

Conservation of Western Hoolock Gibbon -- Summary

From the Population and Habitat Viability Assessment Workshop Report 2005

Compiled by Sally Walker and Sanjay Molur

Illustrations by Stephen Nash, Arnab Roy and Sonali Lahiri



Western Hoolock Gibbon (male)
Hoolock hoolock hoolock
Art by Stephen Nash

Credits

The workshop was facilitated and coordinated by the IUCN SSC Conservation Breeding Specialist Group's regional network for South Asia (CBSG, South Asia).

The IUCN/SSC Primate Specialist Group was represented by several members from South Asia.

Other organizers and collaborators were :

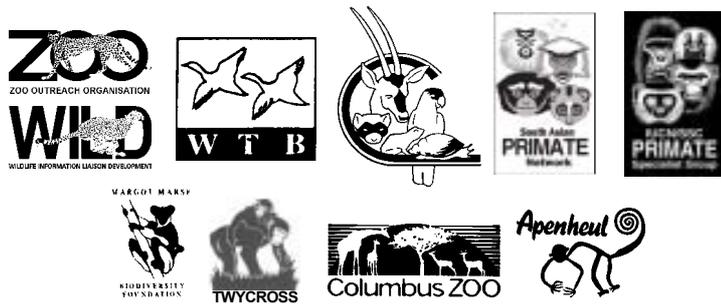
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Artwork by Arnab Roy, Stephen Nash, and Sonali Lahiri.



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Introduction

Hoolock Gibbon is South Asia's only ape species meaning that it has a set of characteristics which make it a species of primate in the same category with man himself. *Homo sapiens*, the scientific name for human beings, is indeed an ape ... an "animal" with no tail, primarily bipedal (two-legged), with opposable thumbs, etc. Other apes — besides gibbons and human beings include: gorillas, chimpanzees, bonobos, orangutans and siamangs.

There are other kinds of gibbons as well but none of them, aside from Hoolock Gibbon, live in South Asia. There are many gibbon species and subspecies that live in South East Asia. You can learn about them in this booklet.

In South Asia, which now consists of Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan and Sri Lanka, we now know there are two subspecies (types or kinds of species) of Hoolock Gibbon. They are called the Western Hoolock Gibbon (*Hoolock hoolock hoolock*) and the Eastern Hoolock Gibbon (*Hoolock hoolock leuconedys*). Western Hoolock Gibbon lives in India, Bangladesh and Myanmar (see locality tables on page 13) and - as far as we know — Eastern Hoolock Gibbon lives in China, Myanmar and in a restricted area in India.

As far as we know ...

This "cop-out" term "as far as we know" is very important in science, particularly taxonomy and species distribution, which changes frequently. Just a short while ago the scientific name for Hoolock Gibbon was very different. Instead of *Hoolock hoolock*, the name was *Bunopithecus hoolock* ! Moreover, a very short while ago, we didn't know that the Eastern Hoolock Gibbon occurred in India — we thought it was only from Myanmar and China! How can this be science ! You will find out in Alan Mootnick's article in this booklet.

Field biologists conduct surveys in the wild to learn things about wild animals, which will help forest officers and managers protect them better. But no field biologist can observe every movement of every species in every locality, and they also may not be able to see every small characteristic, which determines their subspecies. Biotechnology has helped wildlife a great deal in that way, as blood, hair, saliva, faeces, nails, can be indicators of subspecies.

What is important ...

What is important about wildlife in general, however, and about hoolocks in particular is their status in the wild, and the threats to their continued existence as a species. That is why you are reading this booklet ... to help you understand the uniqueness and importance of Hoolock Gibbon as a species in your country. Recently, the Western Hoolock Gibbon (*Hoolock hoolock*) was listed by the IUCN Primate Specialist Group as one of the Twenty-five Most Endangered Primates in the World. Western Hoolock Gibbon is Endangered in India and Critically Endangered in Bangladesh

Most of the information in this booklet was taken from the Report on a scientific workshop on Hoolock Gibbon conducted in Dhaka, Bangladesh, February 2005. It was a special kind of workshop involving a workshop process developed by the IUCN SSC Conservation Breeding Specialist Group, which is explained in detail in this booklet. The best researchers attended and contributed to the workshop data collection and conclusions. Despite the care we took, the name of the animal has changed and so has our idea about the subspecies of Hoolock Gibbon in such a short time ! One thing that unfortunately will not change so quickly however is that the Hoolock Gibbon is highly threatened and needs help to survive. Read this booklet and do your bit to protect it.



Executive Summary of the PHVA Workshop

The Western Hoolock Gibbon (*Hoolock hoolock hoolock*) was assessed as Critically Endangered in Bangladesh and Endangered in India based on IUCN Red List Criteria, Regional Guidelines (IUCN 2003). Numbers are small (600-700) and they are further disadvantaged by their distribution in 133 localities of India and Bangladesh in populations ranging from 1 to 40. That they can be seen in so many localities imparts a false impression of status and security of the taxon. A PHVA Workshop was organized in Dhaka, Bangladesh initiated by Zoo Outreach Organisation and the South Asian Primate Networks of the IUCN SSC Primate Specialist Group and organised with collaborating organizations from both countries, particularly Wildlife Trust of Bangladesh (WTB), Forest Directorate, Government of the People's Republic of Bangladesh, Wildlife Information Liaison Development (WILD), CBSG, South Asia, and IUCN SSC Conservation Breeding Specialist Group (CBSG). The workshop, Report, and other material to generate public awareness was generously sponsored by the Great Ape Conservation Fund (GACF) of the United States Fish and Wildlife Service, Margot Marsh Biodiversity Foundation Primate Action Fund/Conservation International, Twycross Zoo, Columbus Zoo and Appenheul Primate Park.

Hoolock Gibbon localities are situated in areas of high biodiversity, e.g. northeastern India and remaining forest areas of Bangladesh. Participants were invited from the forest and wildlife departments of both countries, local NGOs, field biologists of Bangladesh and India, who have had direct experience with Hoolock Gibbons and a few outside specialists.

The PHVA helps in understanding the implications of small population dynamics on the survival of threatened species. On the basis of deliberations of five Working Groups and frequent plenary discussions over a five-day period, a Draft Report was created and reviewed by participants to provide the basis for this Report. This Report will be used to address policy makers and politicians as well as the public to support recommendations for actions leading to long term survival of Western Hoolock Gibbon. An extensive education component will support circulation of the Report and a Summary, help participants and other educators carry out public awareness recommendations and drive home a message of need for intensive and immediate governmental intervention on behalf of this species.

Working Groups

The **Simulation Modelling Group** ran population simulations using VORTEX with current information on WHG biology. The group modelled different variables around baseline data derived after sensitivity testing analysis. Some variables modelled included initial population sizes (ranging from 5-100 with intervals of 5), adult mortality rates (1%, 3% and 5%), inbreeding (0 and 3.14), age of first reproduction (8-14 years), female fertility rate (20-50%), catastrophes (0% - 5%), carrying capacity (no trend and negative trend), and hunting. The models generated a very high probability of extinction for populations of less than 15 individuals within twenty years, which applies to more than 80% of the existing population of WHG in India and Bangladesh. For populations larger than 15 individuals also, the probability of extinction increased with higher levels of adult mortalities, negative trend in carrying capacity and hunting, which are common factors affecting most wild WHG populations. The largest population in Bangladesh (Lawachara) with 37 individuals is very much prone to extinction within the next 25-30 years if hunting and habitat destruction continues at the present rate. In India, the largest population of 156 individuals is relatively safe, but only if habitat destruction and hunting are reduced.



The **Wild Population Management Working Group** discussed and prioritised problem areas for WHG population management in the wild in both India and in Bangladesh by addressing them in two categories, under direct and indirect effects. The group identified problems under direct and indirect effects and deliberated on each of the identified issues, defining the facts, assumptions, justifications, and data availability. They then prioritised goals and actions for five main issues including 1. arresting habitat loss, 2. receiving legislative support for preventing illegal activities relative to conservation of WHG, 3. improving livelihoods of people living in and around WHG habitat, 4. setting up effective administration to support conservation programmes including periodic population monitoring, and 5. earning political will in favour of conservation.

