BARASINGHA Cervus duvauceli
PHVA held at Wildlife Institute of India, Dehra Dun
3-6 July 1995

Executive Summary

The total population of the three named subspecies of barasingha (Cervus duvauceli duvauceli, C. d. ranjitsinhi, and C. d. branderi) in India is about 3,500-4,000 animals. It is greatly reduced in range and numbers from historical levels in this century, and the populations are fragmented. All of the populations are below historical numbers and presumed carrying capacities. The species is subject to predation and to poaching in some of the populations. The future of the species in India is contingent upon continued management for conservation of the species. It is listed as endangered by the IUCN Cervid Specialist Group.

The barasingha in India was considered a good candidate for a PHVA Workshop to assist in the process (1) of assembling available information, (2) of bringing together relevant individuals to identify the problem and possible solutions in a common forum, (3) of developing objective models of the individual populations to assess the information and the risk of extinction, and (4) of formulating and testing possible management actions to achieve viable populations. In order to achieve the goal of recovery, it is necessary to understand the risk factors that affect survival of the barasingha. Risk evaluation is a major concern in endangered species management and the goal is to reduce the risk of extinction to an acceptable level. A set of software tools to assist simulation and quantitative evaluation of risk of extinction is available and was used as part of Population and Habitat Viability Assessment Workshop. This PHVA process can improve identification and ranking of risks and can assist assessment of management options.

The Ministry of Environment and Forests requested the Central Zoo Authority to sponsor the Workshop and to coordinate the participation of the Forest Departments of the Range States. The Wildlife Institute of India hosted the Workshop and provided technical expertise in participation. The Conservation Specialist Group of the SSC/IUCN and ZOO/CBSG India were requested to facilitate the Workshop, assemble briefing materials, and to provide technical support.

The Workshop was conducted 3-6 July at the Wildlife Institute of India in Dehra Dun. About 50 biologists, managers, and researchers participated to apply these recently developed procedures to the barasingha. The purpose was to review data from the wild and captive populations as a basis for developing stochastic population simulation models. These models estimate risk of extinction and rates of genetic loss from the interactions of demographic, genetic, and environmental factors as information of value for ongoing management of the subspecies. Other goals included determination of habitat and capacity requirements, role of captive propagation and the management of the captive population, use of translocation and reintroduction to supplement or restore specific populations, impact of predation, poaching, and disease threats, and prioritized research needs.

The first morning and afternoon consisted of a series of inaugural presentations providing an overview on the history and current status of the barasingha in India and the use of the PHVA process in assessing available information and formulating and testing management plans. There were presentations from each of the range states, a review of research information by Qamer Quereshi, and a brief introduction to the PHVA process. This was followed by a brief presentation on population biology, the PHVA process and the use of VORTEX (the computer simulation model used). The model was used to start the collection of parameter values in the plenary session. The participants formed three working groups on the first day (distribution, status, and threats of the free-ranging populations, captive population, and modelling and life history data) to: 1) review in detail current information; 2) develop values for use in the simulation models; and 3) formulate management scenarios and make recommendations. A fourth group on Translocations and Reintroductions was formed on the second day. Stochastic population simulation models were initialized with ranges of values for the key variables to estimate the viability of the wild population using the VORTEX software modelling package.

Census estimates & carrying capacity figures of the various populations of the barasingha

NAME OF POPULATION	PRESENT	MANAGEMENT

	POPULATION ESTIMATES	CAPACITY
Sathiana, UP	125	400
Kakraha, UP	500	700
Bankital, UP	125	200
Bhadhi & Nagraha, UP	100	200
Kishanpur, UP	400	600
Katernighat, UP	50	1000
Pilibhit, UP	200	400
Hastinapur, UP	25	50
Suklaphanta, Indo-Nepal Br	1750	1000
Karnali Bardia, Indo-Nepal Br	50	100
Kanha, MP	366	2000
Manas, Assam	50	100
Kaziranga, Assam	427	800

Based upon a consensus of the participants over the first 2 days of the workshop, the following life history values were selected for the modelling process. The intent was to define the values for a healthy population under favorable ecological conditions. The primary data set is taken from a combination of published work for the Kanha population as well as data from other cervid species when barasingha-specific data were lacking. Age of first production of young was 3 for females and 5 for males. Forty-four percent of females produced one offspring each year. Equal-sex ratio at birth was assumed. Mortality was estimated to produce a population capable of growing as much as 10% per year, which is typical of cervid species with litter sizes of one and alternate year production of young. The four populations in Dudhwa National Park were taken as a special case both because of particularly low female production in one population, and because of the metapopulation structure (some populations can potentially exchange individuals regularly). The sensitivity of barasingha populations to various natural and human-induced factors can be evaluated by changing specific life-history characteristics affected by these factors, and modelling the population projections into the future (in this case 100 years).

