Central Zoo Authority
केन्द्रीय चिड़ियाघर प्राधिकरण

CZA Position Statement on Conservation breeding

Introduction

India is home to an extraordinary diversity of wildlife, much of which faces growing threats from habitat loss, climate change, and human-induced pressures. As the apex body overseeing zoos in India, the Central Zoo Authority (CZA) plays a critical role in safeguarding biodiversity. Conservation breeding programs have emerged as a vital strategy, providing a safety net for species at risk of extinction and supporting broader biodiversity recovery efforts.

The CZA's statutory mandate under Section 38C(d) of the Wild Life (Protection) Act, 1972, emphasizes its responsibility to identify endangered species for captive breeding and assign zoos to lead such initiatives. Following an amendment to the Act in 2022[1], the definition of *zoo* was expanded to include conservation breeding centers, ensuring these facilities operate under regulatory standards and contribute effectively to species recovery. Since its inception, the CZA has institutionalized conservation breeding, beginning with the identification of 35 species in 1992 and culminating in comprehensive guidelines adopted in 2011 for 74 species managed across 43 zoos. A subsequent review in 2014 prioritized 26 endangered species, guided by the *Concept Paper on In-Situ Ex-Situ Linkage*. To address evolving challenges and opportunities, a systematic review of ongoing conservation breeding programs was undertaken. The findings from this exercise highlight gaps, successes, and strategies for refinement, building on earlier initiatives while incorporating modern methodologies and global best practices.

This position statement reflects CZA's vision for conservation breeding as a cornerstone of wildlife management. It provides a strategic framework for zoos, conservationists, and stake-

[1]https://www.indiacode.nic.in/bitstream/123456789/1726/1/a1972-53.pdf

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holders to ensure that conservation breeding programs remain scientifically robust, impactful, and aligned with broader efforts to secure the long-term survival of India's threatened wildlife.

Mission & Vision

The overarching mission of conservation breeding programs is to ensure the long-term survival of threatened wildlife species by establishing scientifically managed, demographically viable, and behaviorally competent captive populations that act as *models* and *representatives* of their wild counterparts while supporting broader species recovery efforts. This envisions a future where conservation breeding programs serve as a dynamic tool to prevent species extinction, foster collaboration across zoos and conservation organizations, and integrate seamlessly with in situ conservation strategies to restore and sustain India's biodiversity.

Conservation breeding

Conservation breeding, refers to scientifically managed breeding of threatened species in controlled environments to establish *captive assurance populations* and support species recovery efforts. This includes the establishment and maintenance of viable, genetically diverse, and behaviorally competent populations within ex situ settings such as zoos. While the Wild Life (Protection) Act, 1972, uses the term *captive breeding*, its intent aligns with conservation-oriented breeding that contributes actively to biodiversity recovery through initiatives like conservation translocations. The term *conservation breeding* encapsulates these objectives more comprehensively, underscoring the alignment of breeding programs with species recovery goals and the integration of ex situ efforts with broader conservation strategies.

Globally, conservation breeding has evolved to incorporate scientific advancements in genetic management, demographic modeling, and behavioral assessments. Approaches such as population viability analysis, genetic monitoring, and adaptive management have greatly enhanced the ability to maintain healthy, viable captive populations. These advances emphasize the importance of long-term planning, systematic reviews, and the integration of ex situ efforts with broader conservation strategies. Frameworks like the IUCN's Five-Step Decision Process[2] and the One Plan Approach[3] provide structured methodologies to guide these efforts, advocating for collaboration among stakeholders to manage both wild and captive populations effectively.

[2]https://portals.iucn.org/library/sites/library/files/documents/2014-064.pdf
[3]https://www.cpsg.org/our-work/our-approach/one-plan-approach

Effective conservation breeding programs must focus on population management across zoos, ensuring that zoo populations are not isolated but managed as coordinated metapopulations. Collaboration among institutions, coupled with systematic behavioral, genetic, and demographic management, is critical to achieving this goal. Programs must aim to establish populations that closely mirror their wild counterparts, maintaining their conservation value and long-term sustainability.

The success of ongoing breeding programs has provided valuable insights into maintaining vulnerable species in captivity under challenging circumstances. These programs have deepened understanding of species biology, improved husbandry practices, and, in some cases, facilitated experimental reintroductions to support in situ conservation. For conservation breeding to achieve its full potential, it must contribute directly to species recovery by re-establishing populations in the wild or supplementing existing populations.

Key aspects of conservation breeding

Species Prioritization and sourcing of animals

Species prioritization is central to conservation breeding, requiring a rigorous framework that evaluates population viability, genetic diversity, and ecological significance. Tools like the IUCN's Five-Step Decision Process or Conservation Needs Assessments[4] provide robust methodologies, but these must align with India's unique ecological, cultural, and conservation contexts.

