AWMS Postgraduate Student Research Award Report

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Understanding and Managing Invasive Deer with Genetics

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I am very grateful to have received the AWMS Postgraduate Student Research Award in 2023, for my PhD project "Understanding and Managing Invasive Deer with Genetics".

Invasive species are a major wildlife management issue in both Australia and New Zealand. Six deer species in Australia and seven in New Zealand have established in the wild following 19th century introductions. Deer are an increasing threat to ecosystems, biodiversity and agriculture, with impacts such as herbivory and destruction of vegetation, fouling water sources via wallowing, competition with other herbivores, exotic plant dispersal, and disease transmission to livestock. The focus of my PhD is the development of genetic methods, particularly targeting DNA from faecal samples, to monitor deer and inform management.

For my first chapter I developed a single nucleotide polymorphism (SNP) panel for identifying individuals and determining species, sex, kinship, and population information from faecal samples of sambar deer (Cervus unicolor), a species of particular concern in Victoria, Australia. As DNA from faecal samples is generally poor quality, I also conducted degradation trials to determine the effects of time on genotyping success under various environmental exposure conditions. On average, exposed faecal samples up to four days old were viable (i.e. 200 SNPs successfully genotyped), while samples protected from rain and UV continued to be viable after 14 days. I presented the preliminary findings of this research at the AWMS 2023 conference in Melbourne, where I thoroughly enjoyed hearing about the fantastic work being done by AWMS members and meeting some of you!

Age is another important metric for understanding populations, and recent advances have demonstrated that age can be accurately estimated using an "epigenetic clock" – a model which is first calibrated from DNA methylation patterns in individuals of known age. However, most clocks calibrated to date have used an expensive, generic approach using good quality DNA from tissue or blood, and further work is needed for their development into targeted, cost-effective methods for age estimation in wild populations. This forms the focus of my second chapter, where I aim to develop a management-applicable method for estimating age in multiple deer species, which would be beneficial to deer management in Australia, New Zealand, and the species'

native ranges. If possible from faecal samples, this would allow for targeted sample collection without relying on samples from control operations and hunting. Funds from the AWMS Postgraduate Student Research Award helped with sequencing costs for this chapter and are much appreciated. After a long optimisation process for this admittedly rather ambitious aim, I was pleased to present my very promising progress recently at AWMS 2024 in Fremantle, another wonderful conference. Pilot results suggest that the method will be feasible, provided I can acquire enough known-age deer samples to calibrate a strong model (if any readers happen to have any leads, I'd love to hear from you! – t.dombrain@latrobe.edu.au).

Next for me will be finalising the epigenetic clock and applying both methods to wild populations to inform management. I look forward to sharing more of my research with AWMS in future!