

Lion tamarins' in balance

The three species of lion tamarins face extinction as the last remnants of Brazil's coastal forests are whittled away. The Jersey Wildlife Preservation Trust has been directly involved in captive breeding of the golden lion tamarin and its Zoological Director is an elected member of the seven-person International Management Committee for the species. He visited Brazil in 1983 to see the conservation work being carried out and describes attempts that have been and are being made to save these spectacular New World primates.

Since the early 1960s, the genus embracing the lion tamarins *Leontopithecus* has been on a population decline toward extinction. The total wild population of all three species, the golden lion tamarin *Leontopithecus rosalia* (Linnaeus, 1766), the golden-headed lion tamarin *Leontopithecus chrysomelas* (Kuhl, 1820) and the golden-rumped lion tamarin *Leontopithecus chrysopygus* (Mikan, 1822), is currently estimated at fewer than 400 individuals. The golden lions could well become extinct in the wild by 1990, if not before, unless dramatic changes occur to reverse the present inroads into their remaining pockets of distribution in south-eastern Brazil.

The golden lion tamarin was known to science as long ago as 1551. In 1763 the naturalist Comte de Buffon examined a living specimen that had once been in the possession of Madame Pompadour. Three years later, Linnaeus was the first to

describe the species (see Hill, 1957). Marmosets and tamarins were brought back to Europe by both the Spaniards and the Portuguese during their first voyages of discovery to South America. 'Being fascinated by their rather uncanny appearance and remarkable intelligence, as well as by their endless "conversation" these diminutive New World primates immediately became a rage among the aristocracy, who presented them to their ladies, who often kept them in their muffs or other convenient retreats about their raiment' (Sanderson, 1957).

There has been considerable discussion as to whether both the golden-rumped and golden-headed should be regarded as subspecies of the golden lion or separate species. However, recent morphological work has indicated that these animals are sufficiently distinct to be considered as full species (Coimbra-Filho pers. comm.).

During the first half of the 1960s 200–300 golden lion tamarins were exported annually to zoos, research institutions and the pet trade. At that time Dr Coimbra-Filho called attention to instances of 100–300 individuals being removed from single units of population (Bridgewater, 1972). Since 1968 no further golden lions have been legally exported from Brazil.

In 1970 the golden-rumped lion tamarin was re-discovered after it had not been seen for 65 years (Coimbra-Filho, 1970); subsequently it was found to be restricted to two widely separated areas in the State of São Paulo (Mittermeier *et al.*, 1980). Until the late 1970s it had never been kept in captivity. In 1972 the golden-headed lion tamarin had only been in captivity on three occasions, once in London in 1869, once in Rio

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de Janeiro in 1961, and from 1971 with Dr Coimbra-Filho. Both of the latter species are poorly represented in museum collections.

The centre of distribution of the genus *Leontopithecus* was probably the coastal forest region of the State of Rio de Janeiro. From there it spread north and west until its range was probably continuous from the Rio São Francisco in the state of Bahia to the Rio Paranapanema in the State of São Paulo. Most of the range was in coastal forests but in São Paulo, it extended about 1000 km inland along several major rivers (Coimbra-Filho and Mittermeier, 1972; Hershkovitz, 1977).

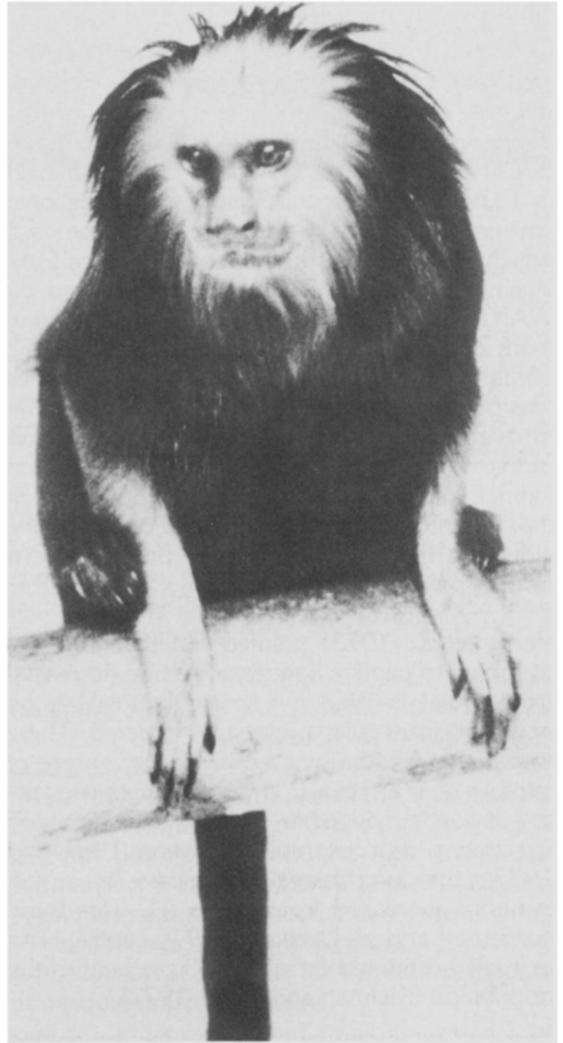
It is regrettable that the remaining area of their restricted ranges, which is estimated as only two per cent of their original distribution, is within the most densely human inhabited parts of Brazil. Forest destruction for lumber, agriculture, pasture and housing, is the chief danger to the ultimate chance of survival of the remnant wild populations of *Leontopithecus*. The chief objective of this paper is to record the measures being taken to prevent their extinction.

