Infertility challenges among endangered wild songbird population revealed in new study

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Female Hihi. Credit: The University of Sheffield

A recent study has provided the most comprehensive estimate to date of infertility rates in a threatened wild animal species. Using 10 years of data, researchers from the University of Sheffield, the Zoological Society of London, and the University of Auckland, New Zealand, have

uncovered critical insights into the reproductive challenges faced by the endangered hihi, a rare songbird native to New Zealand.

The first to establish a link between small population size, sex ratio bias, and reduced fertilization rates in wild animals, the study highlights the significant reproductive challenges faced by threatened species with small population sizes and biased sex ratios. The study is published in the journal *Proceedings of the National Academy of Sciences*.

The research team analyzed over 4,000 eggs and assessed the fertility of nearly 1,500 eggs that failed to hatch. The findings revealed that infertility accounts for an average of 17 percent of hatching failures in the hihi, while the majority of hatching failures are caused by early embryo death.

The study revealed that embryos are most vulnerable within the first two days of development, with no significant difference in survival rates between male and female embryos or any impact from inbreeding. Additionally, infertility rates were observed to be higher during years when the population was smaller and male numbers exceeded female numbers, indicating that elevated stress from increased male harassment of females may play a role in these findings.

The hihi, known for its high levels of female harassment by males and frequent extra-pair paternity, is an example of the reproductive challenges faced by species with skewed sex ratios. In extreme cases, females may be subjected to up to 16 forced copulations per hour, a behavior that is both energetically costly and stressful, potentially contributing to reduced fertility.

By considering the impacts of population size and sex ratio on fertility, conservationists can better manage the numbers and composition of animals in populations, therefore improving fertility rates.

Fay Morland, Ph.D. student at the University of Sheffield, and lead author of the study, said, "One of our key findings is that embryo mortality at the very early stages of development is the most common reason hihi eggs fail to hatch. However, the exact causes of failure at this stage remain unknown. These results highlight the urgent need for more research into the reproductive challenges faced by threatened species, to better understand and mitigate the factors driving their risk of extinction."

Dr. Nicola Hemmings, from the University of Sheffield's School of Biosciences, and leader of the research group that undertook the study, said, "Our research highlights the importance of understanding the factors that affect fertility in endangered species. The link between male-biased sex ratios and lower fertility rates suggests that managing population composition could be crucial for improving reproductive success in conservation programs."

More information: Fay Morland et al, Demographic drivers of reproductive failure in a threatened bird: Insights from a decade of data, *Proceedings of the National Academy of Sciences* (2024). DOI: 10.1073/pnas.2319104121

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