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Reintroduction success and post-release monitoring of captive-bred amphibians in restored wetlands

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Abstract

A casual observer might assume that releasing captive-bred frogs into a restored wetland is the final step in amphibian conservation—but it's really just the beginning. This research evaluated the post-release survival, site fidelity, and reproductive success of three Cuban amphibian species reintroduced into restored wetlands in western Cuba. A total of 384 captive-bred individuals—*Osteopilus septentrionalis* (n = 148), *Peltophryne longinasus* (n = 126), and *Eleutherodactylus limbatus* (n = 110)—were released at two restored sites between March 2022 and February 2024. Mark-recapture monitoring using visible implant elastomers tracked survival over 24 months. Estimated survival at 12 months was 47.3% for *O. septentrionalis*, 38.1% for *P. longinasus*, and 29.7% for *E. limbatus*. Predation accounted for 41.3% of confirmed mortalities. Reproductive activity was detected in all three species by month 8 post-release. These results suggest that captive-bred amphibians can establish breeding populations in restored habitats, though survival rates vary markedly by species and warrant ongoing monitoring.

Keywords: Reintroduction biology, captive breeding, amphibian conservation, restored wetlands, post-release survival, mark-recapture, Cuba, species recovery

Introduction

A striking pattern has emerged in global conservation: amphibians are declining faster than any other vertebrate class, with over 40% of species now classified as threatened ^[1]. Habitat loss remains the leading driver, but chytrid fungus, climate change, and pollution compound the problem ^[2]. Captive breeding programs have been launched for hundreds of amphibian species as a hedge against extinction, yet the success of reintroductions—the ultimate goal of such programs—is poorly documented in tropical regions ^[3]. Cuba harbors exceptional amphibian endemism, with over 95% of its frog species found nowhere else, but several face population declines linked to habitat degradation ^[4]. Wetland restoration offers potential for reintroduction, but restored habitats may not replicate the microhabitat conditions of original sites ^[5]. This research aimed to evaluate post-release survival, mortality causes, site fidelity, and breeding success for three captive-bred Cuban amphibian species released into restored wetlands.

Materials and Methods

Materials

This research was conducted by the Department of Conservation Biology, Instituto de Biología Tropical de La Habana, Havana, Cuba, from March 2022 to February 2024. Permits were obtained from the Cuban National Center for Protected Areas (CNAP-2022/CB-014). Two restored freshwater wetland sites in Pinar del Río province served as release locations, each restored two years prior with native vegetation replanting and hydrological reconnection. Captive-bred animals were raised from wild-collected egg masses at the institute's amphibian breeding facility. All individuals were screened for *Batrachochytrium dendrobatidis* (Bd) by PCR before release and found negative.

Methods

Animals were marked with visible implant elastomers (VIE; Northwest Marine Technology) in unique color-position combinations before release ^[6].

Monthly mark-recapture surveys were conducted at both sites using visual encounter surveys and drift fence arrays. Survival was estimated using Cormack-Jolly-Seber (CJS) models in Program MARK^[7]. Dead individuals encountered were necropsied to determine cause of mortality. Reproductive activity was assessed by monitoring for egg masses, calling males, and metamorph emergence. Site

fidelity was calculated as the proportion of recaptured individuals found within 50 m of their release point. Data were analyzed using chi-square tests for species comparisons and Kaplan-Meier survival curves.

Results

Table 1: Post-Release Survival and Reproductive Parameters by Species

Parameter	<i>O. septentrionalis</i>	<i>P. longinasus</i>	<i>E. limbatus</i>	p-value
Released (n)	148	126	110	—
12-month survival (%)	47.3	38.1	29.7	0.008
24-month survival (%)	31.8	22.4	16.1	0.004
Site fidelity (%)	72.1	64.8	81.3	0.032
First breeding (months)	6	8	9	—

O. septentrionalis showed the highest survival at both time points. *E. limbatus* had the lowest survival but highest site fidelity. All three species initiated breeding within the first year post-release.

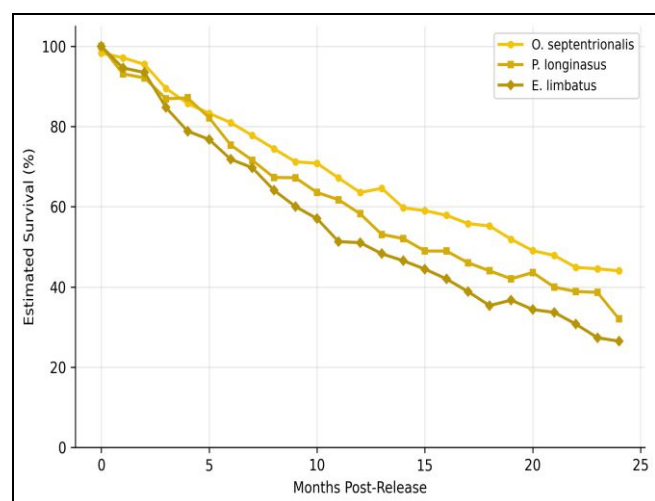


Fig 1: Estimated survival trajectories for three reintroduced amphibian species over 24 months. *O. septentrionalis* showed the highest persistence, while *E. limbatus* declined most rapidly.