Captive population outside Brazil

Golden lion tamarins are now perhaps the most intensely managed exotic animal in captivity. Whereas the species is critically endangered in the wild, the captive population outside Brazil has more than quadrupled in the past decade, thanks mainly due to the efforts of Dr Devra Kleiman and the Smithsonian Institution's National Zoological Park, Washington, DC.

Bridgewater (1972) records that in 1966 this species was blacklisted by the American Association of Zoological Parks and Aquariums (AAZPA)

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Golden-headed lion tamarin (*N. Lindsay*).

Subcommittee on Primate Conservation, pending appropriate activity toward developing captive maintenance recommendations by the Wild Animal Propagation Trust (WAPT). The Brazilian Fauna Protection Law No. 5, 197 regulating export of animals was passed in 1967. Further enforcement was given by the US Public Law 90–135 (The Rare and Endangered Species Act). This combination of action stopped export traffic, and the species's subsequent chances of survival relied on conservation efforts in Brazil and on the establishment of an effective propagation programme with the animals already in captivity.

In 1969 WAPT began to monitor the captive population status of the golden lion tamarin, develop maintenance policies, effect loan agreement documents and act as a central clearing-house for this species. WAPT's activities climaxed in 1972 by their organisation of an international conference entitled 'Saving the Lion Marmoset' which was hosted by the National Zoological Park Washington (NZZP) DC, and co-sponsored by WAPT (later to be disbanded), NZZP and the New York Zoological Society. At the time of the 1972 conference the captive outlook for the species was poor (Kleiman, 1977). With a steady decline in overall numbers and few second generation births, it seemed likely that it would become extinct within a decade. However, optimists felt that the information exchange and publicity provided by the conference might prove to be a turning point.

Perry *et al.* (1973) pointed out that the total numbers of captive lion tamarins had decreased from a peak in 1968, just before the total ban on importation of this species was effected. There was also a steady increase in the percentage of captive-bred animals in the population, suggesting poor survivorship among the imported specimens. For example, between 1969 and 1971, the percentage of captive-bred lion tamarins increased from 23 to 51. This trend continued and by December 1975 captive-born animals accounted for about 80 per cent of the population (Kleiman and Jones, 1977).

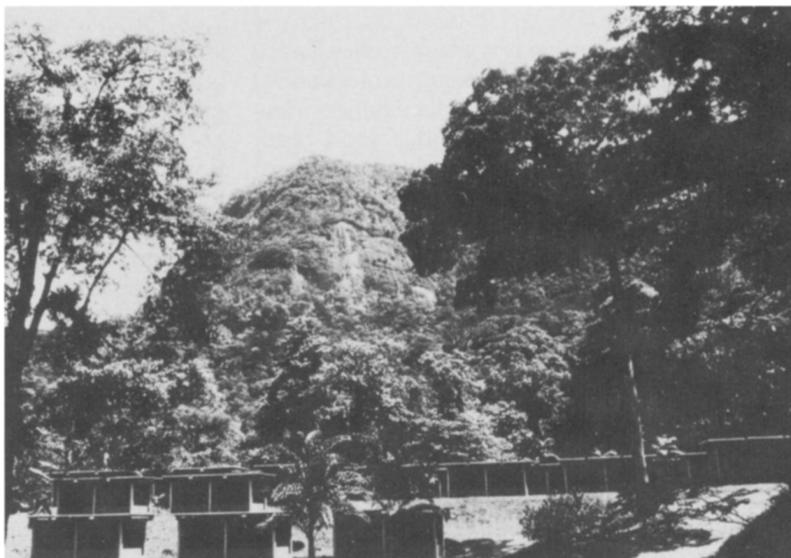
The first international studbook for the golden lion tamarin was published in 1973, with the known captive population on 31 December 1972

recorded at 46 males and 23 females, 64 per cent of which were captive-bred (Jones, 1973). In 1977, although its steady decline in numbers from 1968 had been arrested through increased knowledge of Callitrichid biology, especially in the area of nutrition and social structures, the future of the captive population was considered to be probably at its most critical phase in terms of its long-term survival (Kleiman, 1977).

