change the expected or mean outcome relative to that which would result if there were no such variation. Finally, there is "uncertainty" which represents the alternative actions or interventions which might be pursued as a management strategy. The likely effectiveness of such management options can be explored by testing alternative scenarios in the model of population dynamics, in much the same way that sensitivity testing is used to explore the effects of uncertain biological parameters.

Results
Results reported for each scenario include:

Deterministic r -- The deterministic population growth rate, a projection of the mean rate of growth of the population expected from the average birth and death rates. Impacts of harvest, inbreeding, and density dependence are not considered in the calculation. When r = 0, a population with no growth is expected; r < 0 indicates population decline; r > 0 indicates long-term population growth. The value of r is approximately the rate of growth or decline per year.

The deterministic growth rate is the average population growth expected if the population is so large as to be unaffected by stochastic, random processes. The deterministic growth rate will correctly predict future population growth if: the population is presently at a stable age distribution; birth and death rates remain constant over time and space (i.e., not only do the probabilities remain constant, but the actual number of births and deaths each year match the expected values); there is no inbreeding depression; there is never a limitation of mates preventing some females from breeding; and there is no density dependence in birth or death rates, such as an Allee effects or a habitat "carrying capacity" limiting population growth. Because some or all of these assumptions are usually violated, the average population growth of real populations (and stochastically simulated ones) will usually be less than the deterministic growth rate.

Stochastic r -- The mean rate of stochastic population growth or decline demonstrated by the simulated populations, averaged across years and iterations, for all those simulated populations that are not extinct. This population growth rate is calculated each year of the simulation, prior to any truncation of the population size due to the population exceeding the carrying capacity. Usually, this stochastic r will be less than the deterministic r predicted from birth and death rates. The stochastic r from the simulations will be close to the deterministic r if the population growth is steady and robust. The stochastic r will be notably less than the deterministic r if the population is subjected to large fluctuations due to environmental variation, catastrophes, or the genetic and demographic instabilities inherent in small populations.

P(E) -- the probability of population extinction, determined by the proportion of, for example, 500 iterations within that given scenario that have gone extinct in the simulations. "Extinction" is defined in the VORTEX model as the lack of either sex.

N -- mean population size, averaged across those simulated populations which are not extinct.

SD(N) -- variation across simulated populations (expressed as the standard deviation) in the size of the population at each time interval. SDs greater than about half the size of mean N often indicate highly unstable population sizes, with some simulated populations very near extinction. When SD(N) is large relative to N, and especially when SD(N) increases over the years of the simulation, then the population is vulnerable to large random fluctuations and may go extinct even if the mean population growth rate is positive. SD(N) will be small and often declining relative to N when the population is either growing steadily toward the carrying capacity or declining rapidly (and deterministically) toward extinction. SD(N) will also decline considerably when the population size approaches and is limited by the carrying capacity.

H -- the gene diversity or expected heterozygosity of the extant populations, expressed as a percent of the initial gene diversity of the population. Fitness of individuals usually declines proportionately with gene diversity (Lacy 1993b), with a 10% decline in gene diversity typically causing about 15% decline in survival of captive mammals (Ralls et al. 1988). Impacts of inbreeding on wild populations are less well known, but may be more severe than those observed in captive populations (Jiménez et al. 1994). Adaptive response to natural selection is also expected to be proportional to gene diversity. Long-term conservation programs often set a goal of retaining 90% of initial gene diversity (Soulé et al. 1986). Reduction to 75% of gene diversity would be equivalent to one generation of full-sibling or parent-offspring inbreeding.