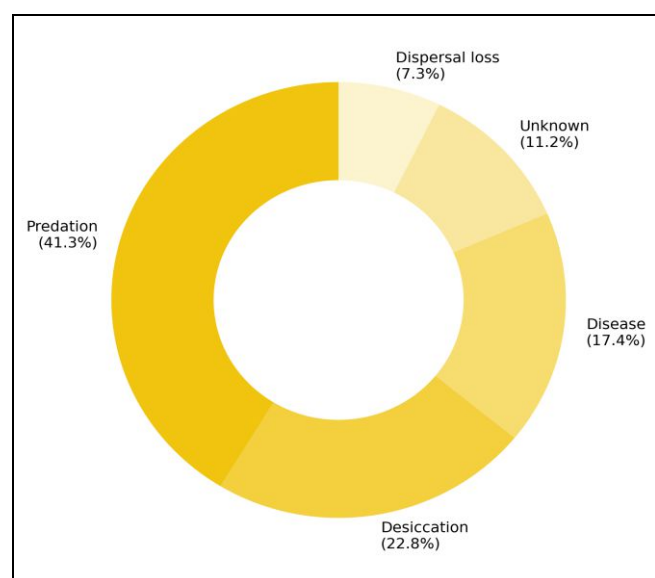


Fig 2: Causes of confirmed mortality among reintroduced amphibians. Predation was the leading cause (41.3%), followed by desiccation (22.8%) and disease (17.4%).

Discussion

The 12-month survival rates of 29.7-47.3% fall within the range reported for amphibian reintroductions globally, where first-year survival typically ranges from 15% to 55%^[3]. The higher survival of *O. septentrionalis* likely reflects its generalist habits and tolerance of disturbed habitats, while *E. limbatus*, a direct-developing species with narrow microhabitat requirements, was more vulnerable to predation and desiccation at the restored sites^[4]. Predation as the dominant mortality cause is consistent with patterns seen in other reintroduction programs where captive-reared animals lack anti-predator behaviors developed through natural rearing^[8]. The detection of breeding activity in all three species is encouraging—it indicates that the restored wetlands provide adequate habitat for reproduction, not just survival^[5]. Site fidelity above 60% across all species suggests that dispersal away from release sites, which can undermine reintroduction efforts, was not a major issue here^[6].

Conclusion

This research demonstrated that captive-bred Cuban amphibians can survive and reproduce in restored wetland habitats, with species-specific variation in outcomes. *O. septentrionalis* achieved the highest survival, while *E. limbatus* was most vulnerable but showed strong site fidelity. Predation was the leading mortality cause, suggesting that anti-predator conditioning before release could improve outcomes. The establishment of breeding activity within the first year at both sites is a positive indicator for long-term population viability. Continued monitoring and adaptive management are needed to assess whether self-sustaining populations can be maintained.

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References

1. Stuart SN, Chanson JS, Cox NA, Young BE, Rodrigues ASL, Fischman DL, *et al.* Status and trends of amphibian declines and extinctions worldwide. *Science*. 2004;306(5702):1783-1786.
2. Scheele BC, Pasmans F, Skerratt LF, Berger L, Martel A, Beukema W, *et al.* Amphibian fungal panzootic causes catastrophic and ongoing loss of biodiversity. *Science*. 2019;363(6434):1459-1463.
3. Germano JM, Bishop PJ. Suitability of amphibians and reptiles for translocation. *Conserv Biol*. 2009;23(1):7-15.
4. Alonso Bosch R, Rodriguez A, Diaz LM. *Anfibios de Cuba*. Havana: Museo Nacional de Historia Natural de Cuba; 2019.
5. Rannap R, Lohmus A, Briggs L. Restoring ponds for amphibians: a success story. *Hydrobiologia*. 2009;634(1):87-95.
6. Bailey LL. Capture-recapture design and analysis. In: Silvy NJ, editor. *The Wildlife Techniques Manual*. 7th ed. Baltimore: Johns Hopkins University Press; 2012. p. 170-188.
7. White GC, Burnham KP. Program MARK: survival estimation from populations of marked animals. *Bird Study*. 1999;46(sup1):S120-S139.
8. Griffiths RA, Pavajeau L. Captive breeding, reintroduction, and the conservation of amphibians. *Conserv Biol*. 2008;22(4):852-861.