Re-Introduction of the Socorro dove, Socorro Island, Revillagigedo Archipelago, Mexico

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Introduction

The Socorro dove (*Zenaida graysoni*) is currently extinct in the wild and is endemic to Socorro Island, Mexico. The last written account mentions the killing of several doves in 1972 (Velasco-Murgía, 1982). However, credible testimonials note its presence on the island as late as 1975 (Captain J. Durán Hernández, pers. comm.). Its extinction coincides with the construction of the naval airstrip and accessory roads in the mid 1970s (Jehl & Parkes, 1982). Doves brought to California in 1925 allowed breeding efforts in the United States (Gifford, 1927) and shortly after in Europe (Nicolai, 1991). Breeding in the United States languished in the early 1990s; hybridization with mourning doves (*Zenaida macroura*) happened and the zoos hosting the species transferred their doves to private breeders (P. Kandianidis, pers. comm.; J. Passantino, pers. comm.). The situation in Europe was different, by 1995, the European Endangered Species Breeding Program (EEP) of the European Association of Zoos and Aquaria (EAZA) became the backbone of global breeding efforts. The Revillagigedo Archipelago was declared a Biosphere Reserve in 1994, lending a solid basis to collaborative re-introduction efforts with Mexican authorities and other organizations.

Goals

- Goal 1: To re-establish a demographically and genetically viable population of Socorro doves using genetically pure captive-bred individuals.
- Goal 2: To maintain an international captive meta-population to preserve extant blood lines and supplement re-introduction efforts.
- Goal 3: To establish a long-term monitoring program to evaluate and monitor the success of re-introduced individuals and their progeny.

Success Indicators

- Indicator 1: Genetic evaluation of captive Socorro doves to determine the extent of hybridization with mourning doves to detect candidate bloodlines for re-introduction.
- Indicator 2: Expansion of the captive breeding partnership in Europe, the United States and Mexico to create a meta-population capable of providing individuals to re-introduction efforts without jeopardizing the demographic and genetic wellbeing of the species.
- Indicator 3: Sampling of pathogens and disease of captive bred individuals and wild birds on Socorro Island to assess the risk of epidemics.
- Indicator 4: Identification of former range and habitat requirements of the species.
- Indicator 6: Removal of introduced grazers and feral predators.
- Indicator 7: Habitat restoration in potential release areas.
- Indicator 8: Construction and operation of a breeding station to provide acclimated offspring for release on Socorro Island.
- Indicator 9: Construction and operation of a release station on areas where habitat restoration has been implemented.
- Indicator 10: Establishment of permanent territories and successful reproduction in the wild by released individuals.

Socorro dove at Frankfurt Zoo
© Stefan Stadler

Project Summary

Shortly after the Socorro dove was presumed extinct in the wild (Jehl & Parkes, 1982), Luis Baptista characterized morphological and behavioral traits of the species. Dr. Baptista visited Socorro Island several times between 1988 and 1995 to determine the feasibility of the project. He found favorable conditions such as significant native forest habitat. The re-introduction program, also known as *The Socorro Dove Project*, has progressed as information drawn from ongoing research is incorporated in implementation strategies (Horblit *et al.*, 2005 and references therein). In its current form, the re-introduction program consists of two parallel initiatives: 1) the international ex-situ captive breeding program and 2) the *in-situ* breeding program and habitat restoration. To determine the impact of hybridization on the extant captive population, DNA fingerprinting and DNA sequencing of Cytochrome C were conducted among a large number of putative Socorro doves from the United States and Europe in the late 1990s (J. E. Martínez-Gómez, unpublished). Banding patterns from these birds were compared to those of known hybrids and pure doves descending from the original Californian stock (L. F. Baptista, P. Kandianidis, & J. Passantino, pers. com). Results showed that

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hybridization was pervasive in the United States but that European doves showed very similar banding patterns to pure doves. Because recurrent backcrossing to Socorro Doves could yield doves with no trace of the hybridization event, it was decided to use the putatively pure European Socorro doves to lower the risk of introducing elements of an alien genome.