The **Habitat and Distribution Working Group, Bangladesh** revisited data compiled at the 2002 Conservation Assessment and Management Plan (CAMP) Workshop for South Asian Primates held in Coimbatore, India. In the intervening three years, eight populations / locations of WHG have become extinct in Bangladesh due to combined effects of habitat loss, fragmentation, human interference and hunting: Horinchara in NE, Chunati, Satghar, Padua, Bomarighona, Hinchari, Hnilla and Teknam in SE. The group also identified WHG in 23 other localities with 14 of those localities having less than ten individuals in the population. One location Lawachara has the largest population which consist of only 37 individuals. Priority problems identified are : habitat loss, human interference, agriculture, development, extraction, alien/exotic species. The Working Group based goals and action plans on these priorities.

The **Habitat and Distribution Working Group, India** also revisited the data from 2002 CAMP exercise and noted that nine previously listed populations had not been recorded. The group recommends surveys to determine whether these localities have lost WHG or not. Hoolocks occur in all the seven states of NE India with Arunachal Pradesh having 168 individuals in 7 populations, Assam having 1985 individuals 94 populations, Meghalaya 236 individuals in 10 populations, Mizoram 128 individuals in 9 populations and Tripura 97 individuals in 3 populations. Population information from Manipur was not available due to difficulties in conducting field studies in the state. Of the total of 111 populations observed in the country the number of population-size classes indicates that more than 55% of the populations of WHG in India have less than 15 individuals while only ten populations have more than 50 individuals. The goals identified by the group included the following six: arresting habitat loss, better understanding of WHG distribution, building political will, upgrading socio-economic as well as education status of people, increasing manpower for protection of WHG habitat, and increasing legislative support for preventing illegal activities.

The **Political and Public Awareness Working Group** felt that the socio-economic as well as educational status of the people living in WHG localities need improvement before they can participate in meaningful activity which would lead to WHG conservation, and recommended actions to bring this about. This included ways to strengthen the education system in general and as applied specifically to information pertaining to WHG as well as improving the socio-economic status, so that an attitudinal change towards conservation could evolve. The group also discussed legislation, suggesting amendment of existing laws to reflect current values and emphasize species and habitat conservation. The group felt religious leaders could play an effective role in conservation education if they were appropriately guided.



In the **Captive Management Group** it was noted with alarm that a large number of WHGs had been captured for exhibition and captive breeding over the years, and even very recently in Bangladesh, without appropriate exhibition or holding facilities, educational emphasis or expertise in husbandry. During that time only one infant has been born and survived and is currently living in Dhaka Zoo. The group discussed lacunae in expertise in zoo conservation, management, administration, education and research and made recommendations for filling these gaps. A beginning was made on the formulation of a management plan for captive propagation utilising only currently held WHGs in India and in Bangladesh. In view of facts from the modelling and the habitat and distribution group, it was felt that no further WHG should be captured for captive breeding or exhibition in either country.

After the Working Groups completed their Reports recommendations were prioritised, read out at the Validictory function and distributed to the Press. The recommendation for *in situ* or field conservation and for *ex situ* or captive conservation follow on the next pages.

But first . . . What is a PHVA ?

PHVA stands for **Population and Habitat Viability Assessment**. It is a "workshop" with multiple conservation goals. CBSG, the Conservation Breeding Specialist Group, developed the current PHVA workshop process over twenty years by practicing, noting problems, correcting imperfections and incorporating new science. The PHVA workshop is built on biological and sociological science: biological ... how organisms (usually non-human) are conceived, born, live and die, and sociological ... how organisms (usually human) relate to other organisms in different localities

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 behaviour 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 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 are to succeed.

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 programmes on the basis of sound science while allowing new information and unexpected events to be used for learning and to adjust management practices.

What is this "Participatory Methodology" in PHVA Workshops.

CBSG uses systematic methods to help working groups maintain timing and discipline to obtain the maximum amount of valuable information from every participant. Working groups are formed according to decisions made by participants.

The Ground Rules for Group Interaction listed here insure that each participant gets ample opportunity to share his knowledge in his working group. In some workshops, superior officers have been known to command the group and people with good information, such as forest rangers, may not feel encouraged to share.

A group Facilitator insures that the group keeps to the topic decided, does not go over time and comes out with an useful output.

There is also a group Recorder who catches the essence of what everyone says. There is a Reporter who gives periodic reports to the greater group on what the working group is doing.

These simple rules, systematic organisation and carefully selected, well-intentioned, passionate participants insure the most current and accurate information resulting in a scientific and practical analysis of the conservation problems of the species and a doable and effective management plan.

CBSG Ground Rules for Group Interaction

- Participate ... don't dominate; give all a chance to contribute to discussion
- Set aside all special agendas except conserving the taxa under assessment
- Assume good intent of all participants. Treat other participants with respect
- Stick to the schedule... begin and end promptly
- The primary work will be conducted in sub-groups
- Facilitators of plenary sessions or working groups can call 'time out' when discussions reach an impasse or stray too far off the topic at hand
- Agreements or recommendations are reached by consensus
- Plan to complete and review of draft report by the end of the meeting
- Flexibility is the key. We adjust our process and schedule as needed to achieve goals.



Who is CBSG? ... besides the folks who run PHVAs and CAMPs

CBSG : the organisation

- Chairman is appointed by the Chair of SSC.
- Members are invited to join by the Chairman
- Membership is based upon expertise and interest
- Active contribution usually made before invitation
- Members are widely scattered globally
- Expectation of conservation role and obligations
- Orientation through newsletters, documentation, and conversation
- No formalized individual evaluation - quadrennial invitation
- Processes of recognition through newsletter and reports
- Professionals - not random volunteers

CBSG Member Characteristics · 520 Volunteer Members in 66 Countries



CBSG is part of IUCN - The World Conservation Union.

Headquartered in Switzerland, The World Conservation Union serves as the "United Nations of conservation".

With 520 volunteer members, CBSG is one of the largest of over 100 Specialist Groups comprising the Species Survival Commission (SSC), one of six IUCN Commissions. CBSG is funded by annual voluntary donations from more than 150 institutions and individuals worldwide.

Support for individual projects comes from conservation organizations, private foundations, zoos, aquariums and regional zoo associations, corporations and wildlife agencies.

CBSG has over 25 years of experience in developing, testing and applying scientifically based tools for risk assessment and decision making in the context of *in situ* and *ex situ* species management. These tools, based on small population and conservation biology, human demography, and social learning, are used in CBSG's workshop process to produce realistic management recommendations.

CBSG's workshop process provides an objective environment, expert knowledge, and neutral facilitation to support the exchange of information across diverse stakeholder groups in order to reach agreement on the important issues facing both humans and wildlife.

With this understanding, meaningful and practical management recommendations can be made. The process has been remarkably successful in uncovering and integrating previously unpublished

information vital to the decision making process.

CBSG's interactive and participatory approach produces positive effects on management decision-making and generating political and social support for conservation actions by local people.

Workshop participants recognize that management policies and actions need to be designed as part of a biological and social learning process.

CBSG workshops provide tools for designing management decisions and programmes on the basis of sound science, while allowing new information and unexpected events to be used constructively to adjust current management practices.

Timely production of workshop reports has immediate impact on stakeholders and decision makers.



CBSG trains people all over the world to facilitate workshops both by conducting expert facilitation and by specific training workshops. Dr. Phil Miller facilitated most of the plenary sessions and assisted the CBSG-trained modelling team in the WHG PHVA workshop.



Conservation Breeding Specialist Group Philosophy

CBSG Goals

- *Organize a global network of people and resources for science-based, collaborative, conservation actions.*
- *Collect, analyse, integrate, and distribute species risk information developed by range country experts in the range countries and globally.*
- *Develop tools for the use of species information and human dimension factors for ecosystem and landscape conservation.*
- *Assist integration of management programmes for ex situ and in situ populations based on collaboration.*
- *Assist conservation organizations, natural resource agencies, and zoos in futures searches and Conservation Planning*

CBSG Mission

CBSG's Statement of Vitality
"CBSG cares about saving endangered species and habitat. It bases its mission and activities on the development and implementation of scientifically sound processes. CBSG takes a leadership position in the conservation community based on cross-cultural, interdisciplinary and inter-sector partnerships. CBSG champions openness, inclusiveness, morality, ethics and risk-taking. It constantly evolves in response to the needs of all those concerned with conserving the planet's biodiversity. It depends on the warmth, support, acceptance and vitality of its extended community."

