

# Population and Habitat Viability Assessment PHVA for Asiatic Lion (*Panthera leo persica*)



## Executive Summary & Summary Recommendations

### Executive Summary

The Asiatic lion is a large, predatory carnivore which used to range over much of the Indian subcontinent and surrounding area. It is an animal whose size, strength and nobility have earned it an identification with emperors and kings. It is an important cultural and historical symbol for India, having been selected as the emblem of the Government of India. The present status of the species is that it survives as a solitary relatively small population of around 300 animals (then, in 1993) in a single relatively small area of 1400 sq km which is intensively managed. The behavioural and biological characteristics of the animal are such that it requires a large area to permit normal social interaction with its conspecifics as well as containment in a protected area away from human habitation.

The Asiatic Lion has been of concern for many years as the population is said to have diminished to a scant twenty to one hundred or so animals. Previously, reintroduction and translocation efforts had been undertaken to try and establish another population but these efforts were not successful due to lack of proper planning and methodology. Recent research has underscored the speculation that even the wild population may be suffering from inbreeding depression.

The Wildlife Institute of India and the Government of India have supported research to study the ecology of the Gir population and take up the matter of finding an alternative habitat for the Asiatic Lion. One of the major tasks of this Workshop being to pursue this initiative, the suitability of several sites for lion translocation were assessed on the basis of prey population and other habitat factors.

They were ranked as follows in order of suitability: Kuno, Sitamata, Darrah-Jawahar Sagar, Kumbalgarh, Barda.

The Asiatic Lion Population and Habitat Viability Assessment workshop was conducted with different working groups in parallel sessions with plenary sessions for presentation, review, and integration of the individual reports. Written draft reports prepared by all the working groups form the body of this report.

Individual working groups for the body of the PHVA Report. These were: 1. Habitat (Gujarat, Madhya Pradesh and Rajasthan subgroups), 2. Prey-base Requirement, 3. Population modelling, 4. Translocation, 5. Monitoring and research, 6. Lion-

human interactions, 7. Captive population, 8. Diseases and Veterinary Research, 9. Reproductive and Genetic Research, 10. Ecodevelopment, 11. Public education.

The three Habitat sub-groups assessed the suitability of the following sites : Barda (Gujarat), Sitamata, Darrah-Jawahar Sagar, Kumbalgarh (Rajasthan), and Kuno (Madhya Pradesh); for lion translocation using 11 parameters. The sites were assessed on the basis of prey population (both including and excluding livestock) by the Prey Base Requirements Group.

The proposed translocation sites were ranked as follows for suitability as a habitat for lions, based upon a synthesis of the results of the above working groups. 1. Kuno, 2. Sitamata, 3. Darrah-Jawahar Sagar, 4. Kumbalgarh, 5. Barda.

The **Population Modelling Group** confirmed through computer simulations that growth rates and probability of extinction of the Gir lion population are critically linked to age of female first reproduction and first year mortality rates which are strongly influenced by habitat and prey availability. In addition, the viability of the population depends on the carrying capacity of the Gir Forest stabilising at a range between 200-250 animals. It was further established that significant reductions and changes in the size and structure of the population due to a catastrophic disease event would be devastating. The modelling exercise provided statistical indicators that establishment of a second population will reduce the risk of extinction significantly. It could be demonstrated also by the modelling exercise that the existing population will not be harmed by the removal of sufficient animals to translocate to the alternative site.

The **Translocation Group** has delineated a methodology to be followed for release of the lions, according to Guidelines of the IUCN SSC Reintroduction Specialist Group. This includes genetic and demographic selection of stock, veterinary screening, research, monitoring, training, and education-ecodevelopmental activity for pre-translocation phase, planning, preparation and release phase and post-release phase.

