

7 September 2023

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Tēnā koe [REDACTED]

Thank you for your request to the Department of Conservation, received on 28 August 2023, in which you asked for:

Further information on the current takahe recovery programme.

My specific interest is in what processes are used for increasing genetic diversity in takahe populations, including what strategies are implemented, and how results are collected and analysed.

Other useful information:

** Are genomic analyses used?*

** The use pedigrees and breeding plans.*

** Guidelines used by the Burwood Takahe Centre.*

** How are studies commissioned and used, internally or externally from DOC?*

** What difficulties are faced when implementing the recovery programme.*

Does the current plan exist as a formal document, such as the one for 2007-2012:

<https://www.doc.govt.nz/globalassets/documents/science-and-technical/tsrp61entire.pdf> ?

We have considered your request under the Official Information Act 1982.

Additional context is included to help with your enquiry:

The Takahē Recovery Programme (alongside kākāpō) has the most integrated population genetic management of any NZ species, and regularly utilises external research and review to keep our processes relevant. All management steps are informed by pedigree-driven analysis, and progression/security is tracked annually as part of our reporting process. Additionally, we bring in external support for review and advice, on a five-yearly basis.

How are our takahē populations managed?

The takahē population of ~500 birds are split evenly between our wild populations (3), which are effectively unmanaged (other than survivorship tracking and targeted transfers), and eighteen Sanctuary Sites. These Sanctuary Site birds are actively managed, with individuals having 100% ancestry known (8% of which have multiple possible parents recorded), back to at least the wild (Murchison Mountains) origin of their bloodline. As each of the eighteen Sanctuary Sites can only hold between 2 and 20 breeding pairs, these are managed as one metapopulation, with regular transfers (up to 80 per year) providing 'assisted migration' to



minimise loss through inbreeding and genetic drift, and maximise opportunity for amplification of rarer bloodlines.

What is the overarching goal, and what tools are utilised to achieve it?

Across the managed metapopulation sites we have the appropriate breeding pair numbers, survivorship, and productivity, to ensure our genetic goals are exceeded - specifically 98% retention of genetic diversity (GD) after 25 years. The necessary size of the metapopulation is modelled utilising historical demographic data, and various management scenarios tested to review their impact, with the minimum retention target in mind.

The strategies we employ are dependent on the individual site. For most sites, where staff capacity and/or experience is limited, our genetic management relies on regular transfers to and from, and monitoring site mean kinship and pairings to avoid inbreeding. At Burwood we can undertake pairwise, location, and nest management to directly influence genetic security of the entire population (further detail below).

How do we measure progress/performance, and test our strategy?

Our key genetic health measures have significantly improved over time, as utilisation of the pedigree and its analysis, population management practices, and site expansion have allowed a more targeted approach. Progress is measured and reported on annually, in the form of site and population-level MK and GD figures. We have been assisted in this progression with the support of past students and staff of the University of Otago, and support from Auckland Zoo and the Conservation Population Specialist Group (CPSG). On a five-yearly basis we have contracted Dr Caroline Lees (CPSG) to review our data and strategies (using PMx and Vortex), and progression against stated targets. These reports are available on request and clearly highlight the gains made as of 2020. An outcome of the most recent report was a suggested reduction in the Sanctuary Site population target, reflecting declining risk of GD loss through rare bloodline amplification, and improved survivorship and productivity compared with historic levels.

In addition to pedigree-based analysis, we are working closely with Dr Lara Urban (Urban Group, Technical University of Munich) on using genomics analysis to fill in the gaps – specifically what is the true relatedness between the 44 founder lines that currently populate the metapopulation and, is there any unsampled GD remaining in the Fiordland source population. This is supported by other external advisors and members of the group, including Dr Debbie Leigh (IUCN Conservation Genetics Specialist Group). DNA material is taken and stored from new takahē to aid in future analysis.