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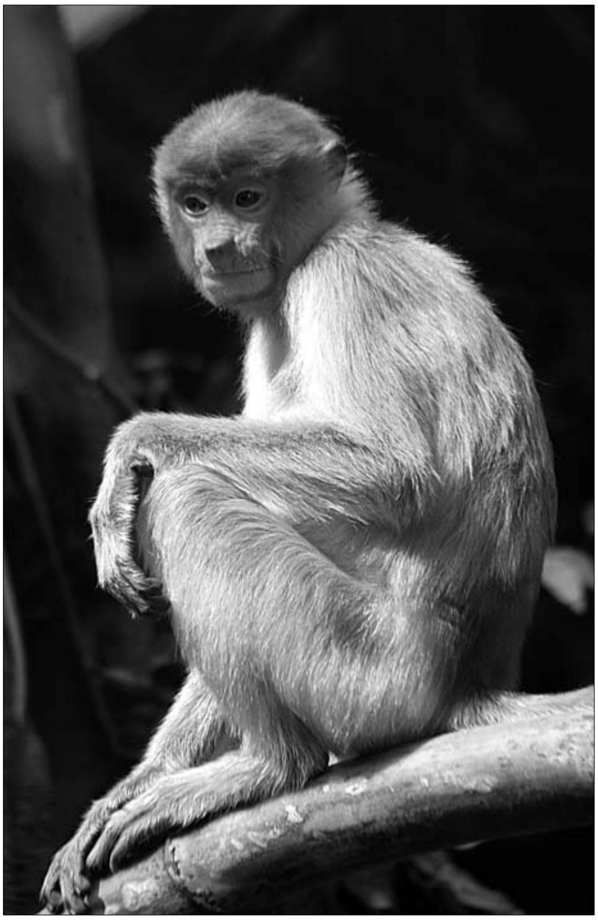
Indonesian
Proboscis Monkey PHVA

Cisarua - Bogor, West Java, Indonesia
4 - 6 December 2004



FINAL REPORT

APPENDIX IV
IUCN Guidelines

IUCN Technical Guidelines on the Management of *Ex-situ* Populations for Conservation

Approved at the 14th Meeting of the Programme Committee of Council, Gland Switzerland, 10 December 2002

PREAMBLE

IUCN affirms that a goal of conservation is the maintenance of existing genetic diversity and viable populations of all taxa in the wild in order to maintain biological interactions, ecological processes and function. Conservation managers and decision-makers should adopt a realistic and integrated approach to conservation implementation. The threats to biodiversity in situ continue to expand, and taxa have to survive in increasingly human-modified environments. Threats, which include habitat loss, climate change, unsustainable use, and invasive and pathogenic organisms, can be difficult to control. The reality of the current situation is that it will not be possible to ensure the survival of an increasing number of threatened taxa without effectively using a diverse range of complementary conservation approaches and techniques including, for some taxa, increasing the role and practical use of ex situ techniques.

If the decision to bring a taxon under ex situ management is left until extinction is imminent, it is frequently too late to effectively implement, thus risking permanent loss of the taxon. Moreover, ex situ conservation should be considered as a tool to ensure the survival of the wild population. Ex situ management should be considered only as an alternative to the imperative of in situ management in exceptional circumstances, and effective integration between in situ and ex situ approaches should be sought wherever possible.

The decision to implement an ex situ conservation programme as part of a formalised conservation management or recovery plan and the specific design of and prescription for such an ex situ programme will depend on the taxon's circumstances and conservation needs. A taxon-specific conservation plan may involve a range of ex situ objectives, including short-, medium- and long-term maintenance of ex situ stocks. This can utilise a variety of techniques including reproduction propagation, germplasm banking, applied research, reinforcement of existing populations and re-introduction into the wild or controlled environments. The objectives and overall purpose should be clearly stated and agreed among organisations participating in the programme, and other relevant stakeholders including landowners and users of the taxon involved. In order to maximise their full potential in conservation, ex situ facilities and their co-operative networks should adopt the guidelines defined by the Convention on Biological Diversity (CBD), the International Agenda for Botanic Gardens in Conservation, Center for Plant Conservation and the World Zoo Conservation Strategy, along with other guidelines, strategies, and relevant legislative requirements at national and regional levels. IUCN recognizes the considerable set of resources committed worldwide to ex situ conservation by the world's zoological and botanical gardens, gene banks and other ex situ facilities. The effective utilisation of these resources represents an essential component of conservation strategies at all levels.

VISION

To maintain present biodiversity levels through all available and effective means including, where appropriate, ex situ propagation, translocation and other ex situ methodologies.