Recommendations

of the PHVA Workshop for W. Hoolock Gibbon

In situ or field recommendations

1. In India the Western Hoolock Gibbon WHG is highly threatened due to habitat loss, but has been neglected compared to large mammals of the country. Considering the uniqueness of this species, the workshop recommends the development of a Ministry of Environment project dedicated to WHG for its long term conservation. A Memorandum should be submitted along these lines.
2. Habitat loss is the primary reason for decline of WHG in Bangladesh with 8 populations becoming extinct in the last 15 years. This decline in habitat must be arrested both in quantity and quality through multi-species plantations, checking illegal felling and other measures.
3. Legislative support (currently being updated) is urgently required for preventing illegal activities such as poaching, encroachment, etc. Even existing legislation can be effectively implemented through a coordinated approach, nurturing working relationships with NGOs, academics, local communities, and policy makers, training and sensitization of legislators towards the need of WHG.
4. In Bangladesh, there are 22 known populations of WGH, of which 18 have less than 10 animals, isolated and fragmented small populations which cannot survive due to their size and pressure on their habitat. The workshop recommends translocation of the small populations to larger, viable habitats, taking advice and help from the IUCN SSC Reintroduction Specialist Group.
5. The workshop recommends enhanced monitoring of habitat of WHG on priority basis including creation of more wildlife posts for patrolling, specific training for management in scientific monitoring methodology, improved infrastructure and peoples' participation.
6. As habitat loss and habitat destruction are the most important factors for the decline of WHG in both countries, the workshop recommends a firm commitment from the two governments for wildlife habitat protection in localities associated with WGH and immediate follow up by the concerned departments.
7. The workshop recommends community-based eco-development programmes to be developed in order to generate alternative livelihood to check illegal activities in WHG habitat to minimize habitat loss.
8. The workshop recommends networking specialists, policymakers, law enforcement and celebrities popular with the general public to assist in producing an attitudinal change in





politicians and general public, particularly local stakeholders, about the need for overall protection of WHG.

9. The workshop recommends both countries to create a widely available database on WGH and its requirements for survival to encourage educational projects including educational programmes directed at laypersons in the localities of the species. Religious leaders/teachers could be particularly effective combining scientific facts with religious scriptures about wildlife conservation.

10. The workshop recommended a systematic study of the eight localities in which WGH had become completely extinct in the last three years in Bangladesh should be undertaken to determine the reasons and causative factors so that the same could be recognised early in other localities.

11. Since translocation may be the only viable alternative to extinction of WHG the Working Group recommended that multidisciplinary teams for each country should be appointed. They should consist of internal and external experts with experience in translocating similar species who would assess sites, review data and make recommendations on the whole operation. They should also document project outcomes and keep the governments and conservation community fully informed.

***Ex situ* or zoo conservation**

12. As many WHGs have been taken from the wild in the past for exhibition in zoos and infructuous captive breeding projects, and since the removal of even a very small number of animals can impact the future survival of the species, the workshop unanimously recommends that no further WHG should be captured from the wild for zoos or captive breeding centres. Zoos currently holding WHG should focus their conservation efforts on education, research and a regional cooperative breeding programme utilising currently held WHG taking advice and help from proven gibbon experts.

13. The workshop recommends that zoo education featuring WHG be given much more attention providing printed material, accurate, effective signage, trained educators and organized activities which to include outreach programmes to educate rural people in/near range of WHG.

14. The workshop recommends that the governments of both countries should insist that zoo staff and other researchers with training, experience, expertise and interest in the care and management of WHG and other threatened species remain in the zoo instead of being routinely transferred.

15. The workshop recommends that dramatic improvements be carried out in the areas of zoo husbandry, management and enclosures of WHG with advice from experts of international repute. This should include a Management Plan for daily care, a Cooperative Breeding Programme for WHG, and a detailed Husbandry Manual after assessment of current practices and enclosures of WHG by experts.



Simulation Modeling and Population Viability Analysis

A model is any simplified representation of a real system. 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 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 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.

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,
- chance results of the probabilistic events in the lives of individuals (sex determination, location of mates, breeding success, survival), and
- interactions among these factors.

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).

In theory, simulation programmes 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.

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.

The *VORTEX* Population Viability Analysis Model

For the analyses presented here, the *VORTEX* computer software for population viability analysis was used. *VORTEX* models 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.

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. It 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. 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.



Where Hoolock Gibbons can be found -- but for how long ?

Looking at the list of places that hold Hoolock Gibbons, at first one might be heartened that so many hoolocks occur in all those places (see map). One might think we don't have to worry then !

Noooooooo ! While it is true that there are about 2753 hoolocks in 155 localities, we DO have to worry ... we have to worry a lot !

IF there were *more* hoolocks in each of those localities (at least 100 mature adults for example) and IF those localities were *less disturbed* forest instead of *more populated* human areas where people gather forest produce, conduct logging operations, put down pipeline, and actually hunt hoolocks for food, medicine and zoos then, yes, we may not have to worry so much.

Each of those localities, however, has at least one human-caused threat, and some of them 3-5 threats. So, we worry !

Also, and this is very important, the total number of hoolocks in Bangladesh or India is not so important, but the fact that there are small numbers in isolated and fragmented localities or pockets of habitat is what is important. In this instance any number less than 50-100 is "small". Why is that important? It is because most of these different localities are *not contiguous*. And... what does that mean ? If these localities are not contiguous, it means that a Hoolock Gibbon from one locality can't safely or easily go to another locality. That means that the mateless hoolocks in one locality can't go to other localities to find mates. Hoolock Gibbon behaviour is such that they form pair bonds, like human beings are said to do and that means that as long as they live, they keep that partner. What do singles do then?

If they try to mate with already mated individuals, fights, injuries and deaths can occur. If they mate a close relative like a sibling, inbreeding occurs which, if

continued, leads to birth defects, loss of fitness and other problems.

Population scientists differentiate between the "total number" of Hoolock Gibbons and "breeding adults". That is because a young (non-adult) Hoolock Gibbon doesn't reach breeding age for 6-8 years. Until they start breeding, they can't contribute to the total numbers with their offspring. Their young also remain parents for years, unlike many animals which become independent very quickly. Hoolock parents don't produce another infant until their previous one can fend for himself which takes about six years. Therefore there is a long inter-birth interval. Also there is usually only one offspring per birth, unlike many other animals which have several offspring per litter. This is how the Hoolock Gibbon's biology affects its population growth and its survival as a species.

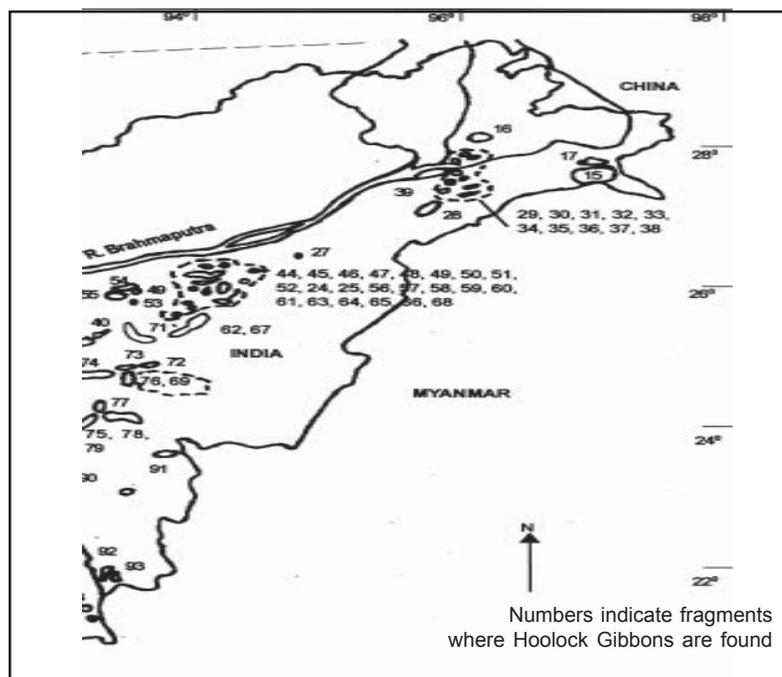
That is just the "tip of the iceberg" of obstacles to population growth of Hoolock Gibbons. We haven't even touched the topic of how delicate they are, how sensitive, and how almost any threat can

put them off their normal behaviour for a long time. Or how they mate for life and if one dies the other mourns for years, perhaps the rest of its life.

That is why, in Bangladesh, the Hoolock Gibbon was assessed as Critically Endangered. The probability of any hoolocks surviving under the present conditions is very poor. No more Hoolock Gibbons for Bangladesh after just a decade or two perhaps.

The very important fact to remember about this sad situation is that human beings did this to hoolocks. Human beings have spread out everywhere into the forest, constructed buildings, laid pipelines, captured animals for zoos, for food and for medicine and generally destroyed the forests that are home to hoolocks.

