

# A call to mitigate threats and fill existing knowledge gaps to facilitate the conservation of the Andean Condor in Colombia

Un llamado a mitigar las amenazas y llenar los vacíos de información para facilitar la conservación del cóndor andino en Colombia

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Ex-situ conservation actions such as reintroduction programs can be relevant for the recovery of threatened animals (Seddon *et al.* 2007). However, to be successful Ex-situ actions should be integrated with in-situ conservation measures (Schwartz *et al.* 2017) and be planned with concrete ecological goals using strategic and scientific approaches (Armstrong & Seddon 2008). It is essential that reintroduction programs for endangered species take into consideration the causes that have led to the decline of the populations; the root causes of decline must be addressed and mitigated before a species can be reintroduced (Armstrong & Seddon 2008).

The Andean Condor (*Vultur gryphus*) is one such species of concern. This species, considered Vulnerable worldwide (BirdLife International 2023), is of particular importance in Colombia, where it is classified as Critically Endangered with a population fewer than 190 individuals (Renjifo *et al.* 2016). Over the last 33 years, reintroduction has been one of the main strategies implemented by the government and private agencies of Colombia for the conservation of the Andean Condor (Lieberman *et al.* 1993, Rodríguez *et al.* 2006). In total, seventy-one captive-born individuals (38 males and 33 females) have been released by the government and San Diego Zoo within the historical range of the species (Lieberman *et al.* 1993, Rodríguez *et al.* 2006, Parrado & Sáenz unpubl. data). Andean Condor reintroduction efforts have allowed condors to inhabit sites where the population had been extirpated. For instance, in the Parque Nacional Natural (PNN) Los Nevados, the last record for wild condors was in 1977 (Tovar 1985). From 1997 to 1999, 14 juvenile condors were released in this protected area, of which six individuals were recently observed (Fig. 1) (Zuluaga & Ospina-Herrera 2020, Restrepo-Cardona 2021).

However, there are numerous gaps in the reintroduction programs to date that need to be addressed going forward. The first is a lack of adequate monitoring. Because of a lack of monitoring following Andean condor releases, little is known about the outcomes of these reintroductions. In fact, a recent study indicates that at least 7% of the condors released in Colombia were poisoned, shot, or killed due to electrocution from power lines (Restrepo-Cardona *et al.* 2022). In addition, evidence of reproduction among reintroduced Andean Condors has only been reported for a single pair of the PNN Los Nevados, which incubated its last egg





**Figure 1.** Captive-born Andean Condor (*Vultur gryphus*) pair released in the Parque Nacional Natural Los Nevados between 1997 and 1999, Colombia (Photo: Juan Sebastián Restrepo, January 2013).

between October and December of 2012 (Restrepo-Cardona *et al.* 2018, Restrepo-Cardona 2022). Due to the lack of monitoring following condor releases, it is difficult to define the role of condor reintroduction in the maintenance of the population in the country (Restrepo-Cardona *et al.* 2018).

Furthermore, reintroduction programs implemented in Colombia appear to have not considered the origin of the individuals and the associated implications of this for genetic composition. For instance, sixty-six captive-born condors released in Colombia came from the San Diego Zoo and five came from the Cali Zoo, but the origin of the parental Andean Condors in these zoos is unknown (Parrado & Ciri unpubl. data). Regrettably, there have been no evaluations of the influence of the genetic composition on released Andean Condors on the Colombian wild-born condor population to date. It is necessary to evaluate the genetic composition of founder individuals in order to

preserve the genetic variability of recipient populations, while also considering the connectivity between populations and their genetic structure (Padró *et al.* 2018, 2019).

Further, there is also insufficient information available about the demography, population size and viability, habitat requirements, range size, movement and genetics of the current wild Colombian Andean Condor population, as well as on the human-condor interactions. Research is needed to fill these gaps to pave the way for not only informed reintroduction programs but all conservation strategies outlined for the species in The National Program for the Conservation of the Andean Condor in Colombia: Action Plan 2006 – 2016 (Rodríguez *et al.* 2006). Of note is that information on measurable progress toward the goals in this plan is unknown to date, and a new roadmap for Andean Condor conservation has not been yet defined.

Moreover, reintroduction is hampered by the fact that causes for the decline of the Andean Condor have not been reduced or eliminated. In fact, between 2007 and 2021, poisoning and illegal shooting caused the loss of 7-21% of the estimated population of Andean Condors in Colombia (Restrepo-Cardona *et al.* 2022). There were 13 records of poisoned condors distributed across four departments: Santander had the largest number of records, with eight cases, followed by Boyacá and Magdalena (two cases each), and Cundinamarca (one case). At least two cases were reported inside protected areas, one in PNN Chingaza, and another in PNN El Cocuy. Most Andean Condors that were poisoned (seven of 13 cases) were reported in rural landscapes of the Cerrito municipality (Restrepo-Cardona *et al.* 2022), where evidence indicates that conflict among farmers, carnivores, and condors could have triggered human attacks towards the Andean Condor (Fundación Neotropical 2018). This represents a critical issue to address because it can produce lasting consequences on the wild Andean Condor population of Colombia and, in turn, across their entire geographic range.

Strict regulation of pesticide use is an important tool for preventing the poisoning of Andean Condors (Plaza & Lambertucci 2020, Restrepo-Cardona *et al.* 2022). However, considering that this conservation problem arises from complex interactions between people and wildlife, the challenges need to be addressed through social-ecological approaches. Elimination of Andean Condor poisoning requires investigations into the underlying social and ecological factors that cause this direct threat to the species. Furthermore, necessary conservation measures that need to be put in place include the strengthening of technical capacities of rural communities, such as appropriate livestock management, and sustainable bird-watching tourism, development of environmental educational programs, and implementation of conservation actions based on scientific evidence to prevent and mitigate human-wildlife conflicts.

Of the 25 Andean Condors affected by different threats between 1991 and 2021, 88% of the injured individuals died (Restrepo-Cardona *et al.* 2022). Rescue management protocols for injured/killed

Andean Condors have been implemented in the last few years. Two wild poisoned Andean Condors were rescued, tagged with GPS transmitters and released in 2018. Furthermore, seven dead condors were given to biological collections for scientific uses between 2013 and 2021. These included the biological collections of the Instituto de Investigación de Recursos Biológicos Alexander von Humboldt (three condors), the Instituto de Ciencias Naturales de la Universidad Nacional, the Museo Historia Natural de la Pontificia Universidad Javeriana, and the Museo de Historia Natural de la Universidad Industrial de Santander, and the Centro de Museos de Historia Natural de la Universidad de Caldas (one condor each) (Restrepo-Cardona *et al.* 2022, Parrado & Sáenz pers. com.).

Both in-situ and ex-situ strategies are important for the conservation of Andean Condors in Colombia. Reintroduction will only be successful if ongoing threats to the species are mitigated or eliminated, and if a better understanding of the ecology, biology and genetics of condors, and human-condor interactions is achieved. We call on the government and private agencies, as well as the academy, NGOs, researchers, and civil society to invest in filling existing knowledge gaps on the species and to mitigate current threats affecting condors. The resulting outcomes of this approach could be relevant for both in-situ and ex-situ strategies and for improving the Andean Condor conservation in Colombia and across their entire geographic range.

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