In Europe, a broad partnership has been established. Today, twenty one institutions led by the Frankfurt Zoo constitute the European Breeding Program (EEP) for this endangered species. This program monitors genetic and demographic parameters in the captive population and currently maintains ~100 doves. Originally, birds for re-introduction were going to travel directly from Europe to Mexico. However, avian influenza outbreaks throughout Europe in 2005 prompted the Mexican government to ban the importation of any birds from Europe. To work within this constraint and maintain the safety of avian populations, captive breeding of European stock will be undertaken first in the United States and then expanded to Mexico prior to any transfer to Socorro Island. By establishing a larger captive meta-population the overall negative impact of any catastrophic loss on Socorro Island would be minimized. In October 2008, twelve Socorro doves were imported from both the Paignton Zoo and the Edinburgh Zoo to the United States by the Island Endemics Foundation and the Albuquerque Zoo. After USDA APHIS quarantine they were transferred to the Albuquerque Zoo in November 2008. Since then, the doves have bred successfully and soon they will be distributed to additional zoos in the United States. After establishing a robust captive meta-population in the United States, Socorro doves will be transferred to partner zoos in Mexico. Concurrent to the international captive breeding program, several actions have been and are being implemented for the re-introduction program on Socorro Island following IUCN Re-introduction Guidelines. Between 1993 - 1997 a partnership with the Mexican Navy was established to control introduced sheep and cats to protect other critically endangered endemic species on Socorro Island. The Mexican Navy conducted the successful eradication of rock doves (*Columbia livia*) by 1994 to remove this source of a potential disease vector (Admiral P. León-Herrera & Captain M. A. Ramos-Real, pers. comm.) In addition, the Mexican government has an on-going program to remove introduced sheep from Socorro Island to prevent further loss of native habitat (A. Aguirre, pers. comm.).

Information about distribution in the wild has been gathered (e.g. localities of museum specimens; S. Bunnell, Sr. unpublished field notes; Captain J. Durán Hernández, pers.

comm.) to compare with recent vegetation surveys to determine the species historic range, habitat requirements and vegetation restoration needs. Also surveys to sample for avian pathogens and disease have been carried out in 2004 and 2009 to estimate the risk of epidemics on both incoming Socorro doves and the native avifauna (Yanga *et al.*, unpublished; J. S. Carlson *et al.*, unpublished). In 2001, a covenant between the Mexican Navy and the Island Endemics Foundation was established to build a Breeding Station on Socorro Island. This facility was completed in November 2004 and is ready to receive Socorro doves to begin breeding efforts *in situ.* Offspring from this effort will then be moved to a release station, yet to be constructed, in order to start the soft release of doves to the wild.

Breeding Station built by the Mexican Navy and Island Endemics Foundation © Juan Martinez

Major difficulties faced

- The six-year term of the federal administration, coupled to the presidential election cycle in Mexico, precludes consistent long-term planning and coordination for the establishment of a multi-year conservation project.
- Although several government environmental authorities support the Socorro Dove Project a better coordination with the Ministry of Agriculture (SAGARPA) is required. The perceived risk of avian influenza from imported birds impeded the return the Socorro dove directly to Mexico. Our disease work had demonstrated that Socorro doves from the European Breeding Program did not represent any risk for the spread of Avian Influenza.
- The National Commission for Natural Protected Areas (CONANP) has no permanent presence on the island and has not yet implemented an enforceable management plan for this insular area, which harbors the largest number of critically endangered avian species in Mexico.
- For NGO´s contributing to the conservation of Socorro Island in particular, and the Revillagigedo Archipelago in general, it is necessary to guarantee continuous access to the island. On occasion, civilian personnel are not allowed to the island because of Military Exercises. It is critical for The Socorro Dove Project to have continuous access to the island. Without continuous access, the survival of the doves used in the *in situ* captive breeding and release programs on the island would be threatened.

Major lessons learned

- The re-introduction project must be considered as a long-term endeavor with multiple success indicators that can be partially achieved according to social and political circumstances.
- The Socorro Dove Project has benefited from a broad and international partnership which has enabled work on many fronts and brought a suite of talents to bear on the Project that no individual partner possessed.
- The perseverance and unfailing will of the captive breeding community that has saved the Socorro dove for more than 80 years provided a solid basis to secure the survival of this species. This is a prime example of a successful trans-generational campaign to save an endangered species.

Success of Project

Highly Successful	Successful	**Partially Successful**	Failure
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Reason(s) for success/failure:

- Although both the international breeding and restoration programs on Socorro Island are moving forward the project must be considered partially successful until the Mexican Government guarantees continuous access to the island to implement *in situ* captive breeding, release and monitoring of individuals.

References

Gifford, E. W. 1927. Grayson's pigeon (*Zenaidura graysoni*) in captivity. Auk 44: 513 - 519.

Horblit, H. M., Martínez-Gómez, J. E., & Stadler, S. G. 2005. The Socorro Dove Project update, México. Re-introduction News 24: 34 - 35.

Jehl, J. R., & Parkes, K. C. 1982. The Status of the Avifauna of the Revillagigedo Islands, Mexico. The Wilson Bulletin 94(1): 1 - 19.

Nicolai, J. 1991. Letzte Chance für die Socorro-Taube. Tropische Voegel 12(2): 55 - 59.

Velasco-Murgía, M. 1982. Colima y las Islas de Revillagigedo. Colima, Mexico: Universidad de Colima.