Developing eDNA methods to detect Top End animals

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Northern Australia Environmental Resources Hub

National Environmental Science Programme

World class research to support sustainable development in northern Australia

This project has developed[1] an eDNA probe for the endangered Gouldian finch and has validated its use on water samples collected from waterholes at sites where the finches are known to drink. The utility and cost-effectiveness of using eDNA to detect Gouldian finches is being compared with existing survey methods. eDNA methods are also being developed for other terrestrial animal species of conservation concern in the Top End.

What's new?

- We have designed a quantitative polymerase chain reaction (qPCR) assay to detect the eDNA of Gouldian finches (*Erythrura gouldiae*) from samples collected from the waterholes where they drink.
- We developed a PCR primer specific to the Estrildidae family of finches. The primer allows us to amplify (make multiple copies) of a fragment of DNA found in Gouldian finches, long-tailed finches (*Poephila acuticauda*) and masked finches (*P. personata*). These three species of finch are often found together in mixed flocks in the Top End and regularly drink from the same water sources.
- We then developed a probe that allows us to detect a region of DNA within this fragment that is specific to Gouldian finches but is not found in long-tailed or masked finches.
- We trialled our protocols for collecting and analysing water samples for eDNA in aviaries containing Gouldian finches at the Territory Wildlife Park. We tested for optimal sample volume, time until first detection, persistence of eDNA in water, the effect of turbidity on the detection of eDNA, and the accuracy of our qPCR assay in detecting Gouldian finch eDNA.
- We found that we could detect the eDNA of Gouldian finches in as little of 20mL of their drinking water, but that the greatest number of detections was gained from 200mL of water. We first detected eDNA in as few as six hours or as long as 30 hours after birds drank from the water trays. eDNA persisted longer in water that was shaded rather than in direct sunlight.
- We then trialled our protocols under field conditions at Yinberrie Hills, with the assistance of Jawoyn Rangers. We had no false-positive results – we only found Gouldian finch eDNA in the waterholes where we observed them drinking. This is a promising result at such an early stage of eDNA test development. We did record some false-negative results, where our sampling failed to detect Gouldian finch eDNA from waterholes where the water was turbid or reached high temperatures, or in waterholes with a large volume of water relative to the numbers of finches drinking from them. Our test was accurate in all waterholes where the Gouldian finches had come to drink for three consecutive mornings.
- We developed a series of graphics-based scorecards for our data from the Yinberrie Hills (see examples on last page) and shared the results with Jawoyn Rangers.

*Adult and juvenile Gouldian finches (*Erythrura gouldiae*) and two long-tailed finches (*Poephila acuticauda*), photo Alexander and Eckhard Garve.*

What's next?

- We are refining our protocols for sampling design, sample collection, eDNA analysis and interpretation to improve our ability to detect Gouldian finch eDNA.
- We are now investigating using eDNA to detect other terrestrial species in the Top End.

Project summary

Detecting animals, especially species that are rare or cryptic, is challenging in the remote and potentially hazardous environments of northern Australia. Traditional survey techniques are time and resource intensive, and so we have little reliable data for many species. Yet knowing whether a species is present or absent at a site is critical for conservation management and land-use planning. Species detection using environmental DNA (eDNA) has great potential to contribute to cost-effective assessments of biodiversity. eDNA techniques are well established for freshwater and some semi-aquatic species. Detecting the eDNA of terrestrial species can be more challenging but studies have shown that eDNA from terrestrial species can be detected in soil or in water bodies where they bathe or drink. This project is trialling eDNA detection on the endangered Gouldian finch, a seed-eating species that drinks daily from small waterholes. We are also extending the application of eDNA methods to other terrestrial species of conservation or management concern in the Top End.

Jawoyn Rangers, Ken Duffill (left) and Ryan Barrwei (right) collecting waterhole samples for Gouldian eDNA research, photo Alea Rose.

