

Conservation-oriented captive breeding of primates in India: is there a perspective?

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Many animal species the world over are threatened and face danger of extinction in their wild habitats. Most of the present-day habitats are much different than the ones in which a species evolved, and the alteration of habitats has been much faster than the time required by a species to make adaptive changes. The alterations could be in the form of changes in vegetation structure, habitat degradation and fragmentation. Many animal species, therefore, require management of habitats, populations and individuals, based on a scientific understanding of the biology of the species. In the case of certain species, captive breeding has become a necessity in order to have a possible self-sustainable captive population, a 'reserve' under protected conditions, and a source for research.

Captivity provides the most altered condition for a species, and hence, requires even more intensive management than the altered but still wild habitats. Primates are often kept in the zoos as they are attractive for visitors. Management of primates under human care requires special know-how. Most primates are long-lived animals with personalized and long-lasting social relationships. The individuals undergo a complex and prolonged process of socialization that helps acquire social competence and development of individual social relationships. Proper socialization requires the presence of individuals of specific age–sex classes in the group. Adults in many species have strong preferences for special mates. This requires prolonged interactions among the same individuals. A variety of social systems has evolved in primates. The macaques, for example, live in female-bonded societies in which females remain in their natal groups and the males at the subadult stage usually migrate. Within these social groups, most interactions are among individuals of a matriline. A group may have more than one matriline of related females. A group may remain stable over generations and decades. These traits are rather conservative and inertial and act as constraints on social interactions and mobility. Another important aspect in primates is the de-

velopment of complex cognitive systems and manipulative skills. If living conditions do not allow the expression of basic social and cognitive traits, it leads to stress and possibly negatively influences reproduction. Suboptimal social conditions may show effects in the short run such as failure of a female to reproduce or to exhibit incompetency in infant rearing, or in the long run such as high reproductive variance among individuals, affecting the population negatively. Social traits specially have to be regarded as key aspects for the development of management. Primates thus are a special case of management.

India is a mega biodiversity country with many species of animals, including primates that are threatened. Many of them require conservation programmes and management. While some institutions are involved in conservation research, only few, mainly zoos, have taken up to establish breeding programmes in order to achieve self-sustaining captive populations. However, these attempts have not reached their goal so far. As the number of species requiring management is rapidly increasing, appropriate approaches need to be put in place for conservation and population management urgently. According to the IUCN criteria, of the 35 primate taxa (species and subspecies) in India, three are critically endangered, nine are endangered, seven are near threatened, two are vulnerable and two are data-deficient¹. In India, 54 zoos hold from one to eight species of vulnerable/threatened primates, including slow loris, stump-tailed macaque, pig-tailed macaque, lion-tailed macaque (Figure 1), long-tailed macaques, Golden langur, Nilgiri langur and Hoolock¹. These primates are mostly kept under less optimal conditions, often in small numbers, which do not provide scope for the establishment of a viable population. Most of the species require better management. To support this, here we put forward a perspective for conservation-oriented breeding of primates. Since the lion-tailed macaque is the only case of an attempt at conservation breeding in India, it is used here to briefly analyse the problems and

to suggest a new perspective for captive primate breeding.

The lion-tailed macaque, endemic to the rainforests of the Western Ghats in southern India, was considered as one of the 'top 25 most endangered primates in the world' in 2010. The present captive population of about 350 individuals in Europe requires further support, especially from India, to develop this population to a global level of self-sustainability. In India, the captive population of lion-tailed macaques has ranged between 62 in 1999 and 63 in 2012. Several attempts to systematically manage the population did not produce the desired results due to a lack of successful breeding². Though a special initiative by the Central Zoo authority in 2001 involving Vandalur, Mysore and Trivandrum zoos resulted in some success at breeding, the overall status of the population has not improved. We assume that the reasons for the problems and failures include insufficient inclusion of scientific knowledge, lack of understanding of the principles of conservation-oriented population management and inappropriate infrastructural conditions. If the prevailing approaches and practices do not change, there is little hope for the future.

