

# Captive Breeding of Ring-tailed Lemur (*Lemur catta*) in Indira Gandhi Zoological Park, Visakhapatnam, Andhra Pradesh

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## Introduction

Ancestral Lemurs were isolated at least 50 million years ago and have gradually diversified into the modern array of over 40 species (including several extinct large bodied species). As such, Lemurs have retained numerous primitive characteristics while at the same time developing many features in parallel to the monkeys and apes of the major southern land masses, in particular increased diurnal activity.

This is the only surviving semi-terrestrial diurnal Lemur, endemic to Madagascar. They are a good environmental health indicator of the area in which they live and contribute a great deal to the longevity of the forest area, through seed germination and dispersal. These are the most terrestrial of all Lemurs, but they spend time in all layers of the forest.

Ring-tailed Lemurs in the wild measure about 42.5 cm from head to rump and weigh between 2.3 to 3.4 kg on average. Males and females are about the same size. There is no pelage difference with males and females. The males have heavier heads and shoulders in comparison to the females.

The conspicuous characteristic for which Ring-tailed Lemurs are known is their long tail, with alternating bands of black and white rings. The rest of their bodies are light reddish gray to dark red-brown with light gray to dark brown rumps and light gray to



**The long tail has alternating bands of black and white rings**

gray-brown limbs. They have white undersides, hands, and feet. They have white faces with dark brown or black triangular eye patches that look like a mask around their light brown eyes and they have black muzzles. These are highly social animals living in groups up to 30 individuals. As one of the most vocal primates, the ring tailed lemurs uses numerous vocalization.

They move by walking or running quadrupedally, holding their tails almost completely vertically as they move, with the tip of the long tail curving away from the body forming the shape of a question mark .

## Distribution

Ring-tailed Lemurs can only be found in the wild on the island of Madagascar. They are restricted to the south and south-western portion of the island, reaching a northern limit near the town of Morondava on the west coast and the town of Ambalavao in the east.

## Habitat/Range

Ring-tailed Lemurs live in a variety of habitat types including rainforests, subalpine, deciduous, gallery,



**Semi-terrestrial diurnal Lemur endemic to Madagascar**

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and spiny bush forests. They live in arid, open areas and forests. Ring-tailed lemurs live in territories that range from 15 to 57 acres (0.06 to 0.2 km<sup>2</sup>) in size.

### Conservation status

In addition to being listed as *Endangered* in the IUCN Red List (IUCN 2014), the Ring-tailed Lemur has been listed since 1977 by CITES under Appendix I (CITES 2008), which makes trade of wild-caught specimens illegal. Although there are more endangered species of lemur, the Ring-tailed Lemur is considered a flagship species due to its recognizability is between 10,000 – 100,000 individuals.

### Enclosure details

Three pairs of Ring-tailed Lemurs (3:3) were brought from Jerusalem Biblical Zoo, Israel in the month of November 2013 they are kept in a very large enclosure having an area of 1358.32sq m.

The enclosure is enriched with grassy landscaping, planted with some indigenous tree species like *Ficus bengalensis*, *Tamarindus indica*, *Syzigium cumini*, *Azadirachta indica* etc. The outdoor enclosure has a large shelter (Machan) constructed with wooden poles and logs and the roof is thatched with Palmyra leaves to provide the lemurs shade and shelter. Long wooden poles linked to wide wooden platform have been provided in the moat as a place for perching, sitting, sleeping, keeping fruits and vegetables and to accommodate more than one lemur for the purpose of mutual grooming. During peak summers the enclosure is provided with sprinklers to reduce excess temperature and have a cooling effect. The hygiene and health of the enclosure is regularly maintained by cleaning/spraying with butax to avoid any harbouring pests. The boundary of the enclosure is provided with naturally planted stand-off barrier as a protective measure.

The night house is divided into four cubicles and a holding cell. As the lemurs are semi-arboreal, each cell is enriched with perching platforms to facilitate the animal. The night house is provided with adequate light and with sufficient ventilation to prevent from accumulation of obnoxious gases and circulation of fresh air. These are used as holding kraal for treatment of any sick animal, to retain the animals during night. The night house is designed in such away so as to facilitate easy separation of lemurs if required. The floor of the night house is provided with a slope for easy drain of water. The hygiene of the house is maintained by cleaning the cubicles twice daily.