A range of values for the effects of predation and poaching on adult mortality were explored to determine their effects on risk of extinction, population growth rates, and as a guide to possible management scenarios. Additional risk factors were also evaluated including disease epidemics and inbreeding depression. Since reintroduction is being considered as a management tool, several scenarios for the establishment of new populations were tested. Separate models were developed to account for the growth characteristics of the captive population, for comparison with values from the wild population, and to determine the impact on heterozygosity of adding new founder stock to the population.

This workshop report includes a set of recommendations for management of the wild and captive populations as well as sections on the distribution and numbers of the wild subpopulations, translocation and reintroduction, and the population biology and simulation modelling of the wild and captive populations.

Recommendations

General

1. The main priority for barasingha deer is strengthening the in situ populations to maintain wild populations with long term viability.
2. Information on population trends, threats and protection measures is needed for each of the populations.
3. Develop an international conservation program for barasinga in collaboration with Nepal.
4. A follow up PHVA Workshop should be scheduled in 1-2 years to evaluate progress in implementing recommendations, review new data, revise the models, review and further develop management plans for each individual population.
5. There is need for a 5-year review process for the results of research and implementation of management plans.
6. Continue the taxonomic work on the relationships of the 3 subspecies using molecular DNA technology as well as protein polymorphisms.

7. Translocation and reintroduction of barasinga in India should be done only with animals taken from wild and captive populations in India.
8. Populations need to be monitored for diseases.
9. Ecological monitoring of the barasingha populations is needed.
10. Identify the rutting, fawning and summer grounds for all barasinga populations.
11. Plantations of eucalyptus and teak have to be removed from all barasingha habitats and the habitat should be maintained. .
12. Zoos and Rreserves need to give a high priority to conservation education for the barasinga and its habitat.
13. Wildlife extension activities must be carried out near all barasingha areas.
14. There must be better infrastructure and incentives for staff.

Distribution and Census

UTTAR PRADESH

General
15. Pilibhit and West Baharaich Forest Division, being a unique ecosystem for barasingha and other wildlife, need to be brought under the unified command of the wildlife wing.
16. Efficient fire management with studies of effectiveness are needed.
17. Other populations need to receive additional protection.

Sathiana Population (Dudhwa National Park)
18. Create patrol areas ('chowkis') and develop the needed infrastructure at the breeding grounds of the Sathiana population which are outside of the protected area.
19. Develop a management plan for action to be taken if the Sathiana population continues to decline. Translocation, if done, should be to another area in Dudhwa.
20. Renovate the road connecting Bumnagar Chauraha, Sumer Nagar, Kema Gowdi, and Gauri Phanta.
21. The Soheli Barrage floodgates have to be kept open between June and September, during the monsoon. It should be closed between October - May during the winter and summer keeping in mind the safety level.

Kishanpur Wildlife Sanctuary
22. Staff and infrastructure at Kishanpur Wildlife sanctuary need to be built up.
23. There must be a monitoring of the Jhadithal and Ull river areas as the barasingha population is distributed along these.
24. Water needs to be provided during dry summer months to fulfill drinking requirements.

North Pilibhit Forest Division
25. No human settlements must be allowed near Lakkabagha to ensure further protection.

Katernighat Population
26. There must be a control on grazing and a closure of the state seed farm.

Hastinapur Population
27. This population needs to be studied and protected more extensively before any concrete management steps can be recommended.

MADHYA PRADESH

Kanha Population
28. The enclosure that has been made for studying the barasingha breeding needs to be put to use and a small population built up in the enclosure. Care must be taken to manage at levels that reduce the risk of parasite buildup.
29. Efficient use of controlled burning is needed.
30. A few barasingha from Kanha and Mukki need to be relocated to the meadows of Supkhar.