Much of the scientific data on the biology of wild animals has been obtained by scientists from universities and research institutions. It has been repeatedly discussed that there is an increasing lack of communication between the field biologists and the wildlife and zoo managers in India. Scientists complain that



Figure 1. The lion-tailed macaque.

they are not heard, and the managers opine that the information provided by the scientists is only theoretical and of limited use for application. The main problem is a difference of perspectives. Conserving and managing a population, both in the wild (*in situ*) and in captivity (*ex situ*), is a long-term process. It is easier for a scientist who works in an evolutionary perspective to accept the long-term nature of the process. The wildlife and zoo managers whose tenure in India usually lasts for a maximum period of three years only, rather tend to plan such that results are expected within their tenure. Under the prevailing bureaucratic and hierarchical structures, it appears that at least in the short run, the communication gap and the difference in perspective will unfortunately continue resulting in the non-incorporation of ecological and behavioural information obtained from wild populations into management.

It is in this context that we propose that in addition to the zoos, some selected research institutions that are involved in conservation-oriented research also support captive breeding programmes for the endangered species. It would be easier to transfer the scientific information into captive management in such institutions as they are by nature open to scientific ideas. The material gained from the basic science needs to be transferred in-house to an applied biologist focusing on the practical use of the information for the research institution's primate colony and its integration into management programmes. The corresponding position of the biologist strictly requires a long-term tenure necessary to acquire empirical background and experience which is more easily possible in a research institution. If such a programme achieves success, it can then be presented as a model for other institutions, including zoos.

A breeding programme should develop with a larger conservation perspective for the species linking captive breeding to *in situ* management of a species. In the case of lion-tailed macaques, the most important conservation issue is the management of a substantial proportion of the wild population inhabiting isolated

forest fragments. Captive breeding groups, therefore, could be modelled as special cases of 'fragmentation'³. The purpose of captive breeding is not only to establish a self-sustainable and eventually a 'reserve' population, but also to develop know-how about *ex situ* and *in situ* intensive management. Several aspects of *ex situ* management may not be possible to learn from the wild situations. The captive populations with an opportunity of much closer observations and some scope of limited and semi-experimental non-invasive manipulations provide a much wider scope for acquiring the management know-how.

What is of utmost importance for the management of a primate colony is 'permanent personnel'. This includes a full-time biologist with a special training in zoo biology, including practical know-how in terms of husbandry and special expertise in the management of populations. This position has to supervise the permanent keepers who have been trained to understand the routine requirements of animals that are often species-specific. The applied biologist should continually obtain information from field biologists and integrate the same into management. If required, metapopulation management at the larger scale has to be carried out in close cooperation between applied and field biologists. As keepers and biologists with special training in zoo biology are difficult to find at present in India, there is a need to build a cadre of such trained personnel on a national level.

When based in a research institution, the primate colony would also serve as a source for intensive research at the molecular and physiological levels that may be required for conservation and management. The animals can be trained to provide faecal and urine samples through non-invasive methods on a routine basis. The ready availability of laboratories and expertise in the research institution can provide a quick analysis. For example, a routine availability of urine samples and hormonal analysis may help understand the underlying physiological mechanisms responsible for long inter-birth intervals despite early weaning in lion-tailed macaque females. Such information would not only contribute to basic science, but

will also aid in the management of reproduction at the population level.

Since achieving a self-sustainable animal population is beyond the capacity of a single institution, a metapopulation level of management is required by coordinating breeding programmes with other institutions. This further leads to the necessity of a critical mass of trained personnel at the national level.

As long-term conservation of lion-tailed macaques and of other endangered species is the desired goal of such programmes, it requires serious change in professional attitudes, training opportunities and infrastructural requirements in India. Breeding rather than commercial interest must remain a priority for the animals under captivity. Captive breeding may require transfer of animals from one institution to another, and this has to be carried out without an institution asking for 'barter'. This is where a national authority such as the Central Zoo Authority of India has to issue mandates for the institutions to comply with the transfer requirements considering the breeding programme to be one in the national interest.

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