Since 1976, the NZZP Washington, DC has each year published a comprehensive international studbook for the golden lion tamarin. On 31 December 1981 a total of 261 animals were held in 31 collections. This was the second consecutive year in which the population had increased by more than 26 per cent. An International Co-operative Research and Management Agreement (CRMA) was signed by nearly all holders and owners of golden lion tamarins (Kleiman and Evans, 1982) and in January 1982, a seven-person management committee (MC) was elected to act as the decision-making body. The MC is responsible for future management and research decisions, including evaluating new research proposals, deciding on future sites for surplus golden lion tamarins, as well as the transfer of specimens among institutions. It was considered that there was sufficient genetic diversity within the captive population to prevent serious inbreeding and to maintain a stable captive population indefinitely without ever having to add new animals from the wild. However, the MC was requested by the chairperson, Devra Kleiman, to address itself to some of the problems that such a captive-breeding programme success had raised. First, with a population growth of over 50 young each year, zoos with adequate facilities and declared interest in a sustained captive breeding programme to which surplus animals could be sent were becoming rarer. Secondly, as the captive population was biased towards individuals from the National Zoological Park, Washington, genetic lineage, it was considered important to attempt to equalise the genetic contribution of other lineages, and to decrease the rate of population increase by the removal of some animals from the captive breeding population, especially those with NZZP lineage.

In 1983 the MC approved a major reorganisation of the captive population in order to equalise the

Part of the Rio de Janeiro Primate Centre, which has achieved considerable success in breeding tamarins and marmosets, including the three lion tamarins (*N. Lindsay*).



genetic contribution of the different founder groups, a move that will reduce the inbreeding problems for several years to come. The proposed changes, which were developed by Ron Evans of the NZP and co-author of the international studbook, were sent to all owners and holders of golden lion tamarins. It is considered that such changes will represent the largest single reorganisation of a captive population ever attempted (Kleiman and Evans, in litt.). At present, there are no golden-headed* or golden-rumped tamarins outside Brazil.

Rio de Janeiro Primate Centre (CPRJ–FEEMA)

Decisive action for the total preservation of the golden lion tamarins was initiated in 1971 when both Dr Coimbra-Filho and Dr Alceo Magnanini were recording the continuous and rapid decrease of natural areas and gave urgent attention to the establishment of a 'bank' of golden lions, and the promotion of captive-breeding programmes prior to the creation of a federal biological reserve in Poco d'Anta. The initial captive breeding facilities at the Tijuca Bank in the

*During November/December 1983 it was established by the author that some 50 golden-headed lion tamarins had been illegally taken from Brazil, the majority of which were then in the hands of a Belgian animal dealer and a private collector in France.

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Tijuca National Park situated within the city boundaries of Rio de Janeiro provided the founder breeding groups of the Rio de Janeiro Primate Centre (CPRJ) (see Magnanini and Coimbra-Filho, 1972).

Thanks to the Rio de Janeiro State Environmental Engineering Foundation (FEEMA), its principal sponsor, the CPRJ was founded by its far-sighted Director, Dr Adelmar Coimbra-Filho in 1979. At the time of the author's visit to the Centre in March 1983, some 120 specimens of the Callitrichidae belonging to 10 different species were represented and this population included over 20 individuals of each of the three lion tamarin species.

The Centre has already achieved significant breeding successes in its attempt to secure self-sustaining captive populations of the endangered primates from south-eastern Brazil. Some two hours drive to the north-east of Rio, it is located in a most naturalistic setting embraced by a belt of tropical rain forest, with the hills to the rear forming a dramatic 'backdrop' to the Centre, and presenting a permanent reminder of the necessity to preserve such oases of forestation if the long-term conservation goals for the captive populations are going to be secured.

