

Golden Lion Tamarins (*Leontopithecus rosalia*)

Reintroduction programme and habitat feasibility



Introduction

Reintroduction initiatives are pivotal in restoring species populations within their historical habitats and require a thorough evaluation of habitat suitability. Defined by the IUCN as an effort to reinstate a species into an area once part of its native range but where it had become extirpated or extinct, reintroductions have served great importance for endangered species like the Golden Lion Tamarin (IUCN, 1998). In the early 1970s, habitat loss and exploitation for the pet trade had reduced the tamarin's captive population to fewer than 80 individuals. Subsequent reintroduction efforts increased their numbers, leading to a significant shift from critically endangered to endangered status by 2003 (Jerusalinsky et al., 2019). Crucially, the success of such reintroduction efforts depends upon establishing a self-sustaining population, measurable in terms of reproductive success and survival, as emphasized by Kierulff et al. in 2002. This transformation from the brink of extinction to an increased population highlights the importance of reintroduction initiatives and the necessity of habitat assessments in the conservation of endangered species like the Golden Lion Tamarin.

Ecology

Golden lion tamarins, found primarily in the Atlantic Forest's lowland and tropical forests, also adapt to secondary forests and modified habitats. Their omnivorous diet includes fruits, insects, small vertebrates, nectar, flowers, and plants, utilising sharp teeth and agile hands for feeding. Living in family groups with a monogamous breeding pair, they exhibit cooperative breeding, commonly raising twins with assistance from older siblings. These primates establish territories, marked by scent and vocal cues, ensuring access to vital resources. Communication through vocalizations and visual cues aids in social bonding, predator warnings, and group cohesion (Dietz, 1985). They move through the forest canopy, jumping between branches and rarely use the forest floor as a means of transport.

Threats

Golden lion tamarins (GLTs) confront a multitude of threats primarily from deforestation driven by logging, cattle ranching, agriculture, urbanisation, road construction, and fires. These activities lead to substantial habitat loss and fragmentation, profoundly impacting their survival (Kierulff et al., 2012). Furthermore, GLTs have been exploited for the pet trade and zoo exhibitions, posing additional risks to their populations (Dietz, 1985). In their natural habitat, GLTs encounter dangers such as predation, diseases, starvation, and snakebites, further exacerbating the challenges they face in the wild. These threats collectively pose a significant risk to the continued existence of the species and require urgent conservation efforts to mitigate their impact and ensure the long-term survival of the golden lion tamarins (Kleinman et al., 1986)

Preparation

Many vital survival behaviours observed in mammals, such as habitat selection, food acquisition, predator awareness, movement, and social interaction, rely on learned skills rather than instinct (Kierulff et al., 2012). Ensuring the successful reintroduction of captive-born animals into the wild often necessitates comprehensive training to enhance their ability to thrive independently.

In the 1984 reintroduction program, considerable time was dedicated to preparing and training these animals extensively for their release, focusing on foraging, feeding, and locomotion skills. A primary challenge faced during the release was the identification and acquisition of natural foods. To address this, a systematic training protocol was established, gradually shifting the captive animals' reliance on predictable food sources to the search for spatially distributed or concealed food items in the wild. In captivity feeding practices involved offering finely cut produce and immobilized prey at set times and places, which did not replicate natural foraging conditions. To simulate wild scenarios, whole fruits and quail eggs were introduced in man-made nests, and food was hidden and provided at random times encouraging natural foraging behaviours. Additionally, the training involved inducing the animals to develop essential locomotor skills by engaging in jumping, climbing, and hanging exercises. The cages' structure was regularly altered to compel the tamarins to adapt to change and explore new paths, fostering adaptability instead of relying on familiar routes (Kleiman et al., 1986). This holistic training regimen aimed to equip captive-born tamarins with the necessary skills and behaviours vital for their survival and successful adaptation in the wild.

Habitat Suitability

The historical habitat that once supported golden lion tamarins before their decline now stands as a protected area within the Poco das Antas reserve, showcasing a diverse array of plant species and small invertebrates crucial for the species' survival. The Poco das Antas Reserve is a patchwork of primary and secondary forest and pasture land (Ferreira et al., 1981). The initial phase of the study focused on a significant protection and restoration effort within the reserve, marked by visible signs indicating its protected status. Measures included the hiring and training of guards to patrol and enforce anti-hunting regulations, the elimination of squatters practising slash-and-burn techniques, and the construction of fire breaks to enhance fire control. Long-term conservation efforts involved distributing lime across over 500-hectare area which was previously used as a cattle ranch, to elevate soil pH and stimulate natural regeneration. Despite these conservation measures, concerns persist, notably the rail track bisecting the reserve with frequent train passages and a nearby 2000-acre government-owned plot slated for development. Furthermore, the reserve's size poses a challenge in maintaining a genetically viable tamarin population so the identification of additional areas for conservation purposes is needed (Kleiman et al., 1986).