The **Monitoring and Research Group** has stressed the need for constant monitoring of the lion population in Gir and also at the site(s) where the numerous lion groups using radio telemetry are recommended. The workshop participants as a group felt the need for a continuous research

programme with a permanent research base in Gir. Research on prey species, other carnivores like leopard and striped hyena, and animal habitat relationships have also been recommended. The Lion-Human Interactions Group considered all the possible types of interaction between lions and human beings, including the *Maldharis* and villagers who live inside the protected area as well as villagers in the border area outside the P.A.) and analyzed the circumstances and consequences of such interactions. The need for population management of lions outside the Gir forest has been stressed, as well as relocation of the *Maldharis* from the Gir protected area. Recent studies of case-by-case physical interaction underscore the need for an innovative education and awareness programme for the people living adjacent to the forest boundary.

The **Captive Population Group** has very clearly outlined the objectives of the captive breeding programme and also has fixed a regional limit on the number of lions that can be held in captivity. Maintaining the purity of the stock of Asiatic lions and retaining the maximum amount of genetic diversity are amongst the major goals identified. This would involve facilitating the integration of wild caught problem lions outside the Gir Forest in captive breeding programmes. All lions would have transponders implanted in them to enable definite identification. A detailed protocol for breeding and husbandry of the lions has also been provided.

The **Diseases and Veterinary Research Group** has compiled a comprehensive list of all diseases reported from captive and free ranging lions and identified areas which need research attention. Some of the surveys for diseases and parasites assume great importance and immediate relevance as these are currently the major threats facing the lions in Gir Forest.

The **Reproductive and Genetics Research Group** has summarised the information available on the reproductive biology of Asiatic lions and identified subjects that need research attention. Detailed outlines and justification have been provided for the proposed research. Emphasis has been placed on the need for setting up a Genome Resource Bank (GRB) within India for insuring the preservation of genetic diversity. Developing artificial insemination techniques as part of the suggested research programmes was also suggested. The group highlighted the urgent need to systematically sample the free-ranging lion population to assess the genetic diversity in the population. A few genetic management strategies are suggested, especially for the captive population.

The **Ecodevelopment Group** looked at a wide variety of possible initiatives which could give a better life for the people living in and around Gir Forest and at the same time reduce their

dependence on the natural resources of this tract. These included grass fodder development, soil-moisture conservation measures, energy-related activities, employment generation activities, regular programme of immunization of livestock, provision of separate water troughs for livestock, relocation of *Maldharis*, and eco-tourism.

The **Public Education Group** stressed the need to educate the population at large on general conservation values and of endangered species in particular. Various strategies have been outlined to achieve this, such as educating village leaders, recognition, motivation and training of individuals and organisations presently doing effective awareness work, and identification of most effective media for imparting nature education to different target groups in order to provide them with attractive and accurate baseline information.

The overwhelming consensus of the Workshop was that an alternative habitat for the Asiatic lion must be established with all possible speed, but without compromise of the accepted strategies and principles governing systematic and scientific reintroduction. This should be done simultaneously with strengthening effective protection and management of the Gir Forest and assuring the viability of the captive population and accurate baseline information.

**Executive Summary and Summary Recommendations are extracted from the Asiatic Lion PHVA Report. Reference: N.V.K. Ashraf, R. Chellam, S. Molur, D. Sharma and S. Walker (Ed.) (1995). Population & Habitat Viability Assessment P.H.V.A. and Global Animal Survival Plan Workshops, 18-21 October 1993, Baroda, India. Report by CBSG, India/ZOO, Pp. 113.**

*Note : The PHVA was hosted by the Baroda Municipality Commission/Baroda Zoo and organised and facilitated by the Conservation Breeding Specialist Group IUCN SSC and its then national network, CBSG, India and Zoo Outreach Organisation. A very respectable number of participants with expertise in Asiatic lion behaviour and biology, large carnivore conservation, ecology, environment, veterinary medicine, population biology, etc. were present from Gujarat, from elsewhere in India and from USA. The Report was circulated very widely to participants, policy makers, politicians, technical people and conservation experts and enthusiasts. The full Report, which has much relevance today even will be made available to you as pdf upon email request to sallyrwalker@aol.com. The full report also carries the list of participants and other material of interest. The Summary Recommendations follow, after which a review of what has been done so far regarding preparation of the recommended site for alternative habitat. It is provided as information only, in the public interest without comment or intent to influence the controversy currently raging regarding Gujarat vis a vis Madhya Pradesh one way or more than the other.*