The main reception building accommodates the offices and laboratories of the director, his deputy Claudio Padua, the head of the pathology service

Dr Alcides Pissinatti, the head of the management and nutrition service Dr Roberto da Rocha e Silva, and an impressive primate reference library which is in the process of being professionally catalogued by a graduate, Leila Fischer. New nutritional research facilities and a food preparation centre were being built, and to the rear of the reception were 30 units of accommodation for the 'treasure chest' of endangered marmosets and tamarins which includes, apart from the three golden lion tamarin species, the buffy-headed marmoset *Callithrix flaviceps*, the buffy-tufted-ear marmoset *Callithrix aurita*, the Geoffroy's marmoset *Callithrix geoffroyi*, and the pied tamarin *Saguinus bicolor*.

In 1981 Wildlife Preservation Trust International (WPTI) provided funds for the construction of 10 units to accommodate three threatened species of marmosets, as well as funding several field trips and the purchase of equipment to facilitate studies on colony management and nutrition. In May 1983 a further grant was awarded by WPTI for the second and final stage of Project *Callithrix* with the construction of 20 more breeding cages, to a total of 50, and to rescue further specimens from threatened sections of the forest. The Fauna and Flora Preservation Society has contributed funds towards units for the breeding of *C. flaviceps*, *C. aurita* and *C. geoffroyi* and the development of the Centre has also been greatly assisted by grants from FINEP, CNPq, and other institutions and private companies from Brazil and the WWF-US Appeal. Through breeding, CPRJ hopes to establish large captive populations of the rare Callitrichidae it accommodates, increase scientific knowledge about these little-known species, and greatly enhance the public awareness of their plight (Coimbra-Filho, in litt.). The 15 golden lion tamarins selected by the International Golden Lion Tamarin Management Committee for reintroduction purposes were all born in the USA, and upon their arrival in Brazil are scheduled initially to be quarantined and acclimatised at the CPRJ.

Poco d'Anta Biological Reserve

The Poco d'Anta Biological Reserve, 100 km north-east of Rio de Janeiro, was specifically established to ensure the survival of the golden lion tamarin. It was chosen in 1971, when more than 70 per cent of the land was densely forested

but it was not until March 1974 that the reserve was formally created and the expropriation of land authorised. The decrees, however, were not enforced during the following years despite the efforts and interest of numerous conservationists, and it was not until 1977 that the Brazilian Forestry Development Institute (IBDF) were able to take possession of the land (see Magnanini, 1977). Regrettably, even since the Reserve's creation, many parts have been deforested and only approximately 30 per cent of its 5000 hectares are suitable for the tamarins.

At the time of the author's visit in March 1983, an irrigation dam had just been completed which was expected to flood about 25 per cent of the reserve. Whereas some parts of the region can still boast of having mature forest, others clearly showed the scars of a previous 'slash and burn' policy, revealing the brick-red terminal wounds of soil erosion. Other regions had been planted with pasture grass and some reforested with eucalyptus.

The railway line that runs through the reserve had not been used for some time, although it was sad to learn that the Brazilian Railway authorities had yet to relinquish their control of the valuable disused station, so that it can be utilised by IBDF. With the completion of the dam the disturbing effect of constant traffic on the road through the park is greatly diminished. However, even to a random visitor it was clear that, due to the poor state of the reserve and the series of isolated forest patches, a large-scale habitat improvement programme is essential if the remnant population of golden lion tamarins is going to be saved.

Population estimates in the reserve are considered not to exceed 75 animals, and on the basis of actual sightings, could be as low as 20–25 individuals (Mittermeier *et al.*, 1980). It is very much hoped that plans to purchase small tracts of forest, bordering on the Poco d'Anta Reserve, will materialise so that vital family groups inhabiting them can contribute to the genetic diversity of the small populations of survivors.

Reintroduction potential

With the current captive population of golden lion tamarins increasing at a rate of over 50 per year surplus captive-bred animals could be made available for reintroduction into their native

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habitat, should such a reintroduction programme be necessary. In June 1982 Devra Kleiman visited the Poci d'Anta Reserve with Dr Coimbra-Filho and officials from IBDF and discussed the development of a programme to investigate the status and behavioural ecology of the golden lion tamarin and the feasibility of reintroducing captive-born individuals. The aims of the programme are to:

- 1, census accurately the golden lions currently in the Reserve, and estimate the amount of available habitat;
- 2, make a major study of the species's behavioural ecology within the Reserve, including feeding habits, group size and social structure, home range size, and habitat use using radio-telemetry techniques;
- 3, evaluate experimental techniques for acclimatisation and readaptation of captive-born animals and examine the behavioural ecology of captive-born golden lions after release into the Reserve;
- 4, develop a conservation education programme locally in the State of Rio de Janeiro and nationally in Brazil, focusing on the golden lion tamarin as an endangered endemic species;
- 5, initiate restoration to improve the Reserve's eventual carrying capacity for golden lions, including the development of corridors between isolated forest patches and the transplanting and planting of vegetation to increase biological diversity within second-growth forest blocks (after Kleiman, in litt.).

