How Genetic Analyses Changed Conservation Biology: Lessons Learned from a Case Study Using Frogs in Arizona

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Introduction and Objectives

The use of genetic management in conservation has sparked considerable debate regarding its ethical and environmental implications. A case study on leopard frog conservation in Arizona was examined to assess the benefits and challenges of genetic management plans. The taxonomy of leopard frogs, including the Northern Leopard Frog, Chiricahua Leopard Frog, Lowland Leopard Frog, and Rio Grande Leopard Frog, has undergone changes based on morphology, calls, range, and genetic analysis. The Arizona Game and Fish Department has been actively involved in the conservation of leopard frog species since confirming population declines in the 1990s, with chytrid fungal disease identified as a leading cause. A 2011 study suggests a potential genetic link to susceptibility to chytrid infection.

Fig. 1: Images displaying the morphology of four different leopard frog species of focus: A) Northern Leopard Frog, B) Chiricahua Leopard Frog, C) Lowland Leopard Frog, D) Rio Grande Leopard Frog

Case Study

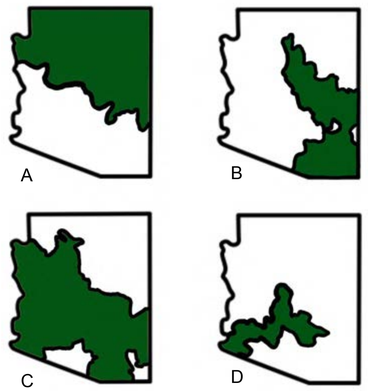

Fig 2. Maps indicating the ranges of four different leopard frog species: A) Northern Leopard Frog, B) Chiricahua Leopard Frog, C) Lowland Leopard Frog, D) Rio Grande Leopard Frog

This case study examines the genetic-based conservation efforts of Arizona leopard frogs by the Arizona Game and Fish Department and their implications for conservation management plans. The study first addresses the management plan for Chiricahua Leopard Frogs, focusing on understanding genetic dynamics to enhance management effectiveness. It then discusses the department's approach to the Northern Leopard Frog, including a captive breeding program to restore wild populations. Initial efforts with native species showed limited success, while a nonnative subspecies thrived, sparking debate on future conservation strategies.

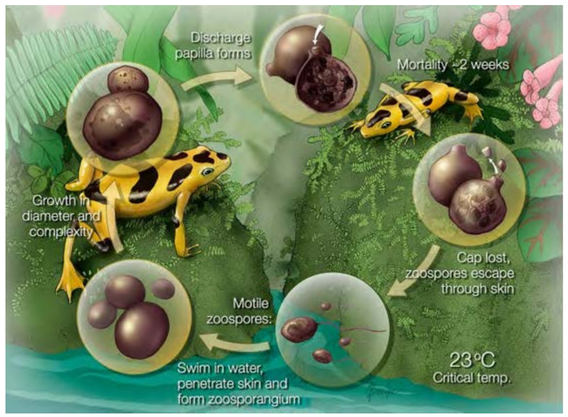

Fig 3. Life cycle of the amphibian chytrid, Batrachochytrium dendrobatids. © Alison E. Burke (Collins 2013)

Discussion

One primary argument against genetic management plans is the potential loss of the species' unique genome, which holds intrinsic value. However, without intervention, the entire genome could be lost. Although certain plans, such as hybridization, may alter the original genome, evidence suggests that genetic management can have positive impacts on the environment and prevent ecological imbalances by maintaining the species' niche. It's important to recognize that genetic management plans are case-specific and have limitations, necessitating careful consideration before implementation.

Conclusions

Despite the complexity of genetic management plans, they are worth considering. Genetics gives conservationists a better understanding of the focus species, allowing for more effective conservation strategies. Hybridization can also be a responsible choice for many species. This case study serves as a strong argument for the benefits of carefully considered genetic management plans.

Literature Cited

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Turpen, Alexa. (2024). How Genetic Analyses Changed Conservation Biology: Lessons Learned from a Case Study Using Frogs in Arizona.