REFERENCE

1. Day K, Campbell H, Fisher A, Gibb K, Hill B, Rose A, Jarman SN. 2019. Development and validation of an environmental DNA test for the endangered Gouldian finch *Endangered Species Research. 40:171-182* https://doi.org/10.3354/esr00987

Further information

Contact project leader, Karen Gibb at karen.gibb@cdu.edu.au

The project page can be found on the Hub website, along with the project start-up factsheet.

This research is due for completion in June 2020.


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Start-up factsheet

We need improved monitoring methods for remote areas

eDNA can help survey land animals including the Gouldian Finch

Overview

This project is supported through funding from the Australian Government's National Environmental Science Program.

Northern Australia Environmental Resources Hub

National Environmental Science Programme

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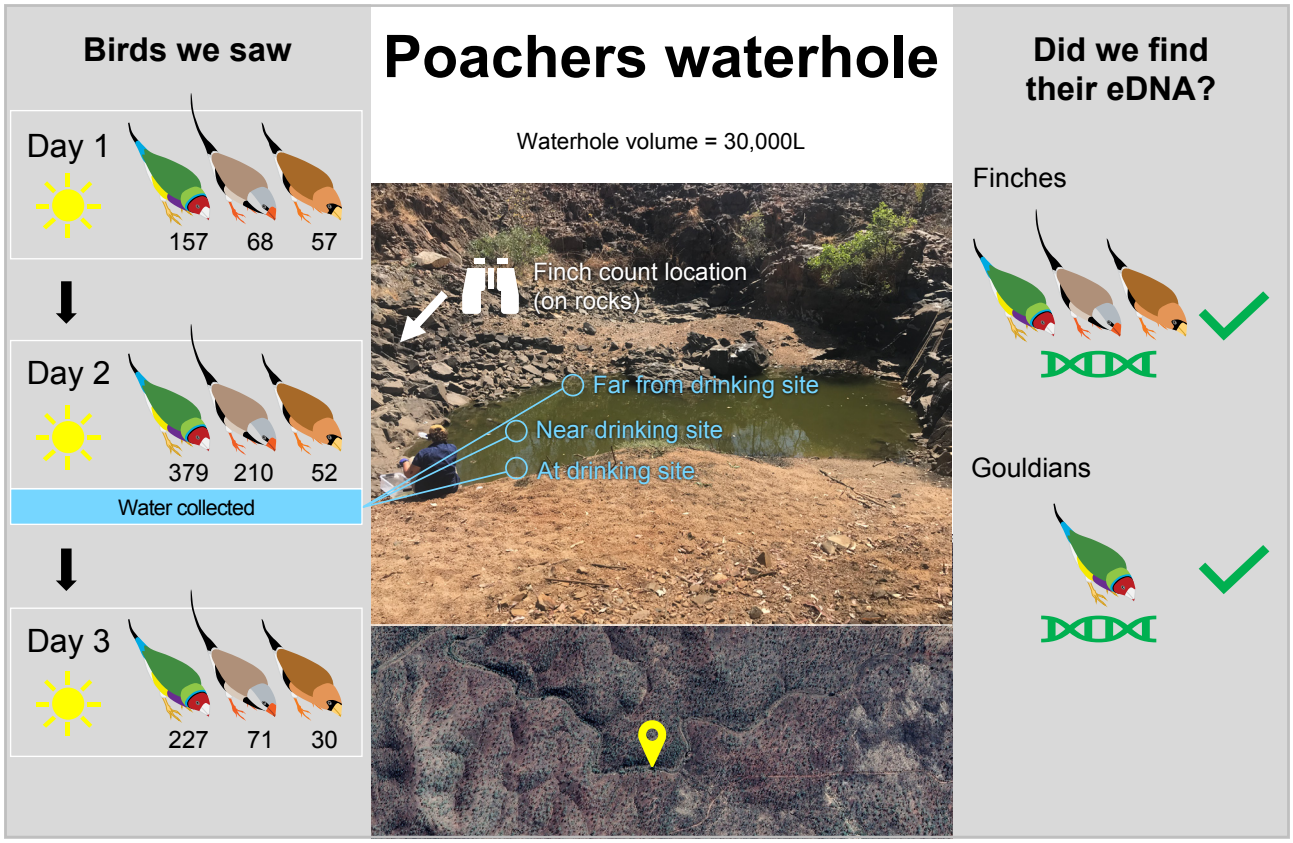