GOAL

Those responsible for managing ex situ plant and animal populations and facilities will use all resources and means at their disposal to maximise the conservation and utilitarian values of these populations, including:
1) increasing public and political awareness and understanding of important conservation issues and the significance of extinction;
2) co-ordinated genetic and demographic population management of threatened taxa;
3) re-introduction and support to wild populations;
4) habitat restoration and management;
5) long-term gene and biomaterial banking;
6) institutional strengthening and professional capacity building;
7) appropriate benefit sharing;
8) research on biological and ecological questions relevant to in situ conservation; and
9) fundraising to support all of the above.

Ex situ agencies and institutions must follow national and international obligations with regard to access and benefit sharing (as outlined in the CBD) and other legally binding instruments such as CITES, to ensure full collaboration with all range States. Priority should be given to the ex situ management of threatened taxa (according to the latest IUCN Red List Categories) and threatened populations of economic or social/cultural importance. Ex situ programmes are often best situated close to or within the ecogeographic range of the target taxa and where possible within the range State. Nevertheless a role for international and extra regional support for ex situ conservation is also recognised. The option of locating the ex situ programme outside the taxa's natural range should be considered if the taxa is threatened by natural catastrophes, political and social disruptions, or if further germplasm banking, propagation, research, isolation or reintroduction facilities are required and cannot be feasibly established. In all cases, ex situ populations should be managed in ways that minimize the loss of capacity for expression of natural behaviours and loss of ability to later again thrive in natural habitats.

TECHNICAL GUIDELINES

The basis for responsible ex situ population management in support of conservation is founded on benefits for both threatened taxa and associated habitats.

- The primary objective of maintaining ex situ populations is to help support the conservation of a threatened taxon, its genetic diversity, and its habitat. Ex situ programmes should give added value to other complementary programmes for conservation.

  Although there will be taxa-specific exceptions due to unique life histories, the decision to initiate ex situ programmes should be based on one or more of the appropriate IUCN Red List Criteria, including:

1. When the taxa/population is prone to effects of human activities or stochastic events or

2. When the taxa/population is likely to become Critically Endangered, Extinct in the Wild, or Extinct in a very short time. Additional criteria may need to be considered in some cases where taxa or populations of cultural importance, and significant economic or scientific importance, are threatened. All Critically Endangered and Extinct in the Wild taxa should be subject to ex situ management to ensure recovery of wild populations.

- Ex situ conservation should be initiated only when an understanding of the target taxon's biology and ex situ management and storage needs are at a level where there is a reasonable probability that successful enhancement of species conservation can be achieved; or where the development of such protocols could be achieved within the time frame of the taxon's required conservation management, ideally before the taxa becomes threatened in the wild. Ex situ institutions are strongly urged to develop ex situ protocols prior to any forthcoming ex situ management. Consideration must be given to institutional viability before embarking on a long term ex situ project.
- For those threatened taxa for which husbandry and/or cultivation protocols do not exist, surrogates of closely related taxa can serve important functions, for example in research and the development of protocols, conservation biology research, staff training, public education and fundraising.
- While some ex situ populations may have been established prior to the ratification of the CBD, all ex situ and in situ populations should be managed in an integrated, multidisciplinary manner, and where possible, in accordance with the principles and provisions of the CBD.
- Extreme and desperate situations, where taxa/populations are in imminent risk of extinction, must be dealt with on an emergency basis. This action must be implemented with the full consent and support of the range State.
- All ex situ populations must be managed so as to reduce risk of loss through natural catastrophe, disease or political upheaval. Safeguards include effective quarantine procedures, disease and pathogen monitoring, and duplication of stored germplasm samples in different locations and provision of emergency power supplies to support collection needs (e.g. climate control for long term germplasm repositories).
- All ex situ populations should be managed so as to reduce the risk of invasive escape from propagation, display and research facilities. Taxa should be assessed as to their invasive potential and appropriate controls taken to avoid escape and subsequent naturalisation.
- The management of ex situ populations must minimise any deleterious effects of ex situ management, such as loss of genetic diversity, artificial selection, pathogen transfer and hybridisation, in the interest of maintaining the genetic integrity and viability of such material. Particular attention should be paid to initial sampling techniques, which should be designed to capture as much wild genetic variability as practicable. Ex situ practitioners should adhere to, and further develop, any taxon- or region-specific record keeping and genetic management guidelines produced by ex situ management agencies.
- Those responsible for managing ex situ populations and facilities should seek both to increase public awareness, concern and support for biodiversity, and to support the implementation of conservation management, through education, fundraising and professional capacity building programmes, and by supporting direct action in situ.