The programme is to be carried out as a collaborative project of the National Zoological Park/Smithsonian Institution, CPRJ and IBDF. Dr Devra Kleiman and Dr Coimbra-Filho are the principal investigators; and Dr Russell Mittermeier (WWF-US) is a major consultant to the project. The bulk of the fieldwork will be conducted by Dr James Dietz (NZIP), whereas Lou Ann Dietz, an education specialist, will develop the conservation education programme.

Funds for the research and release programme were made available from the WWF-US Appeal, the Smithsonian Institution, Friends of the National Zoo, Washington, DC and the National

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Geographical Society. Funds for the conservation education and the Poco d'Anta Reserve Restoration Programmes have been granted by WWF-US, Frankfurt Zoological Society, Fauna and Flora Preservation Society, and CRMA signatory zoos who were all provided with the opportunity to be part of this international conservation effort. Wildlife Preservation Trust International has recently funded the research to be carried out by Dr Benjamin Beck on the preparation and assessment of captive-born golden lion tamarins for reintroduction to the wild.

In conclusion . . .

The combined efforts to save the golden lion tamarin represent a classic example of what can be achieved when various disciplines working for the conservation of a species co-operate and co-ordinate their efforts in order to attain such a goal.

As recorded elsewhere (Mallinson, 1980, 1982), the future of animals in captivity will increasingly rely on national and international co-operation; much of this will depend on the integrity and goodwill of the people concerned. Institutional co-operation, leading to the development of international strategies to safeguard species survival, increasingly relies on the necessary ingredients of field workers, conservationists, educationists, academics and zoo personnel co-operating whole-heartedly; for without such a marriage of disciplines and endeavour, so many species will soon become prematurely extinct.

Although it is recognised that the conservation of ecosystems is more important than the protection of individual species and subspecies, when Brazil adopted a conservation plan for the whole country giving priority to ecosystem protection, taking geographic diversity of plant species into consideration but not that of the fauna, Rylands and Mittermeier (1983) were quick to point out the importance of examining the effectiveness of such plans in protecting many primate species and other animals and plants.

In 1978 the Jersey Wildlife Preservation Trust became the first European zoo to receive golden lion tamarins on breeding loan from the Smithsonian Institution's NZP, Washington, DC, and since that time the Trust has successfully reared 12 individuals (see Carroll, 1982). In 1981 the

Director of CPRJ, Dr Coimbra-Filho, visited Jersey and a year later the Trust awarded scholarships to two members of the CPRJ staff, Claudio Padua and Leila Fischer, who undertook the four-month course on the techniques of the breeding of endangered species in captivity at the Trust's International Training Centre. In 1983 both the author and the Trust's Curator of Mammals, Nicholas Lindsay, had the opportunity to visit Brazil in order to see the conservation work carried out at the CPRJ and to visit the Poco d'Anta Biological Reserve. The Trust's sister organisation, Wildlife Preservation Trust International, has awarded grants to underwrite 30 units of accommodation at the CPRJ, fieldwork and various other aspects of research. The Wildlife Preservation Trusts hope increasingly to become an integral part of the CPRJ efforts to secure the survival of various species of Callitrichidae that inhabit the remnant forest patches of south-eastern Brazil.

During the last decade approximately 40 per cent of the densely forested areas of the Poco d'Anta have disappeared. However, with the type of conservation programme that is being co-operatively developed by IBDF, CPRJ, and the Smithsonian, and funds being granted by several international funding organisations, including fFPS, it is hoped that public awareness of the plight of the critically endangered golden lions will be increased, that the successful reintroduction of captive-bred stock will be realised, and that such a collaborative effort will act as a model for future international conservation projects.

Acknowledgments

This paper has relied on a number of authoritative articles, written communications and conversations dealing with many aspects of the past, present and hoped for long-term future of the genus *Leontopithecus*. In connection with such a compilation of diverse data, I should like to especially thank my friends and colleagues Dr Ademar Coimbra-Filho, Dr Devra Kleiman and Dr Russell Mittermeier for their prolific and fine contributions. My sincere thanks to Mr and Mrs Benno H. Schwarz who presented the Jersey Trust with two return air tickets, London-Rio de Janeiro, that enabled my colleague Nicholas Lindsay and I to visit Brazil, and whilst we were in that country, our sincerest gratitude to Dr Coimbra-Filho and Claudio Padua, who both made our visit such a memorable and worthwhile occasion.

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