Maybe we can survive in this world without Hoolock Gibbons but we can't survive without forests. The two are inter-related. If we protect the animals, we automatically protect the forests and the forests help us sustain life itself.



Source: Das et al. (2003).



Localities of Hoolock Gibbons in Bangladesh and India

Bangladesh

India

Popln.	Size	Popln.	Size	Popln.	Size	Popln.	Size
Barolekha	8	Arunachal Pradesh		Jaypur	69	South Diyu	10
Patharia	2	Changlang	?	Jhunthung	20	Suang	15
Lathitila	3	Manabhum RF?	18	Jorsal	0	Takowani	5
Lawachara	37	Mehao WLS?	48	Kafitoli	5	Tarani	20
Chautoli	5	Miao RF	2	Kakajan	17	Tengapani	25
Kalinji	16	Namdhapa NP	45	Kalapahar	2	Tikok	10
Adampur	16	Pirap	?	Kalioni	30	Tipong	7
Horinchara	0			Kamakhya	12	Tirap 1	9
Kalenga	1			Kashumari	2	Tirap 2	10
Satchari	7		113	Kashumari Part II	2	Upper Dehring	156
Hazarikhil	0	Assam		Katakhal 1	0	Upper Jiri	0
Kaptai	14	Abhayapuri	0	Katakhal 2	0	W. Mikir Hills	30
Chunati	0	Amreng	10	Kaziranga NP 1	45		1985
Satghar	0	Bagser	18	Kaziranga NP 2	28	Meghalaya	
Padua	0	Barail 1	0	Kholahat	20	Baghmara RF	7
Bhomarighona	0	Barail 2	3	Khongkhal	5	Balpakram NP	15
Himchari	0	Barail 3	8	Khurriming	35	Jaintia Hills	10
Inani	5	Barjuri	0	Killing	3	Nokrek NP	25
Ukhia	6	Bogikhas	0	Koonbamun	15	Nongkhylum WLS	3
Hnila	0	Bokajan	5	Kothes	8	Rewak RF	2
Teknaf	0	Borajan WLS	8	Kulsi	20	Saiphung RF	14
Bamu	14	Buridehing NB	10	Kumsang	2	Siju WLS	12
Bangdepa	8	Buridehing SB	11	Kundilkalia	25	Songsek RF	18
Bishari	7	Chandubi	12	Kuwasing	10	West Garo	130
Thanchi	7	Choigaon	2	Langluksho	12		236
Rampahar	16	Daldali	15	Langtingmupa	110	Mizoram	
Dighinala	7	Deosur Hill	2	Longai	45	Dampa WLS	20
Pablakhali	4	Deosur	7	Longnit	45	Khaunglung WLS	36
Massalong	ND	Dessai Valley	15	Lower Dehring	201	Lengteng WLS	24
Lama	ND	Dhanshiri	25	Lumding	59	Murlen NP	8
Dhopachari	7	Dibang valley	13	Mahamaya	5	Ngengpui RF	1
Sazak	12	Dibrisoikhowa	30	Mikir hill	40	Ngengpui WLS	3
Whykong	ND	Digboi East	3	Misaki	9	Phawnggh	6
		Digboi West	7	N. Cachar	60	Tawi WLS	22
Total	202	Dilli	4	Nambar	18		120
		Dirak	19	North Diyu	12	Tripura	
		Disama	8	Panbari	10	Gumti	17
		Doboka	30	Pantan	0	N Tripura	58
		Dolamora	0	Patharia	72	Trishna	22
		Doomdoma	5	Patradisha	10		97
		Gibbon WLS	57	Pengri	3		
		Gorbhanga	20	Philobari	7	Total	2753
		Hakhhati	3	Popahanga	5	Hoolock Gibbons have gone extinct locally in 10 localities in India between 2002 and 2005.	
		Haithapathar	19	Ranigarhbhanga	18		
		Innerline 1	30	Singla	25		
		Innerline 2	50	South Amchang	18		
		Innerline 3	80				

Eight localities in Bangladesh have lost Hoolock Gibbon between 2002 and 2005.

According to recent surveys, some locations in Arunachal Pradesh could have the eastern sub species *H.h. leuconedys*

NP - National Park; RF - Reserve Forest; WLS - Wildlife Sanctuary; SB - South Block; NB - North Block; ND - No data



Population Modeling Working Group Report

The Western Hoolock Gibbon is restricted to a very few viable forest habitats. These gibbons may be the most vulnerable to habitat destruction of all primate species of South Asia as they are strictly canopy dwellers. Their survival potential is further compromised by their biology and behaviour as they are late and monogamous breeders; they maintain a small group size and require long-term parental care as compared to other species. In other words they breed only when they are older compared to other species, and seldom, and with one mate only, and they do not become independent for several years. They dwell in the higher parts of trees which, when destroyed, don't grow back for decades. Modern life doesn't give forests time or place to recoup, so working habitats which support this species grow fewer and fewer.

The Hoolock is distributed throughout its geographic range as a large number of isolated populations within a highly fragmented forest ecosystem. Because of this extensive degree of population fragmentation, many Hoolock populations are no doubt at significant risk of imminent extinction. It is important to determine the best possible management strategies for the security and viability of this species into the future. Perhaps the best tool for accomplishing this task is an analytical technique known as population viability analysis, or PVA.

We used this form of analysis to help us answer the following questions:

1. What is our depth of understanding of the population biology of the Hoolock?
2. Based on this understanding, what do we see as the primary drivers or causes of Hoolock population growth? To which parameters is our demographic (age and sex ratio) model most sensitive?
3. How vulnerable are small, fragmented Hoolock populations to local extinction in the absence of demographic interaction with other populations?
4. What is the relative risk to Hoolock population viability posed by intrinsic biological processes such as inbreeding depression? Are there analogous risks to viability posed by extrinsic (anthropogenic) processes like poaching?
5. Specifically with respect to the populations of Western Hoolock Gibbon which occur only in India and Bangladesh, what is the probability of the species' survival given its small size and great degree of fragmentation?.

1. Our use of the model indicated that current understanding of the population biology of Hoolock Gibbon in the wild is not very good. The age of first reproduction has been taken from captive records of other species of gibbons so there is no certainty

that this information is accurate for Hoolock Gibbon. The age of last reproduction was taken as the age of death of the individual which means that the model is fated to underestimate the probability of extinction because the age of last reproduction in both sexes was taken as the age of life-span of the animals. That is a serious lacunae, which is not the only gap in our knowledge.

2. To answer the second question, reduction in poaching and increase in carrying capacity, if achievable, would be the primary drivers of population growth.
3. Isolated populations with less than 15 individuals showed a very high rate of extinction.
4. Inbreeding, according to the model, doesn't make much of a difference, at least when we use the average inbreeding depression rate of 3.14 known for captive mammals. Extrinsic factors such as poaching, irrespective of population size or inbreeding depression drives populations to extinction more than any biological factor.

It is inevitable that most of the populations under 15-20 animal will be lost. Yet there are very few places with sufficient area and potential habitat for improvement to target for conservation of Hoolock Gibbon by translocating or shifting these small populations. Lawachara is probably the only such area in Bangladesh, but the recent addition of a pipeline and the developmental impact and immigration of human beings will make it extremely difficult. India has a better chance with Upper and Lower Dering which already has 357 animals and a land area of 405.9km². For any of these sites to provide adequate security and comfort for Hoolock Gibbon, however, they need not only a complete cessation of human interference of any kind in the hoolock habitat but also a modicum of habitat improvement.

Unless the mindset of the agencies responsible for these areas changes dramatically which involves full governmental backing from the highest level on down to others such as local workers and residents. For such fragile species we should not pin our hopes on recovery as normally defined as that may be impossible. A species with the biological and behaviour characteristics of Hoolock Gibbon is predetermined to grow at a particular rate, which is insufficient to permit it to recover without human intervention so drastic as to be beyond consideration of most public officials and governments. However, we should not settle for less than preserving the numbers which currently persist. We have less than 3000 Hoolock Gibbons now, therefore we should aim not to lose a single number or to sacrifice a single variable. If we can do better, well and good -- better is best.