### Behavioural aspects

Ring-tailed Lemurs are highly social animals and in the zoo all the six animals live in a single group. Initially, when all the lemurs were kept in a group, one of the male exhibited dominance over the two males. The dominant male was separated for some time to avoid infighting and later was mixed with the group and now all the six animals live in a single group. They exhibit female philopatry and the core



**'Machan' constructed in the enclosure for shade and shelter**

of the social group is the dominant matrilineal adult females are always dominant over adult males, reinforcing their dominance through agonistic encounters. Males have separate dominance hierarchy from females. The males are referred to as central and peripheral based on their relationship with females and their spatial proximity with the group. And the central males are dominant over the peripheral males. As one of the most vocal primates, the ring tailed lemurs uses numerous vocalization.

### Reproductive biology

Females usually produce their first offspring at the age of three, and annually thereafter. This can happen as early as 18 months in captivity. Mating is extremely seasonal beginning in mid-April with infants being born in August and September. Gestation lasts four and a half months. Generally Ring-tailed lemurs give birth to one offspring, but twins can be a frequent sight if food is plentiful.

Initially, infants cling to their mother's belly, but after about two weeks, they can be seen riding jockey style, on their mother's back. Infants begin sampling solid food after about a week and will become increasingly independent after about a month. They return to mom to nurse or sleep until they are weaned at about five or six months of age. All adult females participate in raising the offspring of the group.

The reproductive success of ring-tailed lemurs is highly dependent on environmental conditions. In exceptionally good years in the wild, age of maturation is earlier and birthrate and infant survival are much higher compared to years with severe environmental conditions such as drought.

In normal years, males and females reach adult size until three years of age, and do not reproduce until between 2.5 to four years of age. They exhibit ovarian synchronicity so that all of the adult females in a forest are in estrus at roughly the same time.

Because of the harsh environments in which they live, ring-tailed lemurs have high fecundity. In Indira Gandhi zoological park the Ring-tailed Lemurs gave two litters each litter with two young ones. Out of the first litter, one baby died due to lung ailment.

### Parental care

For the first three weeks of life, the mother is the primary caregiver to her new infant, but she is tolerant of other females in the group, especially siblings of the infant and other mothers. In the first days of life, infant ring-tailed lemurs cling ventrally to the mother, but by day three, they are able to move actively on her body and can climb onto another grooming female. By the age of one month, infant ring-tailed lemurs ride dorsally on their mothers and begin to explore their surroundings independently, spending about 16% of their time off of their mothers.

In addition to licking and grooming new infants, members of the social group provide varying degrees of infant care for the mother in a behavior called allo-parenting. In ring-tailed lemurs, all age and sex classes are seen caring for new infants in some capacity.

### Longevity

In the wild, it is reported that female Ring-tailed Lemurs lived upto 16 years. In captive condition, the Ring-tailed Lemur can live up to 20-25 years.

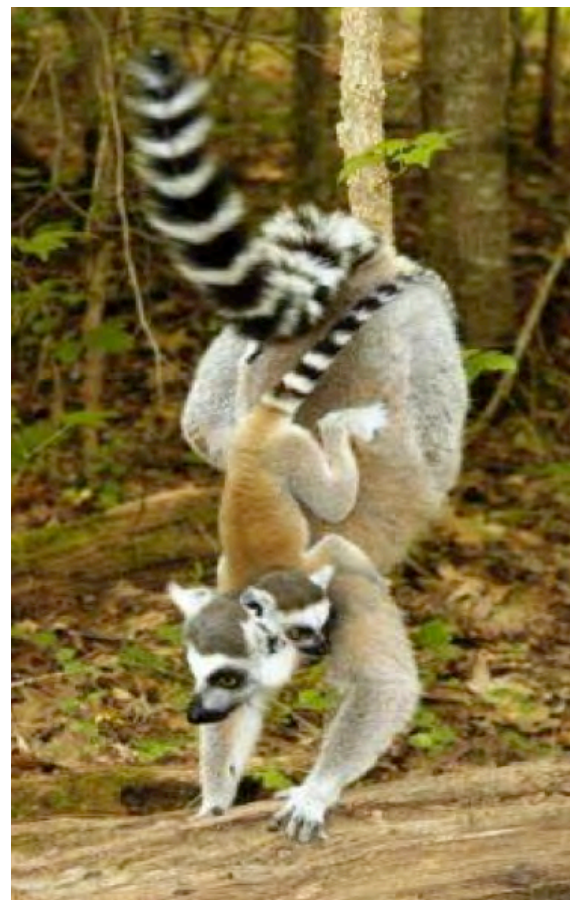
### Social Structure

Ring-tailed lemurs are found in social groups ranging in size from three to 25 individuals. The groups are composed of both males and females. Females remain in their birth group throughout their lives. Generally males change groups when they reach sexual maturity, at age three. Ring-tailed lemur groups range over a considerable area each day in search of food, up to 3.5 miles (6 km). All group members use this common home range.