- Where appropriate, data and the results of research derived from ex situ collections and ex situ methodologies should be made freely available to ongoing in-country management programmes concerned with supporting conservation of in situ populations, their habitats, and the ecosystems and landscapes in which they occur .

NB. Ex situ conservation is defined here, as in the CBD, as "the conservation of components of biological diversity outside their natural habitats". Ex situ collections include whole plant or animal collections, zoological parks and botanic gardens, wildlife research facilities, and germplasm collections of wild and domesticated taxa (zygotes, gametes and somatic tissue).

IUCN/SSC Guidelines For Re-Introductions

Prepared by the SSC Re-introduction Specialist Group
Approved by the 41st Meeting of the IUCN Council, Gland Switzerland, May 1995

INTRODUCTION

These policy guidelines have been drafted by the Re-introduction Specialist Group of the IUCN's Species Survival Commission[1], in response to the increasing occurrence of re-introduction projects worldwide, and consequently, to the growing need for specific policy guidelines to help ensure that the re-introductions achieve their intended conservation benefit, and do not cause adverse side-effects of greater impact. Although IUCN developed a Position Statement on the Translocation of Living Organisms in 1987, more detailed guidelines were felt to be essential in providing more comprehensive coverage of the various factors involved in re-introduction exercises.

These guidelines are intended to act as a guide for procedures useful to re-introduction programmes and do not represent an inflexible code of conduct. Many of the points are more relevant to re-introductions using captive-bred individuals than to translocations of wild species. Others are especially relevant to globally endangered species with limited numbers of founders. Each re-introduction proposal should be rigorously reviewed on its individual merits. It should be noted that re-introduction is always a very lengthy, complex and expensive process.

Re-introductions or translocations of species for short-term, sporting or commercial purposes - where there is no intention to establish a viable population - are a different issue and beyond the scope of these guidelines. These include fishing and hunting activities.

This document has been written to encompass the full range of plant and animal taxa and is therefore general. It will be regularly revised. Handbooks for re-introducing individual groups of animals and plants will be developed in future.

CONTEXT

The increasing number of re-introductions and translocations led to the establishment of the IUCN/SSC Species Survival Commission's Re-introduction Specialist Group. A priority of the Group has been to update IUCN's 1987 Position Statement on the Translocation of Living Organisms, in consultation with IUCN's other commissions.

It is important that the Guidelines are implemented in the context of IUCN's broader policies pertaining to biodiversity conservation and sustainable management of natural resources. The philosophy for environmental conservation and management of IUCN and other conservation bodies is stated in key documents such as "Caring for the Earth" and "Global Biodiversity Strategy" which cover the broad themes of the need for approaches with community involvement and participation in sustainable natural resource conservation, an overall enhanced quality of human life and the need to conserve and, where necessary, restore ecosystems. With regards to the latter, the re-introduction of a species is one specific instance of restoration where, in general, only this species is missing. Full restoration of an array of plant and animal species has rarely been tried to date.

Restoration of single species of plants and animals is becoming more frequent around the world. Some succeed, many fail. As this form of ecological management is increasingly common, it is a priority for the Species Survival Commission's Re-introduction Specialist Group to develop guidelines so that re-introductions are both justifiable and likely to succeed, and that the conservation world can learn from each initiative, whether successful or not. It is hoped that these Guidelines, based on extensive review of case - histories and wide consultation across a range of disciplines will introduce more rigour into the concepts, design, feasibility and implementation of re-introductions despite the wide diversity of species and conditions involved.