Wild Population Management Working Group

Introduction

Problems related to wild populations of Hoolock are broadly classified into two categories Direct Effect and Indirect effect. Perhaps the most significant direct effect is habitat loss which may be complete loss of habitat (quantitative loss) and degradation of habitat (qualitative loss). Habitat loss, both quantitatively and qualitatively, is the most deterministic cause that controls Hoolock Gibbon distribution as well as its survival as a species. The quantitative loss was assigned due to habitat encroachment, development projects, *jhum* cultivation practice, denotification of protected areas, and habitat fragmentation. The qualitative loss was assigned to commercial logging, loss of food and cover trees, *jhum* cultivation practice, illegal felling, habitat fragmentation, monoculture plantation, infrastructure development (roads, dams), and other developmental projects. Other issues such as inadequate legislative support, livelihood issues of local people, poaching and hunting, demographic factors, etc. were also discussed.

Goal I

To arrest habitat loss

Action Plan

Two fold actions are proposed to achieve the goal of arresting the loss of habitat, one by making good of the quantitative losses to the habitat, and second by restoring the qualitative losses to the existing habitat. Following specific Action Points are proposed:

1. The **quantitative losses** can be made good of by reclaiming encroached land by invoking the enabling legislative measures and by undertaking rehabilitation activities for the people to move them outside the Hoolock habitat.
2. The **qualitative losses** can be restored by improving the degraded Hoolock habitats; facilitating aided natural regeneration, raising new plantations of food species, improving the canopy cover, and improving water regime inside gibbon habitat; completely checking illegal felling/cutting of trees; completely stopping or minimizing the collection of non-wood forest products by the local human populations from the Hoolock habitat; invoking the Conservation and Community Reserve Provisions of the Wildlife (P) Act of India to link fragmented Protected Areas having critical Hoolock habitat and population; facilitating canopy connectivity using bamboo bridges (successfully done in Assam).

Goal II

To create political will in favour of conservation Action Plan by conducting conservation awareness programmes for policy makers and politicians;

motivating the media to win favour of politicians by projecting ecological and economic benefits accruing through gibbon conservation programmes; highlighting the economic and other benefits to the local people from conservation of Hoolock and their habitat, which in turn may convince politicians about its importance; involving tribal or religious leaders, drawing up the conservation awareness programmes; creating publicity/extension wings / divisions/cells, etc., in the forest department for periodic and regular documentation and dissemination of success stories linking gibbon conservation with economic development of local human communities and preparing educational materials specifically tailor made for politicians and religious leaders for awareness.

Action Plan to receive legislative support for preventing illegal activities for conservation of Hoolock

1. Creation of infrastructures (e.g., protection camps, wireless networks, transportation facilities, watch towers, etc.) for enabling staff to perform protection activities effectively.
2. Introduction of enabling amendments in the Wildlife Protection Act of Bangladesh to make it effective for Hoolock conservation in contemporary field situation.
3. Constituting co-ordination committees consisting of members from other enforcement agencies (Police, Customs, Judiciary, District Administration, Armed Forces, Paramilitary services, etc.) for supplementing and strengthening the Wildlife legislation with enabling provisions of other Acts/Legislation for effective conservation of gibbon habitat and population.
4. Creation and nurturing working relationships with NGOs & other research and academic Institutions.
5. Induction of local communities to impart protection in the Hoolock habitat *in lieu* of the community based economic benefits rendered to them by the Forest Department.
6. Filling all the vacant posts especially in gibbon areas and providing them training in wildlife related legislation and its implementation techniques.
7. Initiation of in-service training programmes especially for the front-line staff in various aspects of wildlife conservation with special reference to the conservation of Hoolock habitat and population. These training courses may cover aspects related with habitat improvement, conducting population estimation, undertaking effective community based programmes, wildlife laws, etc.
8. Sensitising lawyers, judges and policy makers in the importance of Hoolock conservation through theme based seminars/discussions etc.



Habitat and Distribution in Bangladesh Working Group

The Habitat and Distribution working group identified the following problems as priority upon which action should be taken as soon as possible. They did not exclude other problems from discussion and developed action plans, however. The priority problems were listed as Habitat loss, Human interference, agriculture, development, extraction and alien species. The problems of habitat and distribution in Bangladesh were addressed by creating goals, Action Plans to achieve them and assigning individuals and institutions for implementation.

Goal I & Action Plan

To earn firm commitment from politicians and policy makers for wildlife and habitat protection. The Action Plan consisted of :
Organizing conservation awareness programme for the politicians and policy makers.
Publicizing the successful Hoolock conservation cases in the media.
Projecting the economic benefit to the local communities through Hoolock related conservation programme.

Goal II & Action Plan

To assess and evaluate present status and distribution of Hoolock and its habitats in Bangladesh. The Action Plans are :
Create more posts for wildlife conservation at different levels by imparting training to the staff, developing suitable infrastructure to facilitate the staff to assess and evaluate gibbon habitat and population, adopting proper scientific methods for periodic estimation and assessment of hoolock population and habitat, developing vibrant and working coordination between research/academic institutions and forest department. Hoolock researchers based in universities, ministries and departments of Bangladesh will follow up on this action.

Goal III & Action Plan

To generate alternative livelihood to check illegal activities in and around Hoolock habitats. Plan of Action :
To discourage local illicitors, joint efforts be developed for their alternative livelihood in and around Hoolock habitats. Conservation NGOs, Hoolock researchers government officials, local elites, religious leaders, and media will be involved in follow up.

Goal IV and Action Plan

To minimize human and other biotic pressure on Hoolock habitats by initiating, facilitating and understanding community based programmes (eg, eco-development, eco-tourism, joint conservation efforts, etc.) in and around Hoolock habitats by the NGO's, researchers, government officials, local elite, religious leaders, and media.

Goal V & Action Plan

To create public awareness among primary stakeholders by developing informal educational programme for different stakeholders in and around Hoolock habitats; by organizing programmes for school children to sensitize them about importance of gibbon conservation, by declaring and celebrating wildlife week, gibbon day, etc. with the active participation of local communities, children, and other stakeholders, by organizing theme based seminars and workshops by NGOs, researchers, government officials, local elite, religious leaders, and media.

Goal VI & Action Plan

To create digital database for gibbon population and habitat, including having GIS images for entire Hoolock habitats to digitize hoolock population and habitats for future comparison and management plan. Work can be done by researchers, government officials, and Space and Remote Sensing Organization of Bangladesh (SPARSO).

Goal VII & Action Plan

To achieve greater understanding of Hoolock gibbon in Bangladesh by Collecting accurate demographic and ecological data as well as condition of the gibbon habitats in the country, which should include-
Demographic data of Hoolock in each habitat.
Digitalized distribution of Hoolock in each habitat.
Assessment of the habitat condition of hoolocks in its past and present ranges.
Longterm monitoring of population dynamics of hoolock in the country. Work to be done by the Gibbon specialist group of the country.

Goal VIII & Action Plan

To improve the socio-economic as well as educational status of the people and alleviate poverty by initiating, facilitating and understanding community based programs (eg, eco-development, eco-tourism, joint conservation efforts, etc.) in and around Hoolock habitats by different NGOs should be engaged to undertake poverty alleviation project in and around Hoolock habitats under supervision of FD (Wildlife Circle).



Habitat and Distribution in India Working Group

The Habitat and Distribution Working Group put forth that socio-political issues, mainly insurgency and boundary disputes, are hindering the distribution studies. Other hindrances are lack of infrastructure and difficult physiographic and climatic condition. Multiple factors such as encroachment, illegal timber extraction, lack of infrastructure, lack of enforcement of law, jhum cultivation, affect the habitat of Hoolock Gibbon in India. Their goals and action plans were organised as follows :

GOALS

Keeping in mind the problem statements, the goals required to overcome these problems are:

- Develop political will
- Coordinate between various agencies
- Improvement of communication facilities
- Eviction of encroachers
- Demarcation of forest boundaries
- Enforce strict policing
- More man-power for protection
- Training on legal issues
- Educate the community and religious leaders
- Minimize jhum cultivation

ACTION STATEMENTS

Arrest habitat loss

Prepare a detailed memorandum for the conservation of Hoolock Gibbons and submit the same to the state and central government. Include the recommendations of the PHVA workshop in the memorandum. Prepare a project proposal and submit the same to the Central govt. for declaring a "Project Gibbon" for the conservation of the species in its totality in line with *Project Tiger* or *Project Elephant*.

Create a better understanding of Hoolock Gibbon distribution

Conduct surveys in unexplored habitat of hoolocks in northeastern states and re-evaluate the current status of previously surveyed areas and undertake extensive field research on several ecological parameters of Hoolock Gibbons.

Strengthen the Political will

Build up pressure on the government and politicians through involvement of celebrities as ambassadors of Hoolock conservation in the wild.