31. The reasons for the conversion of the grasslands from long grass (which provides protection of fawns from jackal predation) to short grass need to be established. There must be a study and monitoring of the intrusion on meadows of woody species and woodland. Appropriate measures, if required, may be taken.
32. Studies to determine the impact of jackal predation on the young of the barasingha are needed (chital fawns are being taken by jackals as well).
33. The effects on barasingha of competition between the large population of chital and the barasingha for food resources needs to be evaluated.

ASSAM

Kaziaranga National Park
34. The cause of the drastic decline in barasingha population between 1991-1993 should be ascertained and future management strategies evolved to mitigate the problem.
35. Ecodevelopment activities for the welfare of the local people and getting necessary cooperation in general and especially during the flood season must be continued.
36. The creation of highlands and soil conservation which has been taken up by the department must be given prio rity.
37. Patrolling must be intensified especially along the North and the southern areas of Kaziranga during the floods.
38. Anthropogenic pressures on the fawning and rutting grounds and the land use structure must be focused.
39. There must be detailed studies of the barasingha population in Kaziranga.
40. There must be a monitoring of the movement patterns of the barasingha populations in Manas and Kaziranga especially during floods.
41. Manas needs a status survey of the population as no current figures are available from the protected areas.

Population Biology and Modelling
42. Survey and monitoring studies of barasinga populations need to collect census estimates and fawn production rates with an estimate of confidence limits.
43. Annual census estimates are needed for all populations. The census should record as accurately as possible the stage structure of each population.
44. Basic life-table data on stage and sex specific mortality and fecundity rates need to be collected for barasingha.
45. Poaching rates need to be monitored and estimated in these populations.
46. Estimates of population size limits and trends over time for each population are needed.
47. The percent of males actually participating in breeding needs to be known to estimate the effective population size.
48. Studies of migration rates and breeding success of the migrants are needed.

Translocation and Reintroduction
49. The reintroduction of barasingha will be carried out only after suitability of the site is established. The reasons for loss or continued decline of a population need to be established and corrected before translocation or reintroduction programs are begun to re-establish the population at any site. The following four sites are suggested for reintroduction.
50. Reinforce the existing population in the Katariniaghat Wildlife Sanctuary with animals taken from doomed populations considering the IUCN guidelines and as per an approved action plan.
51. Re-establish a population in the Suhagibarua Wildlife Sanctuary either by translocation from wild populations or reintroduction from captive stock or a combination of the sources considering the IUCN guidelines and as per an approved action plan.
52. Reintroduction/Translocation have to be considered in Achanakmar WLS or Baudhargarh NP with resource stock taken from Kanha in a phased manner, on the basis of IUCN guidelines and as per an approved action plan.
53. In Jaldapara WLS of West Bengal, where barasingha were found in recent times, a re-introduction programme can be initiated on an experimental basis following IUCN guidelines and as per an approved action plan.
54. In view of the threats in Kaziranga WLS and Manas Tiger reserve, alternate suitable habitats for barasingha need to be identified, and rescued animals from Kaziranga reintroduced as per an approved action plan and considering IUCN guidelines.

Captive Population

55. Maintain stocks in Indian zoos as standby for possible future conservation needs of the species.
56. Supplement the captive population with genetically unrelated animals from suitable wild populations to increase the proportion of the wild population genetic variation represented in the captive population.
57. Complete DNA studies of the captive population: (1) to establish the amount of heterozygosity retained in the captive population as compared with the wild population, (2) to clarify matters of parentage and pedigree, and (3) to compare with the named subspecies.
58. All captive animals should be permanently marked and a studbook established.
59. Coordinate the genetic and demographic management of the entire captive population in Indian zoos.
60. Establish captive populations of the unrepresented subspecies (as established by DNA studies) as part of a total management strategy for these subspecies.
61. If animals are required for reintroduction programs, develop a collaborative management plan for production of the needed animals while maintaining the viability of the captive population.
62. Develop information on the reproductive biology of barasinga to allow use of assisted reproduction and genome resource banking as part of the conservation management.