Thus the priority has been to develop guidelines that are of direct, practical assistance to those planning, approving or carrying out re-introductions. The primary audience of these guidelines is, therefore, the practitioners (usually managers or scientists), rather than decision makers in governments. Guidelines directed towards the latter group would inevitably have to go into greater depth on legal and policy issues.

1. DEFINITION OF TERMS

"Re-introduction": an attempt to establish a species[2] in an area which was once part of its historical range, but from which it has been extirpated or become extinct[3] ("Re-establishment" is a synonym, but implies that the re-introduction has been successful).

"Translocation": deliberate and mediated movement of wild individuals or populations from one part of their range to another.

"Re-inforcement/Supplementation": addition of individuals to an existing population of conspecifics.

"Conservation/Benign Introductions": an attempt to establish a species, for the purpose of conservation, outside its recorded distribution but within an appropriate habitat and eco-geographical area. This is a feasible conservation tool only when there is no remaining area left within a species' historic range.

2. AIMS AND OBJECTIVES OF RE-INTRODUCTION

a. Aims:

The principle aim of any re-introduction should be to establish a viable, free-ranging population in the wild, of a species, subspecies or race, which has become globally or locally extinct, or extirpated, in the wild. It should be re-introduced within the species' former natural habitat and range and should require minimal long-term management.

b. Objectives:

The objectives of a re-introduction may include: to enhance the long-term survival of a species; to re-establish a keystone species (in the ecological or cultural sense) in an ecosystem; to maintain and/or restore natural biodiversity; to provide long-term economic benefits to the local and/or nataional economy; to promote conservation awareness; or a combination of these.

3. MULTIDISCIPLINARY APPROACH

A re-introduction requires a multidisciplinary approach involving a team of persons drawn from a variety of backgrounds. As well as government personnel, they may include persons from governmental natural resource management agencies; non-governmental organisations; funding bodies; universities; veterinary institutions; zoos (and private animal breeders) and/or botanic gardens, with a full range of suitable expertise. Team leaders should be responsible for coordination between the various bodies and provision should be made for publicity and public education about the project.

4. PRE-PROJECT ACTIVITIES

4a. BIOLOGICAL

(i) Feasibility study and background research

- An assessment should be made of the taxonomic status of individuals to be re-introduced. They should preferably be of the same subspecies or race as those which were extirpated, unless adequate numbers are not available. An investigation of historical information about the loss and fate of individuals from the re-introduction area, as well as molecular genetic studies, should be undertaken in case of doubt as to individuals' taxonomic status. A study of genetic variation within and between populations of this and related taxa can also be helpful. Special care is needed when the population has long been extinct.
- Detailed studies should be made of the status and biology of wild populations(if they exist) to determine the species' critical needs. For animals, this would include descriptions of habitat preferences, intraspecific variation and adaptations to local ecological conditions, social behaviour, group composition, home range size, shelter and food requirements, foraging and feeding behaviour, predators and diseases. For migratory species, studies should include the potential migratory areas. For plants, it would include biotic and abiotic habitat requirements, dispersal mechanisms, reproductive biology, symbiotic relationships (e.g. with mycorrhizae, pollinators), insect pests and diseases. Overall, a firm knowledge of the natural history of the species in question is crucial to the entire re-introduction scheme.
- The species, if any, that has filled the void created by the loss of the species concerned, should be determined; an understanding of the effect the re-introduced species will have on the ecosystem is important for ascertaining the success of the re-introduced population.
- The build-up of the released population should be modelled under various sets of conditions, in order to specify the optimal number and composition of individuals to be released per year and the numbers of years necessary to promote establishment of a viable population.
- A Population and Habitat Viability Analysis will aid in identifying significant environmental and population variables and assessing their potential interactions, which would guide long-term population management.

(ii) Previous Re-introductions

- Thorough research into previous re-introductions of the same or similar species and wide-ranging contacts with persons having relevant expertise should be conducted prior to and while developing re-introduction protocol.