Strengthen socio-economic as well as educational status of people to alleviate poverty

Conduct socio-economic survey among the fringe area people. Also, promote sustainable ecotourism and ecodevelopment activities while creating community forests to generate biomass (such as fuel wood, fodder, small timber etc). Check cross border human infiltration.

Create more manpower for protection of Hoolock Gibbon habitat

Impress upon the government and try to accord sanction for the creation of new posts of wildlife protective staff, in the staff crunched Hoolock Gibbon habitats of northeastern India. Train the existing and newly recruited staff and equip them with advanced gadgets for effective implementation of the law for the conservation of the species. Provide incentives to the staff for outstanding services towards gibbon conservation.

Strengthen legislative support for preventing illegal activities

Help the judiciary with necessary information through manuals and documents for speedy action on the cases related to wildlife in general and Hoolock Gibbon in particular. Establish more green benches for fast solving of legal issues on wildlife.



Political and Public Awareness Working Group

The socio-economic status of the people living in and around the Hoolock Gibbon range area is under the influence of increasing poverty, low literacy, population explosion, and priority for personal needs and agenda. Thus people's economic status affects the Hoolock population directly or indirectly and also become a major barrier towards Hoolock conservation. The society including media, various stakeholders and policy makers (politicians and government officials) is not committed towards species conservation. The conservation progress is also hampered due to the prevailing negative mindset based on religious reasons.

The present education system is not unified, particularly for Bangladesh, due to religious views and social status. Proper education system at fundamental level is also lacking for want of trained teachers and inexperienced policymakers. Transfer of species information to the society is hampered due to non-availability of complete species information and its ecology. The existing species information is not easily available due to unmanaged information dissemination.

Implementation of existing conservation laws and general laws are not adequate due to lack of law enforcement. Political insurgency is also a major issue that hinders conservation activities. The negative influence of political leaders upon the law enforcing agencies is a barrier.

Goals

To achieve overall conservation objective goals were set for each theme by the group to address the problem. The goals were prioritized using paired ranking and the actions listed which would bring about successful reaching of the goals.

Actions proposed by Political and Public awareness Working Group

Goal 1: Improve the socio-economic as well as educational status of the people and alleviate poverty

1. Conduct survey to collect data on Hoolock population habitat status threats ecological parameters by researchers, fieldworkers (who are working in and around the Hoolock area) local people, representatives from GOs and NGOs
2. Study to understand status and attitude of the local people and various stakeholders towards the Hoolock species by researchers, fieldworkers (who are working in and around the Hoolock area) local people, representatives from GOs and NGOs
3. To educate and motivate local people through various technique and involve them in the conservation by GOs, NGOs, participation of local people.

Goal 2: To strengthen education system and teaching capacity there by including conservation topics in formal and in informal education.

1. Revise school curriculum including conservation biology that should provide compulsory field trips
2. Conduct national level training for the teachers to educate the local people
3. Develop education tools/techniques for informal education especially for Hoolock
4. Create interest among teachers through in service training
5. Implement compulsory primary education for the local people live in and around the Hoolock habitat.

Goal 3 : To create an attitudinal change towards conservation among the politicians and general public.

Action: Formation of village level eco-development committees involving local people and stakeholders to conserve Hoolock and its habitat through participatory management.

Goal 4: Networking all specialists, policymakers and law enforcement agencies and disseminate the information.

Action: A network of primates should be initiated and information dissemination can be done through publication like newsletters, reviews, and directories.

Goal 5: Create species and habitat information for the public.

Action: Formulate database on species and habitat information and uploading the information on web that should be available for layman in forms like documentary films.

Goal 6: To strengthen conservation through wildlife laws. Actions: Amendment of existing laws with the present scenario, which should emphasis on species and habitat conservation.

Goal 7: To unify all education system under one. Action: Explore and bring to light the religious truth about wildlife and its conservation to motivate religious leaders/ teacher to promote wildlife conservation that may alter the religion based education system.



Captive Management Working Group

According to the IUCN Technical Guidelines on the Management of *ex situ* Populations for Conservation (IUCN, 2002), Hoolock Gibbon qualifies for *ex situ* management on two principles under the IUCN Red List Criteria quoted in the Guidelines, e.g., : "1. When the taxa/population is prone to effects of human activities or stochastic events and 2. When the taxa/population is likely to become Critically Endangered, Extinct in the Wild, or Extinct in a very short time" as well as the fact of its biological uniqueness and cultural importance.

The Working Group prioritized Conservation, Husbandry, Welfare, Public Education and Research in that order.

Zoo Conservation can best be served by defining the conservation purpose of Hoolock Gibbon in zoos to education, research and breeding in captivity for exchange with other South Asian country zoos. This is intended to strengthen existing and future legislation in both India and Bangladesh which strictly prohibits the capture of Hoolock Gibbon from the wild for any purpose.

Improvement of Management

Improve the overall scientific management of Hoolock Gibbon in captivity by:

- The creation of a systematic management plan for general animal well-being including monitoring protocols, records improvement (ISIS, ARKS), visitor management to reduce stress and disease transmission, health/sanitation/pest management.
- Creation of a regional studbook (SPARKS), and a regional cooperative breeding programme
- Creation of a scientific captive management manual as a living document with regular updating.
- Provide training to staff for improvement of management and create a research environment.
- Ensure continuity of staff by convincing government to make appropriate changes in the zoo administration to retain staff who have acquired training, experience, expertise and interest in Hoolock Gibbon.
- Improve enclosures to increase comfort and well being, sanitation, and general quality of life.

Zoo Education/Awareness

To initiate a comprehensive public education programme for Hoolock Gibbon (both in the zoo and outreach including in and near Hoolock habitats) for all levels of people in urban and rural areas, particularly in the localities of Hoolock Gibbon, and provide training for potential educators for more effective teaching which would effect a change in attitude and actions relating to survival of Hoolock Gibbons.

ACTION steps -- Most important priorities : Zoo Conservation

Problem : Zoos in South Asia do not have a good track record for keeping and breeding delicate animals. Taking animals from the wild with the idea of conducting captive breeding for reintroduction and conservation has resulted in loss of important individuals from small wild populations. Moreover, but for one instance, captive breeding has not been successful. Further, in many localities, there is not sufficient or secure habitat for reintroduction. Existing legislation in both India and Bangladesh strictly prohibits the capture of Hoolock Gibbon from the wild, yet it has taken place. The Population Modelling Group found that populations with less than twenty individuals were highly vulnerable to extinction processes, if even a single adult individual was harvested annually. In case of a family group harvested the probability of extinction increases manifold.

Goal : To curtail the trapping of Hoolock Gibbons from the wild for captive breeding / conservation until techniques for success are well established and the causes of population decline in target localities of the habitat have been established and curtailed.

Action : The PHVA Workshop participants overwhelmingly agreed that the conservation purpose of Hoolock Gibbon in zoos should be limited to education, research and breeding for exchange with other range country zoos, and that no more animals should be taken from the wild for this purpose. The organizers of the Hoolock Gibbon PHVA will draft a letter recommending that the government endorse this view at a policy level. This action is intended to stop zoos/safaris/ breeding centres from placing orders of gibbons from trappers and even from capturing through the relevant department for captive breeding until expertise is established and the Guidelines of the Reintroduction Specialist Group can be met.

Continuity of Staff caring for Hoolock Gibbon

Problem : The staff of zoos and other captive facilities both in India and Bangladesh is frequently transferred and with them expertise gleaned during their tenure.

Goal : To request government to make appropriate changes in the zoo administration to ensure continuity of zoo staff who have acquired training, experience, expertise and interest in the care and management of Hoolock Gibbon.

Action Step :

Enlist knowledgeable and influential people to work on this step with government, to write letters, to visit officials, to general work towards this goal.



How Hoolock got its name(s)

Alan Mootnick*

Introduction

Gibbons, Family Hylobatidae, are the smallest of the five ape species. Apes are known for having a much larger brain than a monkey of the same size, having longer arms than legs, and for the placement of their shoulders, which allows apes to be true brachiators (swinging from branch to branch). Depending on the species, an adult gibbon weighs between 6 and 20 Kilos. They are the only nonhuman primates that naturally walk upright, and do not need to rely on hands to walk. When standing, some gibbon species are as tall as 91 centimeters. Because gibbons' arms are approximately 1.5 times longer than their legs, their arms can act as pendulums when swinging (brachiating) through the forest canopy. From a hanging position, they are able to pull themselves 4 meters horizontally to the next branch, and once momentum is created, able to they are brachiate at speeds of 40 kilometers per hour, with leaps of 15 meters in a horizontal plane. They are the only nonhuman primates that can pull their body in an upwards motion during brachiation. Because of all this, they are known as the world's greatest acrobats.