**Sally Walker, Convenor, CBSG, South Asia  
Editor Emeritus ZOOS' PRINT.**

## Summary Recommendations

**Habitat Management.** Gir habitat: Gir habitat management includes following forestry measures. It was recommended that afforestation programmes in grasslands and savanna areas in Gir should be avoided in future. It was also recommended that the sub-climax stage of vegetation (highly suitable for lion habitat) should be retained by opening the canopy and thinning of teak stands. Lopping and pollarding of coppicing species may be done so as to lower the browse level for ungulates (after the resettlement of remaining *Maldharis*)

Gir habitat may be increased where there is scope for doing so. Corridors to Babra Vidi, Mitiyala, Ambardi Reserve Forest, Malanka Vidi, Kannada hill, Ghatvad, and Girnar may be developed and these areas should be assigned special status. The adjoining Chachai-Pania sanctuary (38.9 sq.km.) may be considered as part of Gir and more attention given to it for prey base and water resources development.

Gir habitat may be further protected from disturbance by measures to control traffic in the sanctuary. It is recommended that roads in Gir should never be tarred to contain heavy flow of traffic. Metre gauge tracks for railways should be maintained instead of going for broad gauge and trains should not be allowed to pass through the protected area after sunset.

**Water management:** Intensive water hole management should be done for even distribution of water (one water hole per 5 sq.km) and for increasing prey base. Whatever precipitation that falls in the area should be harnessed against days of drought and ground water resource should be more extensively developed. For example, when repairing roads, soil should be dug out by making rectangular pits in level lands along the road which will retain washed out soil and allow part of rain water to percolate into the ground. Water quality should be monitored during drought conditions.

**Alternative habitat: Habitat Synthesis:** An assessment of proposed translocation sites for the Asiatic lion indicated the suitability of the proposed sites for lion translocation were ranked in the following order 1. Kuno, 2. Sitamata, 3. Darrah-JawaharSahar, 4. Kumbalgarh, 5. Barda

### Prey-base Requirement

The Prey- base Working group suggested different estimates according to biomass versus prey numbers, and including or excluding lion preferences for each species of wild ungulate.

**Scenario I:** 70% wild prey and 30% livestock

**Scenario II:** 100% wild prey

**Scenario III:** Prey consumption solely as a function of prey availability.

The lions are assumed to show no preference for wild prey over livestock, and to have equal access to both categories of prey. This analysis suggests that several sites might support viable lion population and it might be desirable to consider more than one site for translocation. Translocated populations would not necessarily be allowed to grow open ended but regulated by active population management.

### Population Modelling

The growth rates and probability of extinction of the Gir Forest lion population are most sensitive to the age of female first reproduction and first year mortality rates. Both of these parameters are strongly influenced by nutrition and population density as it affects conflicts which results in the deaths of cubs.

If the carrying capacity of the Gir Forest is 200 or less the probability of extinction of the population will increase significantly. The range of 200-250 appears to be important for the viability of this population. Thus habitat availability and nutrition are close to critical values for this population. This interpretation is reinforced by the observation that prides of lions are moving outside of the Park. The population is vulnerable to a catastrophic disease event such as has recently occurred in Africa. This would put the population to an increased risk of extinction as a result of normal environmental variation. Also another reduction in population size would lead to more rapid inbreeding. Lions appear vulnerable to inbreeding depression as reflected in measures of sperm characteristic and perhaps cub mortality. It will be valuable to collect blood samples from all animals removed from the Gir Forest for serological studies as a basis to monitor possible introduced diseases.

The risk of extinction of the Asiatic lion will be significantly reduced with the establishment of a second viable wild population. The presence of a captive population provides additional insurance until the second wild population is established. This population can easily sustain removal of sufficient adult animals for translocation to another site to start another population. Removal of younger animals or cubs would have even less effect on the viability of the population. Translocation projects can be designed in terms of the behavioral and genetic requirements. It is likely that removed animals would be rapidly replaced in the population from natural recruitment. Given the baseline conditions that have been explored in these simulation models, further modelling can be done to test ideas about the best strategy for a successful translocation with minimum or no effects on the Gir Forest population.