Re-introduction

The successful reintroduction of captive-born GLT back into their native Brazilian forest was underpinned by several crucial factors. This included the emergence of a self-sustaining captive population in the early to mid-1980s, coinciding with the establishment of the Poco das Antas Biological Reserve in 1975 and an extensive study on the behaviour of wild GLTs within the reserve. Aiming to increase the wild population's size, genetic diversity, and geographic distribution, the reintroduction program had goals to protect additional areas within the Atlantic Forest, contributions to reintroduction science, and public education initiatives (Stolwijk, 2013).

The reintroduction efforts commenced in 1984 until 2000, involving a total of 153 individuals, comprising 146 captive-born and 7 wild-born tamarins. These individuals were released into the Poco das Antas Biological Reserve and adjacent private forests, establishing populations across 28 private farms, spanning approximately 3200 hectares of forested land (Stolwijk, 2013).

However, a specific reintroduction program in 1984 highlighted the challenges faced during soft releases. In this instance, captive-bred GLTs were carefully selected from zoos worldwide and underwent a six-month quarantine period for acclimatisation and disease control measures. Subsequently, 15 tamarins were released into the reserve, with four casualties during the acclimatisation phase by disease, while three offspring were born. By the following June, after release, 11 tamarins had succumbed to various causes such as predation, disease exposure, starvation, and snakebites. Ultimately, out of the initial 15 released tamarins, only three managed to survive,

emphasizing the complex challenges and risks associated with reintroducing captive-born individuals into their natural habitat (Kleiman et al., 1986).

Table 2. The golden lion tamarin reintroduction program, 1984-2000					
Year	Number reintroduced	Cumulative number reintroduced	Number reintroduced still alive	Number wild born still alive	Total alive
1984	14	14	9	1	10
1985	12	26	15	1	16
1986	0	26	5	3	8
1987	21	47	22	5	27
1988	20	67	37	12	49
1989	7	74	29	22	51
1990	7	81	24	34	58
1991	11	92	27	51	78
1992	34	126	42	62	104
1993	7	133	31	87	118
1994	3	136	24	96	120
1995	5	141	22	147	169
1996	6	147	24	176	200
1997	0	147	20	208	228
1998	0	147	14	265	279
1999	0	147	14	288	302
2000	6	153	18	341	359



(Amigo,2018)

In subsequent reintroduction initiatives, a significant focus was placed on the establishment of wildlife corridors to serve as connective pathways linking fragmented habitats. By facilitating the interconnection of fragmented habitats these wildlife corridors effectively promoted genetic diversity among GLT populations, contributing significantly to the long-term viability and sustainability of their habitats. An exemplary instance of this was the construction of a corridor spanning the coastal four-lane BR-101 highway.

Critique

A pivotal aspect that would have significantly improved the success of the reintroduction program entails conducting an in-depth and comprehensive survey of the ecological parameters of the reserve. An improvement would be a detailed survey assessing the forest cover of the reserve as well as surrounding areas. It should include the expanse of the forest but also look at the composition and diversity of plant species identifying potential denning sites canopy cover and nesting sites. Another improvement would be to look more specifically at the availability, accessibility and seasonal variations of food resources and prey species. It also needs to look at the size of the habitat and connectivity between forest fragments to help increase gene flows. The observed mortality among reintroduced golden lion tamarins, attributed primarily to factors such as starvation and snakebites, serves as a reminder of the critical importance of comprehending and accurately replicating the natural foraging conditions prevailing within the reserve's ecosystem

Conclusion

The success story of the Golden Lion Tamarin's population recovery, shifting from critical endangerment to endangered status, underscores the significance of reintroduction initiatives. Overall, the success of this reintroduction effort relied on collaboration with local landowners adjacent to the reserve, who allowed the use of their forests for releasing golden lion tamarins. Additionally, the establishment of wildlife corridors emerged as a crucial strategy, promoting genetic diversity and habitat connectivity. However, a more comprehensive habitat feasibility analysis would have involved a better understanding of vegetation structure, food availability and distribution, prey species dynamics, specific threats, and adaptive management strategies. This would significantly enhance the success rates of reintroduction programs by providing a more holistic understanding of the habitat's suitability and by better preparing the released individuals for survival in their natural environment.

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(Gamberini, nd)