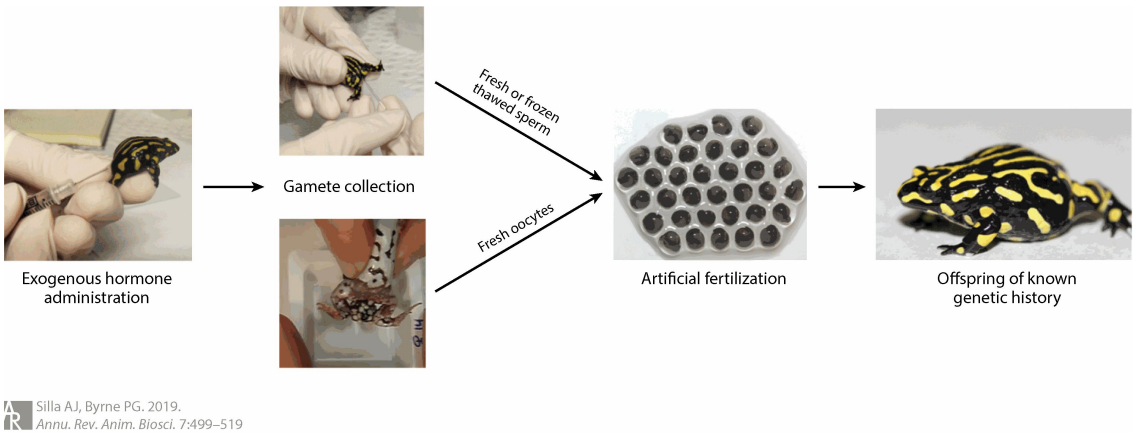

Figure 1 Schematic diagram showing how reproductive technologies can generate offspring of known genetic history (Adopted from Silla and Byrne, 2019)

7 Strategies for Mitigating Species Endangerment

7.1 Habitat restoration and connectivity corridors

Habitat restoration and the establishment of connectivity corridors are critical strategies for mitigating species endangerment. The loss and fragmentation of habitats are major threats to biodiversity, as they isolate populations and reduce genetic diversity. Connectivity corridors help maintain genetic flow between isolated populations, which is essential for their long-term survival and adaptation to environmental changes (Bergès et al., 2019; Ashrafzadeh et al., 2020). These corridors facilitate movement and dispersal, allowing species to access different habitats necessary for their lifecycle, such as breeding and feeding grounds (Joly, 2019). Moreover, habitat restoration efforts aim to rehabilitate degraded ecosystems, enhancing their capacity to support diverse species and ecological processes (Chase et al., 2020).

The implementation of habitat connectivity models, such as the landscape connectivity metric equivalent connectivity (EC), can significantly improve the effectiveness of these strategies. By incorporating spatial configurations into conservation planning, these models help identify critical areas for restoration and corridor establishment, ensuring that conservation efforts are both efficient and effective. This approach not only aids in preserving biodiversity but also supports ecosystem services that are vital for human well-being.

7.2 Ex-situ conservation and captive breeding programs

Ex-situ conservation and captive breeding programs play a pivotal role in species conservation, particularly for those facing imminent extinction. These programs involve the breeding and maintenance of species outside their natural habitats, providing a safeguard against extinction while efforts are made to restore their natural environments (McGowan et al., 2017). The IUCN guidelines emphasize a structured approach to ex-situ management, ensuring that these programs are strategically aligned with broader conservation goals.

Captive breeding programs must also focus on maintaining the genetic diversity and natural behaviors of species to ensure their successful reintroduction into the wild. This includes addressing the “captivity effect”, where animals may lose essential survival skills due to the artificial conditions of captivity (Clark et al., 2023). By incorporating cognitive and behavioral enrichment, these programs can better prepare species for the challenges of reintroduction, increasing their chances of survival in changing environments.

7.3 Genetic interventions and assisted migration

Genetic interventions, such as genetic rescue and assisted migration, are increasingly recognized as essential tools in conservation biology. These strategies aim to enhance genetic diversity and adaptability in populations threatened by inbreeding and environmental changes (Hoffmann et al., 2020). Genetic rescue involves the introduction of new genetic material to small, isolated populations to increase their genetic diversity and fitness, while assisted migration involves relocating species to areas with more suitable environmental conditions.