(iii) Choice of release site and type

- Site should be within the historic range of the species. For an initial re-inforcement there should be few remnant wild individuals. For a re-introduction, there should be no remnant population to prevent disease spread, social disruption and introduction of alien genes. In some circumstances, a re-introduction or re-inforcement may have to be made into an area which is fenced or otherwise delimited, but it should be within the species' former natural habitat and range.
- A conservation/ benign introduction should be undertaken only as a last resort when no opportunities for re-introduction into the original site or range exist and only when a significant contribution to the conservation of the species will result.
- The re-introduction area should have assured, long-term protection (whether formal or otherwise).

(iv) Evaluation of re-introduction site

- Availability of suitable habitat: re-introductions should only take place where the habitat and landscape requirements of the species are satisfied, and likely to be sustained for the for-seeable future. The possibility of natural habitat change since extirpation must be considered. Likewise, a change in the legal/ political or cultural environment since species extirpation needs to be ascertained and evaluated as a possible constraint. The area should have sufficient carrying capacity to sustain growth of the re-introduced population and support a viable (self-sustaining) population in the long run.
- Identification and elimination, or reduction to a sufficient level, of previous causes of decline: could include disease; over-hunting; over-collection; pollution; poisoning; competition with or predation by introduced species; habitat loss; adverse effects of earlier research or management programmes; competition with domestic livestock, which may be seasonal. Where the release site has undergone substantial degradation caused by human activity, a habitat restoration programme should be initiated before the re-introduction is carried out.

(v) Availability of suitable release stock

- It is desirable that source animals come from wild populations. If there is a choice of wild populations to supply founder stock for translocation, the source population should ideally be closely related genetically to the original native stock and show similar ecological characteristics (morphology, physiology, behaviour, habitat preference) to the original sub-population.
- Removal of individuals for re-introduction must not endanger the captive stock population or the wild source population. Stock must be guaranteed available on a regular and predictable basis, meeting specifications of the project protocol.
- Individuals should only be removed from a wild population after the effects of translocation on the donor population have been assessed, and after it is guaranteed that these effects will not be negative.
- If captive or artificially propagated stock is to be used, it must be from a population which has been soundly managed both demographically and genetically, according to the principles of contemporary conservation biology.
- Re-introductions should not be carried out merely because captive stocks exist, nor solely as a means of disposing of surplus stock.
- Prospective release stock, including stock that is a gift between governments, must be subjected to a thorough veterinary screening process before shipment from original

source. Any animals found to be infected or which test positive for non-endemic or contagious pathogens with a potential impact on population levels, must be removed from the consignment, and the uninfected, negative remainder must be placed in strict quarantine for a suitable period before retest. If clear after retesting, the animals may be placed for shipment.

- Since infection with serious disease can be acquired during shipment, especially if this is intercontinental, great care must be taken to minimize this risk.
- Stock must meet all health regulations prescribed by the veterinary authorities of the recipient country and adequate provisions must be made for quarantine if necessary.

(vi) Release of captive stock

- Most species of mammal and birds rely heavily on individual experience and learning as juveniles for their survival; they should be given the opportunity to acquire the necessary information to enable survival in the wild, through training in their captive environment; a captive bred individual's probability of survival should approximate that of a wild counterpart.
- Care should be taken to ensure that potentially dangerous captive bred animals (such as large carnivores or primates) are not so confident in the presence of humans that they might be a danger to local inhabitants and/or their livestock.

4b. SOCIO-ECONOMIC AND LEGAL REQUIREMENTS

- Re-introductions are generally long-term projects that require the commitment of long-term financial and political support.
- Socio-economic studies should be made to assess impacts, costs and benefits of the re-introduction programme to local human populations.
- A thorough assessment of attitudes of local people to the proposed project is necessary to ensure long term protection of the re-introduced population, especially if the cause of species' decline was due to human factors (e.g. over-hunting, over-collection, loss or alteration of habitat). The programme should be fully understood, accepted and supported by local communities.
- Where the security of the re-introduced population is at risk from human activities, measures should be taken to minimise these in the re-introduction area. If these measures are inadequate, the re-introduction should be abandoned or alternative release areas sought.
- The policy of the country to re-introductions and to the species concerned should be assessed. This might include checking existing provincial, national and international legislation and regulations, and provision of new measures and required permits as necessary.
- Re-introduction must take place with the full permission and involvement of all relevant government agencies of the recipient or host country. This is particularly important in re-introductions in border areas, or involving more than one state or when a re-introduced population can expand into other states, provinces or territories.
- If the species poses potential risk to life or property, these risks should be minimised and adequate provision made for compensation where necessary; where all other solutions fail, removal or destruction of the released individual should be considered. In the case of migratory/mobile species, provisions should be made for crossing of international/state boundaries.