The name gibbon could be derived from the Latin word, "gibbus", meaning hump or hunchback, which is a typical sitting posture of a gibbon, or from an old Chaldic word meaning ape.

The gibbon and orangutan are the only apes native to the Asian forests. The orangutan is only found in Southeast Asia, whereas the gibbon inhabits the tropical and semi-deciduous forests of South, East, and Southeast Asia. Gibbons are distributed from Northeastern India and Bangladesh eastward to Yunnan China, Vietnam, Cambodia, Laos, Thailand, and south to the Malaysian Peninsula, Sumatra, Borneo, and Java.

Gibbons are characterized by long-term pair bonding. The gibbons' territorial vocalization can be heard up to 2 kilometers, which helps define their boundaries to neighbouring gibbons. A gibbon family consists of an adult male and female, and from 1 to 4 offspring. Once the offspring are sexually mature, they leave their family group to establish their own territory. The gibbons' long, razor sharp canines assists them in territorial defense, in holding fruit in their mouth when traveling through the forest canopy, and opening tough-skinned fruits. Over the years, numerous scientists have studied gibbon behaviour in the Asian forests, but because of the gibbons' elusive nature, they are not easily observed.

Understanding more about this fascinating primate gives us better insight into our ecosystems. Since gibbons eat an abundance of fruit, and require up to 200 hectares of forest for their family to survive,

the gibbon aids with seed dispersal in the regeneration of new trees.

Gibbons are recognized as belonging to four genera and 13 species. Some gibbon species go through coat colour changes during infancy and before adulthood. All gibbons are recognized as endangered, and the rarest primate in the wild is one of the gibbon species, *Nomascus nasutus hainanus*. This species is found on the island of Hainan China, with only 17 individuals surviving. Depending on which country a gibbon lives in, their demise is due to: loss of habitat by forest fires and logging, collection of wood for cooking, capture for the pet trade, medicinal purposes, use as a food source, and, in some cases, to obtain the bones from their forearms for chop sticks. Only infant gibbons are desirable in the pet trade. Once a captive gibbon is an adult, it is not manageable. In order to obtain an infant gibbon from the forest, a poacher shoots the mother, and if the infant survives the fall from the forest canopy, the infant will end up in a marketplace waiting for someone to purchase it. Generally the infant gibbon is malnourished during its time away from its family, and rarely survives to maturity. With the rapid decrease of the forests worldwide, gibbons suffer from this loss. The gibbons' vocalizations are the sounds of the forest, and when the forest vanishes, so will their territorial call.

Note regarding Hoolock genus name

Before 1982 there were three subgenera of gibbon, and the hoolock gibbon was classified in the subgenus *Hylobates* with the other 44-chromosome gibbons. In 1983, Prouty, Buchanan, Politzer, and Mootnick published their findings that hoolock gibbons have 38 chromosomes, and that this species has enough morphological differences to be placed in its own subgenus. The name that was chosen was *Bunopithecus*, from the fossil gibbon jaw named by Frisch. Unfortunately, the dentition on the jaw resembled that of an ancestor of the concolor gibbon more than that of the hoolock gibbon. For this reason, the name *Bunopithecus* was not the best choice for the subgenus name for the hoolock gibbon. In 2005, Mootnick and Groves elevated all the gibbon subgenera to genus level, and at the same time, changed the genus name of the hoolock gibbon to *Hoolock*.

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Hoolock Gibbon in Captivity : from 1875 to the present

Hoolock Gibbons have not been exported to foreign countries like other Gibbons. There is not even an international studbook for Hoolock.

But the earliest record perhaps of any gibbon in captivity and certainly the first management information occurred in the first zoo management book in the world, written by an Indian named R. B. Sanyal.

In India in the latter part of the 19th Century the Calcutta Zoo had a pair of Hoolocks which had lived there for nine years. Zoo superintendent, Sanyal, wrote three and a half pages about aspects of hoolocks and gibbons generally, stating that their length of life was not normally so long as those currently in the zoo.

Sanyal's book about zoo management, described in the most interesting fashion, the way to keep a variety of animals, including their treatment in health and in sickness, their diet, housing, need for exercise, toys, etc. He closely observed the habits of Hoolocks. He describes their lovingly hugging persons who fed them treats such as buns and fruits by twining their long arms around their necks. Conversely they also exhibited an extreme jealousy when their attendant did not give them attention before the other monkeys at a time when they were housed together.

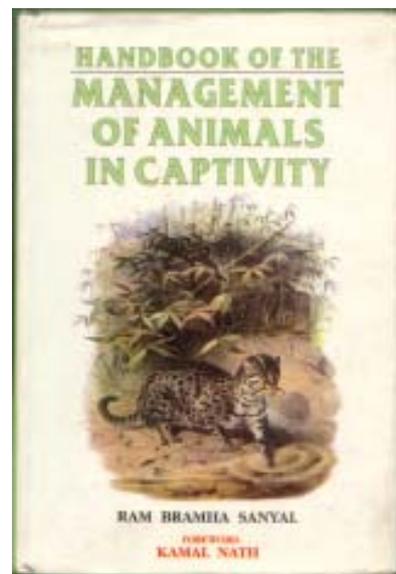
Best of all, Sanyal wrote, there was an elderly female Hoolock Gibbon who developed an "inveterate hatred" of female human beings which became an obsession. On seeing a lady, she became furious, dashing violently against the bars of the cage. She used to poke her long arms through the bars try to drag women towards her, or at least filch a handkerchief, purse or bonnet."

Sanyal ends his discourse by contributing information gleaned

from travellers in the North East that Hoolocks from the Assam forests bear captivity better than those from Chittagong and Arracan (now Bangladesh). He also observed that a hoolock had the habit of using its hand to scoop up water or milk to drink rather than lapping from its bowl. Today, in India 9 zoos hold 17 Hoolock Gibbons but one never reads such interesting observations anymore and more's the pity. Anyway, Hoolock Gibbons are just as much fun to watch now and then and they can be seen in the listed below zoos :

List of zoos holding Western Hoolock Gibbon in India and in Bangladesh

India	
Assam State Zoo	1.0
Bokakhat Rescue Centre	0.1
Delhi Zoo	0.1
Imphal Zoo, Manipur	1.1
Sepahijala Zoo, Tripura	0.1
Lucknow Zoo	1.1
Itanagar, Arunachal Prad.	0.0.1
Aizawal Zoo, Mizoram	2.4
Miao Zoo, Arunachal Prad	2.0
Total	7.9.1
Bangladesh	
Dhaka Zoo	3.1
Dulhazara Safari Park	1.1
Total	4.2



Hoolock Gibbons are one of the most popular animals in the zoos of India and Bangladesh, which are almost the only nations which have the western variety. The Eastern form of Hoolock Gibbons occurs in Myanmar although we do not know whether they are in their zoo, but we do know that Alan Mootnick, who is one of the two persons who renamed Hoolock Gibbon has a couple of pairs in his Gibbon Breeding Centre where he hopes to keep them happy and healthy enough to reproduce.

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Apes and gibbons

All apes are primates but not all primates are apes ! There are about 230 groups and species of primates, from the tiny mouse lemur or slender loris (either of which would fit in the palm of your hand) up to the Eastern Lowland Gorilla, the largest of its species, which is far larger, heavier and stronger than the largest man, except perhaps a sumo wrestler, but even a sumo wrestler would have a hard time beating up on a gorilla.

Humans

Human beings are distinguished from the other apes by their intellect, facility with language, and ability to use tools. Human beings, like cockroaches, can be found in every nook and corner of the earth.



Gorillas

Gorillas are different from the other apes by their size, strength, appearance and behaviour. There are two species and four subspecies of gorillas, all found in the continent of Africa.



Orangutans

Orangutans can be identified by their long red hair and very long arms which seem to drag the ground when they walk. All orangutans live in Borneo and in a few regions of Sumatra. There are two species of orangutans, the Sumatran with its linear build and the Bornean which is built stouter and more stocky than the Sumatran species.

Orangutans, like gorillas and chimpanzees, are very popular zoo animals. They are charming

with their slow, deliberate movements, and frightening when they do decide to move.

Sometimes they scare visitors half to death with a violent sudden movement which seems completely out of character after watching them move around in slow motion for a while.



Chimpanzees

Chimpanzees are said to be the most like man of any ape. Their behaviour, movements, agility are most like man although they are faster and stronger than any human being.