Captive breeding programs must address the ethical and ecological implications of sourcing animals from the wild. Historically, wild sourcing replenished captive collections, but increased understanding of species-specific requirements, legal safeguards, and shifting ethical attitudes have emphasized the importance of sustaining populations through captive breeding. Rescued or wild-caught individuals should only be integrated into breeding programs as a last resort, particularly to avoid depleting wild populations. Before considering these options, foreign zoos housing the species should be explored as potential sources. Such institutions can provide genetically diverse founders, facilitating the development of sustainable populations while minimizing the need to extract animals from the wild.

When rescued or wild-caught animals are deemed necessary for a breeding program, their integration must be guided by a detailed assessment of their taxonomy, genetic profile, and health status. This ensures compatibility with existing populations and minimizes risks to the program. The focus must remain on sustainable practices, particularly for species with

[4]https://www.conservationneeds.org/

restricted natural distributions, reinforcing the role of zoos as centers of conservation rather than exhibition spaces. By adopting these ethical and scientifically sound sourcing strategies, zoos can maintain the integrity and sustainability of conservation breeding programs.

Founders and population management

Many breeding programs initiated with existing stock lack systematic efforts to acquire genetically diverse founders. While empirical studies suggest that approximately 20 unrelated breeding individuals can capture optimal heterozygosity (Crow and Kimura, 1970; Lacy, 1994), species-specific and context-dependent approaches are essential due to variable breeding success and representation. Future strategies must emphasize planned acquisition, prioritizing genetic diversity and health while accounting for effective population sizes (N_e) (Waples, 2024). The practice of *ad-hoc* animal transfers, must be replaced with coordinated population management. Additionally, the transactional approach to animal transfers—treating animals as possessions in exchanges—should be eliminated. Transfers should be guided by scientific population management principles, ensuring alignment with broader conservation goals (Allen et al., 2010; Faust et al., 2019; Gray et al., 2022).

Husbandry

Effective husbandry practices are integral to conservation breeding programs. Rather than creating new protocols, existing knowledge on species-specific husbandry, behavioral ecology, and management practices should be integrated into breeding strategies. Captive habitats must allow the full expression of natural behaviors, aligning management with species' behavioral ecology (Rabin, 2003).

The Recognition of Zoo Rules (RZR), 2009, specifies that conservation breeding facilities should be dedicated but does not mandate off-display housing. Global standards emphasize enclosure quality over display status. Enclosures must reflect species-specific needs, supporting natural behaviors, social interactions, and zones of retreat for privacy and reduced stress. On-display enclosures should minimize habituation to humans while maintaining behavioral integrity. Moderate habituation can be mitigated through soft-release protocols in pre-release phases. Conservation breeding must balance public education with animal welfare, prioritizing functionality and species-specific requirements over rigid display mandates (Flanagan et al., 2020).

Animal welfare and conservation synergy

Animal welfare and conservation breeding share overlapping goals that reinforce each other. Effective conservation breeding programs must prioritize high welfare standards to ensure the health, reproductive success, and survival of animals in captivity. This includes addressing behavioral and physical needs, mitigating stress, and promoting species-typical behaviors. By fostering welfare through enriched environments, targeted husbandry practices, and minimizing human contact, conservation breeding can prepare animals for reintroduction to the wild. Programs should adopt evidence-based welfare strategies, such as those emphasizing opportunities for self-maintenance, species-specific behaviors, and choice and control. Aligning welfare outcomes with conservation objectives not only supports the development of competent, viable populations but also ensures ethical and sustainable practices at every stage of conservation breeding efforts (Greggor et al., 2018).

Financial Sustainability

In the initial phases of conservation breeding programs, the Central Zoo Authority (CZA) provided significant funding for their establishment and operation. However, as CZAŽ019s funding has decreased, support has been limited to maintenance expenses, creating financial challenges. State governments often assume that CZA is solely responsible for funding these initiatives, resulting in minimal state-level allocations. This lack of investment impacts critical components, including enclosure maintenance, infrastructure development, and the adoption of advancements in enclosure design.

To address these challenges, CZA must prioritize conservation breeding in its funding strategy and explore collaborative mechanisms such as partnerships with conservation organizations, corporate sponsorships, and grants. A shared financial responsibility model, where states contribute a defined percentage of funding, will ensure greater ownership and commitment, enhancing program sustainability.

Comprehensive Long-Term Management Plans

All conservation breeding programs must be guided by comprehensive, species-specific management plans spanning at least 10 years. These plans should outline clear goals, measurable success indicators, and strategies to achieve conservation targets. CZA will adopt a standardized template for these plans, ensuring alignment with broader conservation objectives. The plans should also include detailed financial projections to facilitate effective resource allocation. Structured, long-term plans are essential for ensuring that conservation breeding initiatives remain goal-oriented, measurable, and impactful in achieving their objectives.

Technical Oversight

The Central Zoo Authority (CZA) recognizes that the technical complexity of conservation breeding programs requires guided oversight beyond the capacity of individual zoos. To address this, CZA will lead efforts to develop species-specific conservation breeding plans through targeted workshops. These workshops will follow structured formats, such as Integrated Collection Assessment and Planning (ICAP) or Conservation Needs Assessments, focusing on priority species and those requiring refined management strategies.