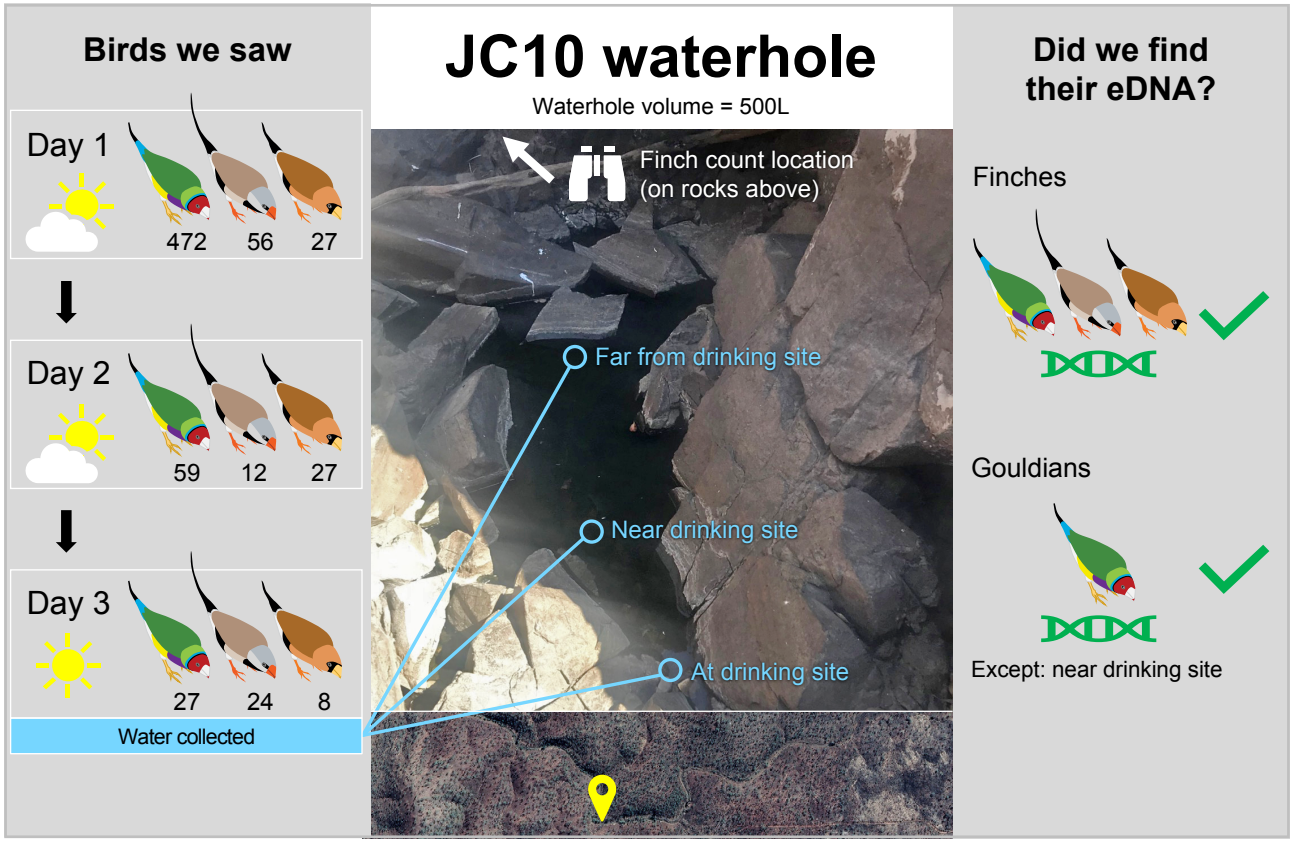

Example scorecards for two of the waterholes used to trial this eDNA protocol.