Your questions and our responses are listed below:

1. Are genomic analyses used?

Genetic analyses are extensively used as a tool for all aspects of our population and individual management. Specifically, we use measures such as:

- Mean Kinship (MK), for ranking of individuals, sub-populations, and populations, pairwise analysis. This also allows us to track the impact of our management – primarily bird transfers and targeted pair-wise management. MK is taken from PMx, based on our pedigree data (stored in ZIMS).
- Change in Genetic Diversity. This is primarily used when creating a new population, allowing us to plan which individuals to use as founders, and who to target in future transfers, to best ensure the as much of the entire remaining takahē genetic diversity is represented. This is also completed in PMx.

- Pairwise management (FSI). This is used to select appropriate pairings where pairwise management is possible (e.g. small populations and Burwood Takahē Centre). Again, PMx is used for this analysis.

These genetic tools are being improved through genomic analyses to estimate founder relatedness and to further assess genetic diversity in the source population. Currently 75 individual takahē genomes have been sequenced at low coverage as part of this study led by the Urban Group.

2. The use pedigrees and breeding plans.

We have a comprehensive takahē pedigree, stored and maintained in ZIMs. This currently contains 1260 past and present animals and is updated regularly (as hatches, deaths, transfers occur) to ensure any analyses utilising the data are accurate. The takahē pedigree is very complete relative to most species, with an almost complete pedigree known back to their original source population – Fiordland’s Murchison Mountains. The pedigree is used for transfer planning (undertaken in April each year), informing the movement of ~ 70-80 birds per year.

Breeding plans are specific to the Burwood Takahē Centre (discussed below and available in a separate document), other than ensuring birds at the various Sanctuary Sites are in appropriate pairings ahead of the breeding season. The breeding plan for the Burwood Takahē Centre is reviewed in July each year, with pairs and individuals ranked, and birds moved to appropriate enclosures according to their rarity (some enclosures are more productive than others). During the breeding season, highest ranked (platinum birds) receive more intensive nest management to maximise productivity. This involves removing eggs and fostering to other, lower ranked, pairs, enabling up to three clutches (six eggs) to be produced annually.

3. Guidelines used by the Burwood Takahē Centre.

The Burwood Takahē Centre population is intensively managed utilising our pedigree analysis. Burwood holds the highest ranked individuals due to our ability to protect, force-pair, and amplify the rare bloodlines (survivorship and productivity are the highest of any of the 21 takahē sites). Specifically, pairings are made according to best available mate (FSI ranking), individuals are ranked according to their individual MK and likelihood of loss, and nests are managed accordingly (e.g. highest ranked individuals/pairs given best territories, and receive the most nest management – occasionally at the expense of lower ranked pairs).

4. How are studies commissioned and used, internally or externally from DOC?

We have always worked closely with the Zoology Department at the University of Otago, with a long history of support and research from Ian Jamieson and students, and more recently with Research Fellow, Dr Lara Urban. We also have a strong association with Auckland Zoo, and CPSG via Dr Caroline Lees. Dr Lees is contracted every five years to undertake a review of the population management of the Takahē Recovery Programme, with the first being in 2015. Given the experience and network associated with these experts, it is likely that we will continue to utilise their support in the future.

5. What difficulties are faced when implementing the recovery programme.

Supported by National Partner Fulton Hogan, the Takahē Recovery Programme is relatively well funded. We have a strong relationship with Treaty Partner Ngāi Tahu, and an excellent network of researchers connected to the recovery programme. This financial, technical, and ethical support means the recovery programme is generally able to progress our action plans.



Our difficulties are the same as many similar species recovery programmes – how to create safe habitat on a landscape scale in a way that is achievable and sustainable.

Collaborating with others, both internal and external, and taking calculated risks in the trialling of new tools and technology, is the only way to progress towards our overarching goal of building sustainable takahē populations in the wild. For this there is a strong reliance on progression at a pest control research and development, and legislative level – things that are outside our direct influence.

6. Does the current plan exist as a formal document, such as the one for 2007-2012:

We have a draft plan 2016-2020, and 2021-2025 available on request. The goals and actions are clear, complete, and approved, and we have been working to these. Final publication has been delayed by a new Species Recovery Plan template being developed.

Please note that this letter (with your personal details removed) may be published on the Department's website.



Nāku noa, nā



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Te Papa Atawhai