### **Translocation**

The Translocation Working Group followed guidelines of IUCN/SSC Reintroduction Specialist Group and suggested 1) a pre-translocation phase with feasibility studies and background research, identification of suitable release stock including appropriate genetic assessment and due consideration to the human element; 2) a planning, preparation and release phase should first insure governmental and funding approval and establishment of well-defined institutional support after which an actual release strategy with strategic measures regarding transport, quarantine, etc. may be made; 3) a Post release phase for monitoring, demographic, ecological, genetic and behavioral study of the released stock, and periodical review of the project.

### **Monitoring and Research**

Monitoring the size and structure of the free-ranging lion population(s) is essential to understand their population dynamics. Monitoring should include the techniques of Individual recognition, Radio telemetry; Cross-sectional censuses. Research should consist of basic demographic parameters, Social organization and dispersal patterns, monitoring of lion diet through collection of scat, of prey populations, of leopards and striped hyenas, and of vegetation.

### **Lion-Human Interactions**

The Lion-human Interactions Working group recommended lion population management outside the park by appointing village wildlife watchers, relocation of *Maldharis* from Gir P. A.; implementation of the recommendations from studies carried out over the years (e.g. Central Committee on Tourism in Protected Areas, 1984 and Experts Committee. appointed by Government of Gujarat, 1990-1993).

### **Captive management**

A genetically pure, healthy captive population of between 400 to 600 animals should be developed taking care to provide for the genetic diversity and demographic stability for the long term.

### **Reproductive and Genetics Research**

For *ex situ* (zoo) breeding programmes, assisted reproduction (techniques like artificial insemination) should be developed for overcoming problems associated with sexual incompatibility, cases of organic infertility and aged or under-represented founders unable to contribute to species preservation. This will also be useful for implementing the controlled breeding strategy with fewer complications such as transport of large animals. Genetic resource banks (GRBs), repositories containing germplasm, blood product, tissues and DNA from selected, free living individuals to provide insurance against future human-induced or natural catastrophes, allowing the interactive movement of biological materials between living populations

should be started in a systematic fashion in the range country, that is, India.

### **Veterinary Research**

It is recommended to initiate veterinary research on captive as well as wild populations of the endangered Asiatic lion. A full time researcher with veterinary background should be employed on this long term project. A complete disease diagnostic laboratory at Sakkarbaug Zoo which is located about 60 km away from Gir should be established as well as a small laboratory facility at Sasan itself, primarily for preserving collected specimen. Research topics for wild and captive animals were identified by the working group. Free ranging population at Gir: 1. Investigation on the prevalence of macroparasites; 2. Investigation on the prevalence of antibodies against specific microbial infections; 3. Research on posterior weakness. Captive population: 1. Establishing the normal physiological values of the Asiatic lion; 2. Research on the probable causes for juvenile mortality; 3. Investigation of epidemiology and therapy of myiasis (maggot infestation).

### **Ecodevelopment**

The following items for providing for the local communities have been proposed; Grass fodder development, soil-moisture conservation measures, energy-related activities, employment generation activities, regular programme of immunization of live-stock in and around Gir, provision of separate water troughs for domestic live-stock, relocation of *Maldharis*, community development facilities, ecotourism, local NGO's, research monitoring and evaluation.

### **Public Education**

Recommendations for nature education programme included creating awareness in the local community of the value of the biodiversity on Gir forests, its benefits and the dangers of losing it. It was also recommended to educate the village leaders to organise a "Forest Protection Team" which can be utilised for solving some of the conservation problems of Gir. Recognition of the persons and groups currently working effectively will motivate them further and among them some identified persons may be provided training opportunities in education and interpretation. The importance of using appropriate methodologies according to the season in conducting nature activities was stressed. Identification of the most appropriate press media for educating different target groups and providing them with well-thought out material should be done. Creating ecological awareness and improving attitudes towards environment and conservation can be done with active participation from the community, including community leaders, school students, local industrial houses, religious and political leaders and other association and staff desirable for achieving educational goals.