The workshops will involve subject-matter experts, zoo professionals, and conservation biologists to ensure the development of scientifically sound plans. They will also evaluate the infrastructure, technical expertise, and resource availability of participating zoos, identifying their capacities to act as coordinating or participating institutions. Additionally, these workshops will facilitate collaboration, capacity building, and the integration of advanced tools for population management, enclosure design, and behavioral monitoring. By embedding such technical oversight, CZA aims to ensure that conservation breeding programs remain scientifically rigorous, collaborative, and aligned with long-term conservation goals.

Mentorship and periodic review

To support the intensive and long-term nature of conservation breeding programs, CZA will designate mentors with expertise in species biology, population management, and captive breeding. Mentors will be assigned at the species level or, where necessary, at the order level, acting as focal points to guide zoos, address technical challenges, and ensure program alignment with conservation objectives.

Periodic reviews, conducted every three years, will assess progress against defined targets, identify gaps, and recommend corrective actions to maintain program efficacy. These reviews will be carried out independently from routine zoo evaluations by qualified personnel with expertise in conservation breeding and scientific population management, ensuring reliable and actionable insights. A standardized evaluation format will be developed and refined through pilot testing to ensure effectiveness and ease of implementation.

Leveraging International Partnerships

The Central Zoo Authority (CZA) emphasizes that conservation breeding efforts in Indian zoos must integrate with global initiatives to maximize their impact. Many species identified for breeding programs are managed in foreign zoos, presenting opportunities for collaboration to enhance genetic diversity, population health, and long-term viability. By aligning with international programs such as Global Species Management Plans (GSMPs) and Regional Collection

Plans (RCPs), Indian conservation breeding programs can access technical expertise, unrelated founders, and advanced genetic and demographic management tools.

CZA envisions leveraging international partnerships to facilitate knowledge exchange, capacity building, and collaboration through joint workshops, expert consultations, and cross-border research initiatives. These efforts will ensure that Indian programs remain aligned with global best practices while contributing meaningfully to species conservation on an international scale. To this end, CZA will establish formal linkages with global zoo associations and international conservation bodies, fostering seamless coordination and mutual benefits.

Broadening the Scope of Conservation Breeding

Conservation breeding should not necessarily be restricted to native species, but decisions to initiate breeding programs—especially for non-native species—must be guided by conservation need rather than the mere presence of these species in one or more zoos. International collaborations, such as those managed by global regional associations, play a critical role in supporting recovery efforts, particularly for non-native species. Collaborative management ensures that populations can be integrated into global metapopulations, enabling structured genetic and demographic management across institutions.

For native Indian species, partnerships with international counterparts provide valuable expertise, access to resources, and enhanced methodologies, as demonstrated in programs for species like the Lion-tailed Macaque (*Macaca silenus*), Red Panda (*Ailurus fulgens fulgens*), Snow Leopard (*Panthera uncia*), and Indian Rhinoceros (*Rhinoceros unicornis*). These partnerships exemplify how international cooperation can enhance conservation outcomes while ensuring alignment with scientific principles and global best practices.

While the overarching goal remains the conservation of India's biodiversity, non-native species programs must prioritize collaboration with global associations to ensure population management is conducted as part of coordinated, international efforts. Aligning these initiatives with national conservation policies is essential to ensure they remain relevant to India's ecological and cultural contexts, while contributing meaningfully to global conservation goals. Indian zoos can play a vital role by collaborating with international agencies to manage non-native species populations and contribute to their global conservation.

Objectivity & Adaptive management

Future actions in conservation breeding programs should adopt structured, evidence-based frameworks and an adaptive management approach to remain flexible to emerging challenges and scientific advancements. Infrastructure investments should not bias species selection; in-

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stead, decisions should prioritize conservation needs, ecological significance, and alignment with global best practices like the IUCN's ex situ management guidelines. Programs must focus on measurable conservation outcomes, ensuring resources are utilized effectively and priorities are regularly reassessed to adapt to changing conservation goals.

Towards global excellence in conservation

With the outlined frameworks, strategies, and actions in place, Indian zoos have the opportunity to transform their approach to conservation breeding and align with the goals set out in the Vision Plan 2031. By adopting evidence-based decision-making, integrating global best practices, fostering international collaborations, and ensuring sustainable financial and technical support, zoos can position themselves as key contributors to species conservation on a global scale.

The Central Zoo Authority (CZA), through its leadership and strategic guidance, can drive this transformation by embedding scientific rigor, collaboration, and adaptive management into conservation breeding programs. The adoption of standardized, long-term management plans and periodic evaluations will ensure that programs remain goal-oriented and responsive to emerging challenges. Furthermore, integrating the behavioral and ecological needs of species into enclosure design and management will enhance welfare while maintaining conservation value.

If these strategies are diligently implemented, zoos in India can evolve into globally recognized hubs of conservation excellence. They will not only meet but exceed global standards, making meaningful contributions to biodiversity recovery and reinforcing their role as centers for education, research, and species preservation. Achieving the Vision Plan 2031 will mark a significant milestone, demonstrating India's commitment to wildlife conservation and its leadership in advancing ex situ conservation efforts worldwide.

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