Females are dominant in the group, which means they have preferential access to food and choice of whom to mate with. Males do have a dominance hierarchy, but this does not seem important during mating season because even low-ranking males are able to copulate. Females have been seen to have closer social bonds with other female relatives in a group than they do with unrelated females.

The social bonds are established and reinforced by grooming. Prosimians groom in a rather unique way, all prosimians have six lower teeth, incisors and canines that stick straight out from their jaw, forming a toothcomb. This comb is used to groom their fur and the fur of the other members of their social group.

One of the most unusual lemur activities that ring-tailed lemurs participate in is sun-bathing. They sit with their bellies toward the sun and their arms and legs stretched out to the sides. This position



**Parental care: Infants riding on their mother's back and move actively on mother's body**

maximizes the exposure of the less densely covered underside to the sun.

### Communication

Ring-tailed lemurs have scent glands on their wrists and chests that they use to mark their foraging routes. Males even have a horny spur on each wrist gland that they use to pierce tree branches before scent-marking them.

**Tail flick:** Secretions from the wrist glands are rubbed on the tail and flicked at an opponent.

Ring-tailed lemurs communicate visually in a number of ways as well. They also communicate using facial expressions.

### Successful breeding of Lemurs in Vizag zoo

Indira Gandhi Zoological Park, Visakhapatnam is the only zoo in India where successful breeding of Ring-tailed Lemurs has been done during 2014. The management has taken precautionary measures at each and every step to facilitate lemurs breeding.

- Large size of the moat enriched with grassy ground cover, long poles and dried trees/branches, thatched sheds and machan for arboreal habit and maintaining naturalistic conditions near to wild that facilitated lemurs to functioning and exhibiting their primate characteristic features like jumping, perching, mutual grooming etc.
- Maintaining hygiene conditions by regular cleaning of moat, day kraal, animal house and spraying lime and bleaching powder as per requirement.
- Providing hygienic feed to the lemurs and giving pure drinking water.
- Taking precautionary measures during summer by providing sprinklers in the enclosure and fans in the night houses to reduce temperature and to check humidity.
- Providing the animals with feed rich in water so as to overcome dehydration and to supplement with glucose in water. Feed supplemented with vitamins during breeding season.

Three pairs of Ring Tailed Lemurs (3:3) were brought from Jerusalem Biblical Zoo, Israel and now the number has increased to (8) eight. This is an attempt to put forth the success story of Ring-tailed Lemur Breeding bin Indira Gandhi zoological park, Visakhapatnam.

### DIET

Ring Tailed Lemur is an opportunistic omnivore primarily eating fruits and leaves. The diet chart of *Lemur catta* contains a wide variety of plants, *Rinorea greveana*, *Pithecelobium dulce* and the mature leaves & fruits of the Tamarind or kily tree, *Tamarindus indica*. They also feed on fresh leaves, fruits of many species, melons, sweet potato. In Indira Gandhi Zoological Park, Visakhapatnam utmost care is taken while providing feed to the lemurs. It is ensure that all the feed supplied to the animals is cleaned thoroughly. During summers the water is supplemented with glucose to prevent from dehydration. The daily diet chart is as follows (6 individuals' adults)

Bananas	-	1 Dozen.
Grapes	-	½ Kg.
Apple	-	4 Nos.
Boiled Eggs	-	6 Nos
Guava	-	12 Nos.
Carrot	-	250 grams
Bread	-	1 Packet (300 grams)
Honey	-	25 grams

Lemurs have a low basic metabolic rate compared with other primates. Several behaviors exhibited by

Lemurs (Basking & huddling) are related to energy conservation. They also possess dense coats compared with other tropical primates.

### Veterinary Care Feed Supplements

- Multivitamin tablets
- Polybion syrup
- Vimeral syrup
- Glucose
- Mineral water for daily consumption

Periodical Faecal Sample screening every month.

**Deworming:** once in 3 months mass de-worming with solution Albomar tablet – Panacur (Dosage as for the body weight of an animal)

### Wounds treatment

Wound cleaning with solution Betadin, mebasulf powder for dressing and application of ointment Loraxin.

**Antibiotics:** Lixen powder was given with food.

### Conclusion

By taking precautionary measures at each and every point right from moat designing, hygiene, diet, veterinary assistance, Indira Gandhi Zoological Park management is successful in breeding of Ring-tailed Lemurs for the first time in the country to a viable number.

To avoid inbreeding and to infuse new blood (heterozygosity), Ring-tailed Lemurs would be exchanged soon from Taiwan zoo.

From the present number, founder stock will be selected by genetic profiling with the help of LaCONES, Hyderabad and these will be translocated to off-display area to breed as per CZA guidelines with intensive monitoring and management.

### Acknowledgement:

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