

Progress Report SP 2021-024

Genetics of Pilbara threatened bats

BCS Animal Science

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Genetics of Pilbara threatened bats

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Context

The orange leaf-nosed bat (*Rhinonicteris aurantia*) and the ghost bat (*Macroderma gigas*) were both once widespread across Australia but are now restricted to patchily distributed habitat across northern Australia. Isolated populations occur in the Pilbara bioregion, where a distinct form of the orange leaf-nosed bat is recognised (hereafter Pilbara leaf-nosed bat). Both species are considered to be declining in the Pilbara, being highly threatened by habitat loss through mining activity, and are consequently recognised as Vulnerable under State and Commonwealth environmental legislation. Genetic analyses are providing insight into landscape-scale and fine-scale patterns of genetic structure and connectivity in these species. The development of novel genetic techniques for non-invasive monitoring of ghost bats is providing rich insights into roost occupancy patterns and animal movement. Further research is required to address priority knowledge gaps for the species, including estimation of population size and identification and characterisation of critical habitat for each species.

Aims

- Understand the historical and contemporary genetic diversity and landscape-scale genetic structure of Pilbara bat species.
- Understand the fine-scale patterns of genetic connectivity of bat populations and sex-biased dispersal.
- Undertake SNP genotyping of non-invasive samples for genetic monitoring of ghost bat populations.
- Undertake development and refinement of mark-recapture analyses to assist development of standard monitoring protocols.
- Integrate genetic, spatial and distributional data to identify and understand critical habitat for Pilbara bat species.

Progress

- Population genomic analysis of the Pilbara leaf-nosed bat has been completed and published in *Global Ecology and Conservation*.
- A manuscript on the genetic structure of Pilbara ghost bats is in preparation.
- Four genetic monitoring reports for ghost bats have been completed for industry.
- Two manuscripts have been completed on ghost bat research prioritisation, one is published in *Australian Mammalogy* and the other is submitted.
- A draft report on the performance of alternative mark-recapture approaches for non-invasive genetic monitoring is being finalised.
- A draft manuscript on the development of ghost bat MassArray SNP genotyping panels is being finalised.
- A draft report on the integration of genetic IDs from microsatellite and SNP genotypes for the ghost bat is nearly complete.
- First-pass draft reference genome and transcriptome assemblies have been completed.

Management implications

- High genetic connectivity was observed across roosts of the Pilbara leaf-nosed bat, indicating the species has a high capacity for dispersal. Preserving critical roosting habitat and protecting and maintaining dispersal corridors between roosts will be important to maintain connectivity.
- Ghost bat monitoring has shown bats persist in the same roosts across multiple seasons and most detected bat movements are within 1 – 10km, with infrequent longer distance dispersal also observed (up to 160km). Similarly, preserving critical roosting habitat and maintaining dispersal corridors will be crucial for ghost bat conservation.
- Development of non-invasive sampling methods is providing individual-level information on ghost bat behaviour and population dynamics with minimal disturbance to roosts. Refinement of survey design and

application of mark-recapture models will contribute to development of robust monitoring protocols that involve minimal disturbance.

- SDM's will assist in identification of critical roosting and foraging habitat for both bat species and provide a guide for targeted surveys.

Future directions

- Complete draft manuscript on population genetic structure of ghost bats and submit manuscript on ghost bat MassArray SNP genotyping panels.
- Continue ghost bat genetic monitoring projects as required.
- Complete draft report on mark-recapture approaches for ghost bats and SNP genotyping.
- Undertake testing and validation of ghost bat MassArray panel.
- Further refine ghost bat genome and transcriptome assemblies and undertake genome annotation.
- Complete SDM's for ghost bat and PLNB roosting and foraging habitat.