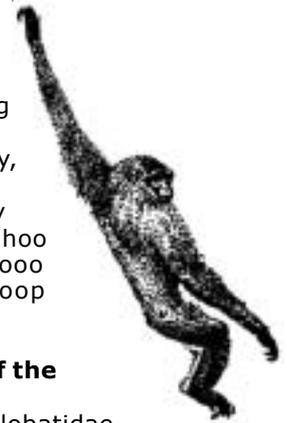
Chimpanzees have been studied a great deal to determine whether they are even more like man than we think. When it was observed that Chimpanzees were using straws to put in holes in a log to catch termites, there was great excitement as the use of tools to accomplish tasks was considered a uniquely human trait.

Gibbons

Gibbons are found only in Asia and that too only in South and South East Asia and some areas of East Asia, China, Taiwan, etc.

Gibbons can also walk on their back legs without difficulty. Their arms are long and strong enough to remain up in the air climbing between branches for days at a time. Gibbons are some of the most popular zoo

animals also, owing to their raucous cry, so easily imitated by children ...hoo hoo hoo hoo whoop whoop whoop!



Gibbons of the World

Family: Hylobatidae

Hoolock gibbons

Hoolock hoolock hoolock
Hoolock hoolock leuconedys

Hylobates group of gibbons

Hylobates agilis agilis
Hylobates agilis unko
Hylobates albibarbis
Hylobates klossii
Hylobates lar carpenteri
Hylobates lar entelloides
Hylobates lar lar
Hylobates lar vestitus
Hylobates lar yunnanensis
Hylobates moloch
Hylobates muelleri abbotti
Hylobates muelleri funereus
Hylobates muelleri muelleri
Hylobates pileatus

Nomascus group of gibbons

Nomascus concolor concolor
Nomascus concolor lu
Nomascus gabriellae
Nomascus leucogenys leucogenys
Nomascus leucogenys siki
Nomascus nasutus hainanus
Nomascus nasutus nasustus

Siamang

Symphalangus syndactylus continentus
Symphalangus syndactylus syndactylus

Source: Alan Mootinic in litt., 5 July 2006



Public Education

The PHVA working group on Education and Awareness commented that the education system in general needed strengthening. They call on conservation actioners specifically to develop innovative materials and means of teaching the public about Western Hoolock Gibbon and its plight. Making efforts to take innovative educational to residents of gibbon range areas would be helpful in bringing about a change of attitude towards Hoolock Gibbon so that conservation efforts would be more effective.

As the organisers of the PHVA workshop, the Zoo Outreach Organisation, CBSG, South Asia and the Wildlife Trust of Bangladesh in collaboration with their local NGOs in India and in Bangladesh have planned a series of activities with materials funded by the U.S. Fish and Wildlife Service Great Ape Conservation Fund, the primary sponsor of the PHVA.

ZOO has developed a range of materials, including this Summary Report which we hope to be interesting and useful to a large number of people. Other materials include:

- a 132 page scientific Report which will make a very useful reference for foresters, policy makers, governmental agencies in planning further actions for conservation of WHG.
- a young people's educational packet consisting of masks of Hoolock Gibbons (for participating in skits, dramas, photo sessions, play), wrist bracelets with a cultural significance, a booklet for kids about WHG and other small items which kids enjoy, small placard, stickers, and a beautiful colour poster of the male and female Hoolock Gibbon
- a drama kit for teachers and other educators who want to organise events for promoting the safe passage of WHG through its lifespan. The drama

kit consists of Guidelines, over a dozen masks of different characters who might appear in a drama of WHG, such as the male and female hoolock, a baby hoolock, forest animals of all kinds themselves, some typical figures or personalities, such as a housewife, a poacher, a businessman, a child, etc. There is a book of how to organise and conduct dramas for education with a sampling of stories which would be suitable for dramas and various themes. The Hoolock PHVA report and even this Summary would provide fodder for dramas. There is also a Guidelines booklet.

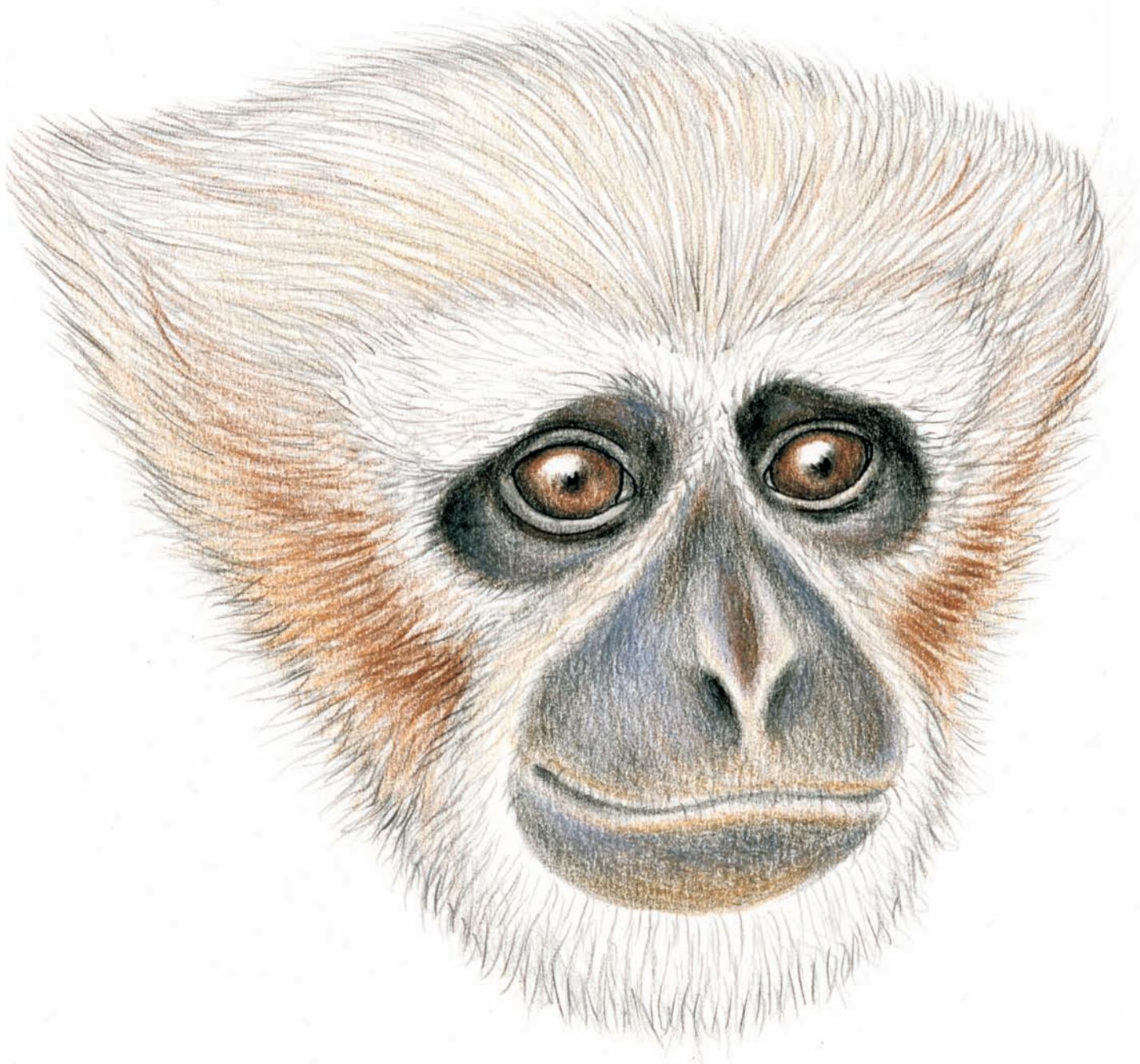
In future we hope to conduct workshops about Hoolock Gibbon using active learning techniques, and to create a Manual about how to teach people to protect Hoolock Gibbon.

We encourage educators of all kinds — teachers, NGOs, conservation activists, etc. to order our materials and conduct education programmes about Hoolock Gibbon. If you are interested and are in India

please write to us at ZOO, Box 1683, Peelamedu, Coimbatore, TN 641004 or email us at <zoocrew@vsnl.net> for an invitation to apply and instructions for applying for free materials.

If you live in Bangladesh please contact the Wildlife Trust of Bangladesh at <gawsia@yahoo.com>





Western Hoolock Gibbon (female)
Hoolock hoolock hoolock
Art by Stephen Nash