5. PLANNING, PREPARATION AND RELEASE STAGES

- Approval of relevant government agencies and land owners, and coordination with national and international conservation organizations.
- Construction of a multidisciplinary team with access to expert technical advice for all phases of the programme.
- Identification of short- and long-term success indicators and prediction of programme duration, in context of agreed aims and objectives.
- Securing adequate funding for all programme phases.
- Design of pre- and post- release monitoring programme so that each re-introduction is a carefully designed experiment, with the capability to test methodology with scientifically collected data. Monitoring the health of individuals, as well as the survival, is important; intervention may be necessary if the situation proves unforseeably favourable.
- Appropriate health and genetic screening of release stock, including stock that is a gift between governments. Health screening of closely related species in the re-introduction area.
- If release stock is wild-caught, care must be taken to ensure that: a) the stock is free from infectious or contagious pathogens and parasites before shipment and b) the stock will not be exposed to vectors of disease agents which may be present at the release site (and absent at the source site) and to which it may have no acquired immunity.
- If vaccination prior to release, against local endemic or epidemic diseases of wild stock or domestic livestock at the release site, is deemed appropriate, this must be carried out during the "Preparation Stage" so as to allow sufficient time for the development of the required immunity.
- Appropriate veterinary or horticultural measures as required to ensure health of released stock throughout the programme. This is to include adequate quarantine arrangements, especially where founder stock travels far or crosses international boundaries to the release site.
- Development of transport plans for delivery of stock to the country and site of re-introduction, with special emphasis on ways to minimize stress on the individuals during transport.
- Determination of release strategy (acclimatization of release stock to release area; behavioural training - including hunting and feeding; group composition, number, release patterns and techniques; timing).
- Establishment of policies on interventions (see below).
- Development of conservation education for long-term support; professional training of individuals involved in the long-term programme; public relations through the mass media and in local community; involvement where possible of local people in the programme.
- The welfare of animals for release is of paramount concern through all these stages.

6. POST-RELEASE ACTIVITIES

- Post release monitoring is required of all (or sample of) individuals. This most vital aspect may be by direct (e.g. tagging, telemetry) or indirect (e.g. spoor, informants) methods as suitable.
- Demographic, ecological and behavioural studies of released stock must be undertaken.
- Study of processes of long-term adaptation by individuals and the population.
- Collection and investigation of mortalities.

- Interventions (e.g. supplemental feeding; veterinary aid; horticultural aid) when necessary.
- Decisions for revision, rescheduling, or discontinuation of programme where necessary.
- Habitat protection or restoration to continue where necessary.
- Continuing public relations activities, including education and mass media coverage.
- Evaluation of cost-effectiveness and success of re- introduction techniques.
- Regular publications in scientific and popular literature.

Footnotes:

[1] Guidelines for determining procedures for disposal of species confiscated in trade are being developed separately by IUCN.

[2] The taxonomic unit referred to throughout the document is species; it may be a lower taxonomic unit (e.g. subspecies or race) as long as it can be unambiguously defined.

[3] A taxon is extinct when there is no reasonable doubt that the last individual has died

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The IUCN/SSC Re-introduction Specialist Group (RSG) is a disciplinary group (as opposed to most SSC Specialist Groups which deal with single taxonomic groups), covering a wide range of plant and animal species. The RSG has an extensive international network, a re-introduction projects database and re-introduction library. The RSG publishes a bi-annual newsletter RE-INTRODUCTION NEWS.

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